Call for Symposium Proposals

Flattening the World: Building the 21st Century Global Knowledge Society

We live in a time when collaborations between countries and continents have never been easier, at least from a technical standpoint. A stunning example is the Large Hadron Collider, which is being used by a multinational group of physicists to understand the fundamental building blocks and laws of nature, from subatomic to cosmic. Stores of information and knowledge can be accessed from anywhere by anyone. Remote sensing technology enables the detailed observation of virtually every aspect of our planet’s surface, subsurface, and climate. Technology and the Internet are transforming education. Learning is, in principle, available to everyone everywhere.

The 21st century is shaping up to be a challenging one. The issues that face us are many: climate change, energy, agriculture, health, water, biodiversity and ecosystems, population growth, and economic development. The 2012 program will focus on the complex challenges of the 21st century that are both global in their scope and profoundly interconnected as well as ways to tackle them on a global scale through international, multidisciplinary efforts.

Symposium proposals for the 2012 meeting are now being solicited. To submit a proposal, visit www.aaas.org/meetings. The deadline for submission is Tuesday, 26 April 2011.

Call for Poster Submissions

Student Poster Competition
Open to college undergraduate and graduate students only
The competition recognizes the individual efforts of students who are actively working toward a college-level degree. Winners in each category receive a cash award and framed certificate, and are listed in Science.

General Poster Session
Open to postdocs and professionals
This session provides an opportunity for postdocs and professionals to present their research to the broad community of scientists attending the AAAS Annual Meeting.

Information about the call for poster submissions for the 2012 Annual Meeting will be available at aaas.org/meetings on 12 May 2011.
Emerging Researchers National (ERN) Conference in STEM

February 24-26, 2011
Washington Hilton Hotel

Co-hosted by the
American Association for the Advancement of Science (AAAS)
Education and Human Resources Program (EHR)

National Science Foundation (NSF)
Division of Human Resources Development (HRD)
Directorate of Education and Human Resources Program
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   Joan E. Ferrini-Mundy, NSF
   James H. Lightbourne, NSF
   Alan I. Leshner, Shirley M. Malcom, and Yolanda S. George, AAAS

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Overview of the Conference

EMERGING RESEARCHERS NATIONAL (ERN) CONFERENCE IN STEM

The 2011 Emerging Researchers National (ERN) Conference in Science, Technology, Engineering and Mathematics (STEM) is hosted by the American Association for the Advancement of Science (AAAS), Education and Human Resources Programs (EHR) and the National Science Foundation (NSF) Division of Human Resource Development (HRD), within the Directorate for Education and Human Resources (EHR). The conference is aimed at college and university undergraduate and graduate students who participate in programs funded by the NSF HRD Unit, including underrepresented minorities and persons with disabilities.

In particular, the conference seeks to highlight the research of undergraduate and graduate students who participate in the following NSF HRD-funded programs:

- Centers of Research Excellence in Science and Technology (CREST);
- Historically Black Colleges and Universities Undergraduate Program (HBCU-UP);
- Louis Stokes Alliances for Minority Participation (LSAMP) and LSAMP Bridges to the Doctorate;
- Research in Disabilities Education (RDE); and
- Tribal Colleges and Universities Program (TCUP).

The objectives of the conference are to help undergraduate and graduate students to enhance their science communication skills and to better understand how to prepare for science careers in a global workforce. Towards this end, the general format for the 2-1/2 day conference includes:

- Student poster and oral presentations.

Other conference activities include workshops focused on:

- Strategies for applying for and succeeding in graduate programs and finding funding for graduate school;
- Career preparation for the STEM workforce, including employment searches and retention; and
- Understanding STEM careers in a global context and identifying international research and education opportunities for undergraduate and graduate students and faculty.

Exhibitors include representatives from academic, government, business, and the non-profit sector with information about graduate school admissions, fellowships, summer research opportunities, professional development activities, and employment opportunities.

For more information, visit the Web site (http://www.emerging-researchers.org/).
THE NATIONAL SCIENCE FOUNDATION (NSF) DIVISION OF HUMAN RESOURCE DEVELOPMENT (HRD)

The National Science Foundation (NSF) Division of Human Resource Development (HRD), within the Directorate for Education and Human Resources, serves as a focal point for NSF’s agency-wide commitment to enhancing the quality and excellence of science, technology, engineering, and mathematics (STEM) education and research through broadening participation by underrepresented groups and institutions.

The Division’s programs aim to increase the participation and advancement of underrepresented minorities and minority-serving institutions, women and girls, and persons with disabilities at every level of the science and engineering enterprise.

HRD programs contribute to attainment of the PEOPLE outcome goal of the NSF Strategic Plan FY 2003-2008: A diverse, competitive, and globally engaged U. S. workforce of scientists, engineers, and well-prepared citizens. Programs within HRD have a strong focus on partnerships and collaborations in order to maximize the preparation of a well-trained scientific and instructional workforce for the new millennium.


AAAS

The American Association for the Advancement of Science (AAAS) is the world’s largest general scientific society, and publisher of the journal, Science (www.sciencemag.org) as well as Science Translational Medicine (www.sciencetranslationalmedicine.org) and Science Signaling (www.sciencesignaling.org). AAAS was founded in 1848, and includes some 262 affiliated societies and academies of science, serving 10 million individuals. Science has the largest paid circulation of any peer-reviewed general science journal in the world, with an estimated total readership of 1 million. The nonprofit AAAS (www.aaas.org) is open to all and fulfills its mission to “advance science and serve society” through initiatives in science policy; international programs; science education; and more. For the latest research news, log onto EurekAlert!, www.eurekalert.org, the premier science-news Web site, a service of AAAS.

MEMBERSHIPS AND PROGRAMS

Open to all, AAAS membership includes a subscription to Science. Four primary program areas fulfill the AAAS mission:

- Education and Human Resources
- Project 2061

AAAS MISSION

AAAS seeks to "advance science, engineering, and innovation throughout the world for the benefit of all people." To fulfill this mission, the AAAS Board has set these broad goals:

- Enhance communication among scientists, engineers, and the public;
- Promote and defend the integrity of science and its use;
- Strengthen support for the science and technology enterprise;
- Provide a voice for science on societal issues;
- Promote the responsible use of science in public policy;
- Strengthen and diversify the science and technology workforce;
- Foster education in science and technology for everyone;
- Increase public engagement with science and technology; and
- Advance international cooperation in science.

Visit the AAAS Web site at http://www.aaas.org/
Welcome

Dear Conference Participants:

On behalf of the National Science Foundation (NSF) and its Directorate for Education and Human Resources, I welcome you to the 2011 Emerging Researchers National Conference in Science, Technology, Engineering and Mathematics (STEM). This research conference for undergraduate and graduate students builds on and continues NSF’s commitment to increase participation in STEM fields for underrepresented minorities, women, and individuals with disabilities as a means to foster the research and education capacity of the nation.

Undergraduate and graduate student research is the key to educational preparation for the science and engineering workforce. The recent report: Expanding Underrepresented Minority Participation: America’s Science and Technology Talent at the Crossroads by the National Academies states that “at the undergraduate and graduate level, engagement in rich research experiences allows for the further development of interest and competence in and identification with STEM and enhances academic opportunities.”

I applaud your enthusiasm for research experiences as part of your ongoing studies, and we look forward to your research presentations at this, and future conferences.

Sincerely,

Joan E. Ferrini-Mundy
Assistant Director (Acting)
Directorate for Education and Human Resources
Dear Conference Participants:

On behalf of the Division of Human Resource Development at the National Science Foundation, I welcome you to the 2011 Emerging Researchers National Conference in Science, Technology, Engineering and Mathematics.

Student scholarship is not only classroom learning, but also the creation of scientific knowledge, aligning classroom learning with real-world scientific problems, collaboration with other students, faculty, and researchers, and dissemination of that research in journals and at conferences. I congratulate you on taking the important step in your education to participate in research and in this conference.

I encourage you to take advantage of all of the opportunities this conference has to offer - research presentations, exhibits from academia, government, and business, workshops, plenary sessions, and networking.

Sincerely,

James H. Lightbourne
Division Director (Acting)
Division of Human Resource Development
Directorate for Education and Human Resources
Dear ERN Conference Participants:

On behalf of the American Association for the Advancement of Science (AAAS), publisher of the journal Science, we welcome you to the 2011 Emerging Researchers National (ERN) Conference in Science, Technology, Engineering and Mathematics (STEM). We applaud the National Science Foundation (NSF) for its commitment to enhancing the quality and excellence of STEM education and research through broadening participation by underrepresented minorities, persons with disabilities, and institutions.

We also applaud the efforts of faculty and administrators who develop and implement innovative undergraduate and graduate educational initiatives. These initiatives are key components in keeping the U.S. at the forefront of technological innovation and for building a strong economy.

We appreciate the continued support and efforts of the nearly 50 exhibitors at this Conference, many of whom are grantees of the NSF Alliances for Graduate Education and the Professoriate (AGEP) or the Integrative Graduate Education Research Traineeship (IGERT) Programs. These organizations provide very important information about graduate school admissions, fellowships, summer research opportunities, professional development activities, and employment opportunities.

AAAS is delighted to co-sponsor this conference with the NSF because it provides one of the few national venues for undergraduate and graduate students to network, build their scientific communications skills, and to showcase their research. This year we welcome nearly 520 undergraduate and graduate student presenters at the Conference.

We also welcome the 15 PhD alumni of David and Lucile Packard HBCU Graduate Scholars Program who are joining us at the Conference this year, as well as the current Scholars. Since the inception of the Program in 1992, eighty-five (85) African American participants have earned PhDs, primarily in physical sciences, engineering, and mathematics and statistics.

As a part of its mission to “advance science, engineering, and innovation throughout the world for the benefit of all people,” AAAS provides a wide array of programs and resources. To find out more about the internships, fellowships, and educational and career resources offered by AAAS, we invite you to visit online at http://www.aaas.org/.

We hope the contacts, strategies, and online resources that you discover at this Conference and via our Web site are useful in helping you meet your institutional or career goals.

Sincerely,

Shirley M. Malcom

Yolanda S. George

Alan I. Leshner, Chief Executive Officer, AAAS and Executive Publisher, Science
Shirley M. Malcom, Director, AAAS Education and Human Resources (EHR) Programs
Yolanda S. George, Deputy Director and Program Director, EHR
Conference Staff

NSF AND AAAS STAFF

NSF DIVISION OF HUMAN RESOURCES DEVELOPMENT

SENIOR MANAGERS
James H. Lightbourne, Acting Division Director
Victor Santiago, Acting Deputy Division Director

HRD PROGRAM DIRECTORS
Lura (Jody) Chase, TCUP
A. James Hicks, LSAMP and LSAMP-BD
Caesar Jackson, CREST and HBCU-UP
Keith James, LSAMP and LSAMP-BD
Martha James, LSAMP and LSAMP-BD
Mark H. Leddy, RDE
Kelly Mack, Advance Program
Demetrios Kazakos, CREST
Claudia Rankins, HBCU-UP
Richard N. Smith, CREST
Marilyn J. Suiter, HBCU-UP
Linda Thurston, RDE

AAAS OFFICE OF PUBLIC PROGRAMS
Sandra Audia, Senior Art Associate

TECHNOLOGY TEAM
Chrissy Rey-Drapeau, Pongo Interactive
Kelly Hansen, Pongo Interactive
Michael Dance, Pongo Interactive

LEAD POSTER AND ORAL PRESENTATIONS JUDGES
Jonathan Lambright, Savannah State University
Tina King, The Albert Einstein Distinguished Educator Fellowship Program
Arlene Maclin, AAAS Consultant
Gregory Triplett, University of Missouri, Columbia
Michael Smith, The University of Trinidad and Tobago

AAAS EDUCATION AND HUMAN RESOURCES (EHR)
Shirley M. Malcom, Director
Yolanda S. George, Deputy Director

CONFERENCE TEAM
Donna Behar
Gerard Boulin
Cursilla Fenwick
Catherine Ledec
Marty McGihon
Sabira Mohamed
Lucas Pershing
Ryan Rexroth
Brittany Taggart
Barbara Laval
Nisha Laval
### THURSDAY, FEBRUARY 24, 2011

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<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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<tbody>
<tr>
<td>3:00pm - 9:00pm</td>
<td>Registration</td>
<td>International Terrace / Columbia Hall</td>
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<tr>
<td>1:00pm - 7:00pm</td>
<td>Exhibitor Setup</td>
<td>Columbia Hall</td>
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<tr>
<td>4:00pm - 5:00pm</td>
<td>Exhibitor Orientation</td>
<td>Columbia Hall</td>
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<tr>
<td>5:00pm - 6:00pm</td>
<td>Judges Orientation</td>
<td>International Ballroom West</td>
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<tr>
<td>6:00pm - 8:00pm</td>
<td>Opening Plenary Session 1</td>
<td>International Ballroom Center</td>
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<tr>
<td>8:00pm - 10:00pm</td>
<td>Exhibits Open/Judges Room Open</td>
<td>Columbia Hall / International Ballroom West</td>
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#### Moderator & Welcome:
Claudia Rankins, Program Director, NSF HRD

#### Welcome Remarks:
Shirley M. Malcom, Director, AAAS EHR

#### Speaker:
Alicia Abella, Executive Director, Innovative Services Research Department, AT&T Labs Research

### FRIDAY, FEBRUARY 25, 2011

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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<tbody>
<tr>
<td>7:00am - 7:00pm</td>
<td>Registration</td>
<td>International Terrace / Columbia Hall</td>
</tr>
<tr>
<td>7:00am - 7:45am</td>
<td>Oral and Poster Presentations Session 1 (Set-Up)</td>
<td>Heights Executive Meeting Center / Columbia Hall</td>
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<tr>
<td>7:00am - 6:30pm</td>
<td>Judges Room Open</td>
<td>International Ballroom West</td>
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<tr>
<td>7:45am - 9:45am</td>
<td>Networking Breakfast &amp; Plenary Session 2</td>
<td>International Ballroom Center</td>
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#### Moderator:
Shirley M. Malcom, Director, AAAS EHR

### Welcome:
Alan I. Leshner, CEO, AAAS and Publisher, Science

Joan Ferrini-Mundy, Acting Assistant Director, NSF EHR

#### Speaker:
Marco Midon, Lead Systems Engineer, NASA

#### Poster Presentations Session 1
Columbia Hall

#### Oral Presentations Session 1
Heights Executive Meeting Center

#### Biological Sciences 1A
Holmead

#### Biological Sciences 1B
Kalorama

#### Chemistry and Chemical Sciences 1A
Independence

#### Chemistry and Chemical Sciences 1B
Northwest

#### Computer Sciences and Information Management
Jay

#### Mathematics and Statistics
L’Enfant

#### Nanoscience / Physics
Morgan

#### Social and Behavioral Sciences
Oak Lawn

#### Technology and Engineering
Piscataway

#### Concurrent Workshops Session 1
A. NSF Graduate Research Fellowships Proposal Preparation: Preparing for Graduate School
Dupont

James Lightbourne, Division Director, NSF Division of Graduate Education (DGE)
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<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
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<tbody>
<tr>
<td>12:15pm - 1:30pm</td>
<td><strong>Plenary Session 3</strong></td>
<td><strong>International Ballroom Center</strong></td>
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<tr>
<td>1:30pm - 4:00pm</td>
<td><strong>Exhibits Open</strong></td>
<td><strong>Columbia Hall</strong></td>
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<tr>
<td>3:30pm - 4:00pm</td>
<td><strong>Oral and Poster Presentations Session 2 (Set-Up)</strong></td>
<td><strong>Heights Executive Meeting Center / Columbia Hall</strong></td>
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<tr>
<td>4:00 pm - 6:30 pm</td>
<td><strong>Poster Presentations Session 2</strong></td>
<td><strong>Columbia Hall</strong></td>
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<td><strong>Oral Presentations Session 2</strong></td>
<td><strong>Heights Executive Meeting Center</strong></td>
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<td><strong>Biological Sciences 2A</strong></td>
<td><strong>Holmead</strong></td>
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<td><strong>Biological Sciences 2B</strong></td>
<td><strong>Kalorama</strong></td>
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<td><strong>Chemistry and Chemical Sciences</strong></td>
<td><strong>Independence</strong></td>
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<td><strong>Computer Sciences and Information Management</strong></td>
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<td><strong>Ecology, Environmental and Earth Sciences</strong></td>
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<td><strong>Mathematics and Statistics</strong></td>
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<td><strong>Nanoscience / Physics</strong></td>
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<td><strong>Technology and Engineering</strong></td>
<td><strong>Piscataway</strong></td>
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<td><strong>Concurrent Workshops Session 2</strong></td>
<td><strong>Heights Executive Meeting Center</strong></td>
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| Moderator:         | **Caesar Jackson**, Program Director, NSF HRD                       |                                  |

**Speaker:**

**Robert E. Megginson**, Arthur F. Thurnau Professor of Mathematics & Associate Dean for Undergraduate and Graduate Education, College of Literature, Science, and the Arts University of Michigan
**Agenda**

**Saturday, February 26, 2011**

7:00am - 2:00pm  Registration

7:00am - 7:45am  Oral and Poster Presentations Session 3 (Set-Up)

7:00am - 8:00am  Buffet Breakfast & Plenary Session 4  International Ballroom Center

Science and Technology Policy Careers: What's that?

Moderator: Richard Weibl, Director, AAAS Center for Careers in Science and Technology

Speakers: Richard Hill, Science Assistant, NSF DGE

Alexander Nicholas, AAAS Science Policy Fellow, NSF DGE

Cindy Maria Quezada, Life Sciences Specialist and AAAS Diplomacy Fellow

9:00am - 1:00pm  Exhibits Open

Columbia Hall

8:00am - 10:30am  Poster Presentations Session 3

Columbia Hall

Oral Presentations Session 3

Heights Executive Meeting Center

Biological Sciences 3A

Holmead

Biological Sciences 3B

Kalorama

Mathematics and Statistics

L’Enfant

Technology and Engineering

Piscataway

Concurrent Workshop Session 3:

Heights Executive Meeting Center

A. Choosing the Right Graduate School and Survival 101

DuPont
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<tr>
<th>Time</th>
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<tr>
<td>10:30am - 11:00am</td>
<td>Break</td>
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<tr>
<td>11:00am - 12:30 pm</td>
<td>Poster Presentations Session 4 (Set-Up)</td>
<td>Columbia Hall</td>
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<td>Concurrent Workshop Session 4</td>
<td>Heights Executive Meeting Center</td>
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<td></td>
<td>A. Choosing the Right Graduate School and Survival 101</td>
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<td>Travis Brown, Manager, Center for STEM Diversity, Tufts University</td>
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<td></td>
<td>B. Funding Opportunities and Support: Before, During, and After Graduate School and Tips for Applying</td>
<td>Embassy</td>
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<td></td>
<td>Sandra Thomas, Senior Administrator, Institute for Broadening Participation, Inc. (IBP)</td>
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<tr>
<td>1:00pm</td>
<td>Exhibits Close</td>
<td>Columbia Hall</td>
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<tr>
<td>1:00pm - 3:30 pm</td>
<td>Judges Meeting &amp; Lunch (Determining Awardees)</td>
<td>International Ballroom West</td>
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<tr>
<td>1:00pm - 6:30 pm</td>
<td>Free time for tours or special meetings</td>
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<tr>
<td>6:30pm - 9:00pm</td>
<td>Plenary Session 5 &amp; Awards Banquet</td>
<td>International Ballroom Center</td>
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<td>Moderator:</td>
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<td></td>
<td>Kenneth Boutte, Dean, Freshman Studies, Office of Academic Enhancements, Xavier University of Louisiana</td>
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<td>Speaker:</td>
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<td>Tyrone B. Hayes, Professor, Integrative Biology, University of California, Berkeley</td>
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<td>Recognition of David and Lucile Packard HBCU Scholars</td>
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<td>James Stith, Vice President Emeritus, American Institute of Physics (AIP)</td>
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<td>Presentation of Awards</td>
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<td>Shirley M. Malcom, AAAS and Claudia Rankins, NSF</td>
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<td>Caesar Jackson, NSF</td>
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<tr>
<td>9:30pm - 12:30am</td>
<td>Talent Show &amp; Networking</td>
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<tr>
<td></td>
<td>James Stith, Vice President Emeritus, American Institute of Physics (AIP)</td>
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**Agenda**

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**Sandra Thomas**, Senior Administrator, Institute for Broadening Participation, Inc. (IBP)

**Kenneth Boutte**, Dean, Freshman Studies, Office of Academic Enhancements, Xavier University of Louisiana

**Tyrone B. Hayes**, Professor, Integrative Biology, University of California, Berkeley

**James Stith**, Vice President Emeritus, American Institute of Physics (AIP)

**Shirley M. Malcom**, AAAS and Claudia Rankins, NSF

**Caesar Jackson**, NSF

**Moderator:**

**Travis Brown**, Manager, Center for STEM Diversity, Tufts University

**Sandra Thomas**, Senior Administrator, Institute for Broadening Participation, Inc. (IBP)

**Kenneth Boutte**, Dean, Freshman Studies, Office of Academic Enhancements, Xavier University of Louisiana

**Tyrone B. Hayes**, Professor, Integrative Biology, University of California, Berkeley

**James Stith**, Vice President Emeritus, American Institute of Physics (AIP)

**Shirley M. Malcom**, AAAS and Claudia Rankins, NSF

**Caesar Jackson**, NSF
Alicia Abella, Executive Director, Innovative Services Research Department, AT&T Labs Research

Alicia Abella is Executive Director of the Innovative Services Research Department, at AT&T Network and Services Research Lab. Abella manages a group of multi-disciplinary technical staff specializing in data mining, user interfaces, IPTV, mobile services, SIP/VOIP technology, ubiquitous computing, and environmental sustainability.

In 2010, she was honored as one of the Top Five Women of the Year by Hispanic Business Magazine. Her awards include the Pioneer Award from the Women of Color STEM Conference and the 2010 Latinos in Information Sciences and Technology Association Leadership of the Year Award. In 2009, she was recognized by the Congressional Hispanic Caucus Institute (CHCI) for her contributions in the area of green technology. This recognition was bestowed at the CHCI Annual Awards Conference attended by President Obama and the First Lady, and by Supreme Court Justice Sonia Sotomayor. In 2008 she became a member of the elite group of AT&T Science and Technology Medal award winners. She was also a recipient of the 2008 Hispanic Engineers National Achievement Award for Outstanding Technical Achievement.

Abella also serves as the Executive Vice President for the Young Science Achievers Program and she chairs the AT&T Labs Fellowship Program. Following completion of her Ph.D. in computer science from Columbia University, Abella joined AT&T Bell Laboratories in Murray Hill, NJ where she began her work in the problem of natural language understanding and dialog management. She received a MS degree from Columbia and bachelor’s from NYU, both in computer science. She lives in Morristown with her husband Alex and their son Mark.

Kenneth G. Boutte, Dean, Freshman Studies, Office of Academic Enhancements, Xavier University of Louisiana

Kenneth G. Boutte, Sr., is the Dean of Freshman Studies and Professor of Biology at Xavier University of Louisiana located in New Orleans. Boutte received his BS degree cum laude in Biology from Xavier University of Louisiana in May of 1976. He earned the Ph.D. in Immunoparasitology from the University of California, Berkeley in December 1983. He was the third African American to earn the Ph.D. from Berkeley’s Zoology Department and the first in the area of immunoparasitology.

Boutte’s research interests involved the host-parasite interface of Taenia crassiceps tapeworms. Later he worked on gene sequences in Trypanosoma that could serve as a target for chemotherapy.

Boutte joined the faculty of the Biology Department at Xavier University in August of 1985. He became an Associate Professor of Biology with tenure in 1991. In 1995, he became the Chairman of the Biology Department, in July of 1997 he became the Associate Dean of the College of Arts and Sciences, and in July 2007 he became Dean of Freshman Studies. He attained the rank of Professor of Biology in 1998.

Boutte was a Scholar in Residence at New York University in 1991 and 1992. He has held several appointments, including the New Orleans Mosquito and Termite Control Board, The National Institutes of Health (NIH) BRIDGES Grant Review Panel, the Higher Education Advisory Group for the National Educational Goals panel, the Chancellor’s Council for Tulane University’s School of Medicine, The National Science Foundation (NSF) Grant Review Panel, and the Board of Directors for St. Augustine High School in New Orleans. He is a 2005 graduate of Harvard University’s Management Development Program.

Boutte has dedicated his life to the education of under-represented minorities, particularly in the sciences. He was the founder and director of the Ernest E. Just Pre-Graduate Scholars Program at Xavier which was significant in increasing the number of science and mathematics students who entered graduate school. He is involved with Xavier’s Pre-Medical Program which has gained national reputation as the leading producer in the nation of African American medical students. He was also involved in and contributed to Xavier’s Model Institution of Excellence program, a National Science Foundation funded program of 12.3 million with a goal of increasing the number of Xavier science, engineering, and mathematics (SEM) students who enter graduate school. He has served as the PI or Co-PI on several grants, and is currently the PI for HBCU-UP. Boutte has personally applied and obtained over $150,000 in scholarship money for Xavier students, and has secured more than $4 million in grants for programs involving Xavier students and faculty in the past ten years.

As Dean of Freshman Studies, Boutte is responsible for the day-to-day operations of the Office of Academic Enhancement, which has a mission to improve retention and graduation rates of Xavier students, particularly by addressing new freshmen students and students who are academically at risk. He has spoken on this topic in several venues. Boutte has also served as a Program Officer at the National Science Foundation.
Joan Ferrini-Mundy, Acting Assistant Director, Education and Human Resources, NSF

Dr. Joan Ferrini-Mundy is the Acting Assistant Director of the National Science Foundation (NSF) for Education and Human Resources (EHR). In 2009 she served as Acting Executive Officer for the EHR Directorate, and from January 2007 through December 2009 was Director of EHR’s Division of Research on Learning in Formal and Informal Settings (DRL).

While at NSF, Dr. Ferrini-Mundy continues to hold appointments at Michigan State University (MSU) as a University Distinguished Professor of Mathematics Education in the Departments of Mathematics and Teacher Education. She served as Associate Dean for Science and Mathematics Education in the College of Natural Science at MSU from 1999-2006. Ferrini-Mundy was a Visiting Scientist in NSF’s Teacher Enhancement Program from 1989-1991, and served as Director of the Mathematical Sciences Education Board and Associate Executive Director of the Center for Science, Mathematics, and Engineering Education at the National Research Council from 1995-1999. She directed the Michigan Department of Education Teacher Preparation Policy Study Group (2006-2007) and chaired the MI Mathematics High School Content Expectations Development Committee.

From 1983-1999 Ferrini-Mundy was a member of the Mathematics Department at the University of New Hampshire, and in 1982-1983 she was a mathematics faculty member at Mount Holyoke College, where she co-founded the SummerMath for Teachers Program.

She has served on the Board of Directors of the National Council of Teachers of Mathematics (NCTM), chaired the Writing Group for NCTM’s 2000 Principles and Standards for School Mathematics, and served on the Board of Governors of the Mathematical Association of America.

In 2007-2008, representing NSF, she served as an ex officio member of the President’s National Mathematics Advisory Panel, and co-chaired the Instructional Practices Task Group.

Ferrini-Mundy holds a PhD in mathematics education from the University of New Hampshire; her research interests include calculus teaching and learning, the development and assessment of teachers’ mathematical knowledge for teaching, and mathematics and science education policy.

Yolanda George, Deputy Director, Education and Human Resources (EHR) Programs, AAAS

Yolanda Scott George is Deputy Director and Program Director, Education and Human Resources Programs, American Association for the Advancement of Science (AAAS). She has served as Director of Development, Association of Science-Technology Centers (ASTC), Washington, DC; Director, Professional Development Program, University of California, Berkeley, CA, a pre-college academic enrichment, university retention, and pre-graduate school program in SMT for minorities and women; and as a research biologist at Lawrence Livermore Laboratory, Livermore, California involved in cancer research and cell cycle studies using flow cytometer and cell sorters.

George conducts evaluations, project and program reviews, and evaluation workshops for both the National Institutes of Health and National Science Foundation, as well as reviews SMT proposals for private foundation and public agencies, including Carnegie Corporation of New York, the Ford Foundation, and the European Commission. She develops and coordinates conferences and workshops related to SMT undergraduate reform and recruitment and retention of minorities, women, and persons with disabilities in SMT. She works with UNIFEM, UNESCO, L’Oreal USA and Paris and non-governmental organizations on gender, science, and technology initiatives related to college and university recruitment and retention and women leadership in SMT.

Over the last 25 years she has raised over $80 million for a variety of SMT education initiatives for colleges and universities, associations, and community-based groups. She currently serves as principal investigator (PI) or co-PI on several National Science Foundation (NSF) grants, including the Vision and Change in Undergraduate Biology Education; the Alliance for Graduate Education and the Professoriate (AGEP); National Science Education Digital Library (NSDL) Biological Sciences Pathways; Historically Black Colleges and Universities-Undergraduate Programs (HBCU-UP); Robert Noyce Teacher Scholarship Program; and Transforming Undergraduate Education in STEM (TUES). In addition, George is the lead AAAS staff person for the L’Oreal USA Fellowships for Women in Science Program (postdoctoral fellowships) and the David and Lucile Packard Foundation HBCU Graduate Scholars Program (graduate school fellowships).

George serves on a number of boards or committees, including: International Network of Women Scientists and Engineers (INWES); Maria Mitchell Women in Science Awards Committee; McNeil/Lehrer Productions Online Science Reports Advisory Committee; the Center for the Advancement of informal Science Education (CAISE).
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Education Advisory Board; and the South Dakota Biomedical Research Network Advisory Committee; Burroughs Wellcome Fund, Science Enrichment Program Grants, Advisory Board; and The HistoryMakers, ScienceMakers, Advisory Board.

George has authored or co-authored over 50 papers, pamphlets, and hands-on science manuals. She received her B.S. and M.S. from Xavier University of Louisiana and Atlanta University in Georgia, respectively.

Tyrone B. Hayes, Professor, Integrative Biology, University of California, Berkeley

Tyrone B. Hayes is Professor, Integrative Biology Department at the University of California, Berkeley. He was born and raised in Columbia, South Carolina where he developed his love for biology. He received his Bachelor’s degree from Harvard University in 1989 and his PhD from the Department of Integrative Biology at the University of California, Berkeley in 1993.

After completing his PhD, Hayes began post-doctoral training at the National Institute of Child Health and Human Development, National Institutes of Health and the Cancer Research Laboratories at UC Berkeley (funded by the National Science Foundation), but this training was truncated when he was hired as an Assistant Professor at UC Berkeley in 1994. He was promoted to Associate Professor with tenure in 2000 and to full Professor in 2003.

Hayes’ research focuses on developmental endocrinology with an emphasis on evolution and environmental regulation of growth and development. For the last ten years, the role of endocrine disrupting contaminants, particularly pesticides, has been a major focus. Hayes is interested in the impact of chemical contaminants on environmental health and public health, with a specific interest in the role of pesticides in global amphibian declines and environmental justice concerns associated with targeted exposure of racial and ethnic minorities to endocrine disruptors and the role that exposure plays in health care disparities.

Caesar Jackson, Program Director, Human Resources Development (HRD), NSF

Caesar R. Jackson is currently a Program Director for the National Science Foundation Education and Human Resources Directorate and the Dean of the College of Science and Technology at North Carolina Central University (NCCU). He joined NCCU in August 2005 after being employed at North Carolina Agricultural and Technical State University (NCA&T) for 13 years. At NCA&T, Jackson was Interim Dean of the College of Arts and Sciences from 2002 to 2005, Associate Dean for Research and Graduate Programs in the College from 1998 to 2000, Professor of Physics and Chairperson of the Department of Physics from 1994 to 1998, and Assistant Professor from 1992 to 1994. Before NCA&T, Jackson was a Staff Engineer for the IBM Corporation, where he was employed from 1977 to 1992.

Jackson earned a Bachelor of Engineering Technology in Electrical Engineering from Florida Agricultural and Mechanical University in 1977, a Master of Engineering in Electrical Engineering from the University of Florida in 1980, and a Doctor of Philosophy in Physics from North Carolina State University in 1992. He has been engaged in nuclear physics research at Triangle Universities Nuclear Laboratory in Durham, North Carolina, and at Thomas Jefferson National Laboratory in Newport News, Virginia. He continues to be involved in scholarly activities at the NCCU, focusing on science education research and on issues associated with increasing the number of minorities pursuing degrees and careers in science, technology, engineering, and mathematics.

Alan Leshner, CEO, AAAS and Publisher, Science, AAAS

Alan I. Leshner has been Chief Executive Officer of the American Association for the Advancement of Science and Executive Publisher of the journal Science since December 2001. AAAS (triple A-S) was founded in 1848 and is the world’s largest, multi-disciplinary scientific and engineering society.

Before coming to AAAS, Dr. Leshner was Director of the National Institute on Drug Abuse (NIDA) from 1994-2001. One of the scientific institutes of the U.S. National Institutes of Health, NIDA supports over 85% of the world’s research on the health aspects of drug abuse and addiction.

Before becoming Director of NIDA, Dr. Leshner had been the Deputy Director and Acting Director of the National Institute of Mental Health. He went to NIMH from the National Science Foundation (NSF), where he held a variety of senior positions, focusing on basic research in the biological, behavioral and social sciences, science policy and science education.

Dr. Leshner went to NSF after 10 years at Bucknell University, where he was Professor of Psychology. He has also held long-term appointments at the Postgraduate Medical School in
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Budapest, Hungary; at the Wisconsin Regional Primate Research Center; and as a Fulbright Scholar at the Weizmann Institute of Science in Israel. Dr. Lesher is the author of a major textbook on the relationship between hormones and behavior, and has published over 150 papers for both the scientific and lay communities on the biology of behavior, science and technology policy, science education, and public engagement with science.

Dr. Lesner received an undergraduate degree in psychology from Franklin and Marshall College, and M.S. and Ph.D. degrees in physiological psychology from Rutgers University. He also has been awarded six honorary Doctor of Science degrees. Dr. Lesner is an elected fellow of AAAS, the National Academy of Public Administration, the American Academy of Arts and Sciences, and many other professional societies. He is a member of the Institute of Medicine of the National Academies of Science and Vice-Chair of its governing Council. The U.S. President appointed Dr. Lesner to the National Science Board in 2004. He is also a member of the Advisory Committee to the Director of NIH.

James Lightbourne, Division Director, Division of Graduate Education (DGE), NSF

James Lightbourne received his PhD in Mathematics at North Carolina State University in 1976. He joined the faculty at Pan American University in 1976 and at West Virginia University in 1979. Subsequently, he held a Visiting Research Position at the Mathematics Research Center of the University of Wisconsin-Madison. He served as Director of Graduate Studies of the WVU Department of Mathematics and became Chair of the Department in 1988.

In 1991, he took a leave of absence from WVU to assume a rotator position in the NSF Division of Undergraduate Education to manage the NSF Calculus Program. In 1992, he accepted a permanent position at NSF as a Section Head in the Division. He has also served as Senior Advisor in the NSF Directorate for Education and Human Resources and in the Office of the NSF Director. He currently is Director of the Division of Graduate Education and Acting Director for the Division of Human Resource Development.

Shirley M. Malcom, Director, Education and Human Resources (EHR) Programs, AAAS

Shirley M. Malcom, Director for Education and Human Resources (EHR) Programs at AAAS, has served as a program officer in the NSF Science Education Directorate; an assistant professor of biology, University of North Carolina, Wilmington; and a high school science teacher. Malcom received her PhD in Ecology from The Pennsylvania State University; Master’s in Zoology from the University of California, Los Angeles; and Bachelor’s with distinction in Zoology from the University of Washington. In addition, she holds 16 honorary degrees.

Dr. Malcom serves on several boards, including the Heinz Endowments and University Corporation for Atmospheric Research. She serves as a trustee of Caltech and as a Regent of Morgan State University. In 2003, Malcom received the Public Welfare Medal of the National Academy of Science, the highest award granted by the Academy. She was a member of the National Science Board, the policymakers body of NSF, from 1994 to 1998, and of the President’s Committee of Advisers on Science and Technology from 1994 to 2001.

Robert Megginson, Arthur F. Thurnau Professor of Mathematics & Associate Dean for Undergraduate and Graduate Education, College of Literature, Science, and the Arts, University of Michigan

Robert E. Megginson is Arthur F. Thurnau Professor of Mathematics at the University of Michigan. After receiving his Bachelor’s in Physics from the University of Illinois at Urbana-Champaign in 1969, he worked in industry for eight years, rising to the position of Lead Computer Systems Software Specialist for Roper Corporation, a Fortune 500 company. He then returned to Illinois to pursue graduate study, and received his Master’s in Statistics in 1983 and his Ph.D. in Mathematics in 1984, specializing in the geometry of Banach spaces. He has been on the faculty of U-M since 1992, with a two-year leave to serve as Deputy Director of the Mathematical Sciences Research Institute in Berkeley in 2002–04, and from 2004–2010 was Associate Dean for Undergraduate and Graduate Education in the liberal arts college at U-M as well as Interim Director of the U-M Center for Global and Intercultural Study during the 2008–09 academic year. His current mathematical interests have widened to include the mathematics of climate change.

Meggins has been active at the national level in programs to address the underrepresentation of minorities in mathematics. His recognitions for these efforts include the U.S. Presidential
Award for Excellence in Science, Mathematics, and Engineering Mentoring in 1997, the Ely S. Parker Award of the American Indian Science and Engineering Society in 1999, and the Etta Zuber Falconer Excellence in Mathematics Teaching Award of the Quality Education for Minorities Network in 2006. He has been named to the Native American Science and Engineering Wall of Fame maintained at Southwestern Indian Polytechnic Institute in Albuquerque, and portrayed in 100 Native Americans Who Shaped American History by Bonnie Juettner, Bluewood Books, 2002. In January 2009, Megginson received the Mathematical Association of America’s Yueh-Gin Gung and Dr. Charles Y. Hu Distinguished Service to Mathematics Award, the Association’s highest honor for service. In December of that year he was elected a Fellow of the American Association for the Advancement of Science.

Marco Midon, Lead Systems Engineer, NASA

Marco Midón has always experienced the world differently than most. The son of an Argentinean father and an African-American mother (who died when Midón was young), Marco was born prematurely in a rural hospital in Embudo, New Mexico, where he and his twin brother, Raul, were blinded as infants after spending time in an incubator without adequate eye protection. “At the time, they didn’t know you have to protect the eyes from the oxygen of the incubator,” Midón says, “so a generation of people were blinded in that way.” Marco and Raul attended the New Mexico School for the Blind and Visually Impaired from age 5 to 15. After realizing that this school was not properly preparing him for college, and due to a generous contribution from an anonymous donor, Marco and Raul were able to complete high school at Santa Fe Prep. Marco went on to graduate from Florida International University with Bachelor’s and Master’s degrees in Electrical Engineering. His career at NASA Goddard Space Flight Center as an electronics engineer has spanned more than a decade and included an assignment to upgrade a NASA ground station in Antarctica.

Cindy Maria Quezada, Life Sciences Specialist and AAAS Diplomacy Fellow, AAAS

Cindy Quezada has focused her scientific studies on protein structure and function. As a Fulbright Scholar at Oxford University, she studied how proteins obtain their three dimensional fold. During her PhD studies at the California Institute of Technology, she elucidated the structural and chemical mechanisms of a key protein that allows bacteria to sense the environment. As a postdoctoral scholar at Rockefeller University, she studied the molecular mechanisms of bacterial virulence.

Quezada was a recipient of the L’Oreal For Women in Science Fellowship, which she used to evaluate a molecular diagnostic test for multi-drug resistant tuberculosis in Rwanda. In addition, Cindy has developed content for the Science Friday Initiative, the non-profit arm of National Public Radio’s Science Friday program. She has also been actively involved in science outreach programs for young girls, junior high, and high school students that mix science with the arts.

Alexander Nicholas, AAAS Science Policy Fellow, NSF Division of Graduate Education (DGE), NSF

Dr. Nicholas is currently a Senior Policy Advisor in the Office of Innovation and Entrepreneurship at the Department of Commerce and an America Association for the Advancement of Science (AAAS) Science and Technology Policy Fellow. Prior to his selection as a AAAS fellow, Dr. Nicholas was a research fellow at Harvard Medical School and Beth Israel Deaconess Medical Center in Boston, MA. As a researcher, he investigated the molecular cues that underlie human aging and age-related neurodegenerative disorders. The goal of this project was to identify patterns in the mitochondrial genome for various disease states. Away from the laboratory, Dr. Nicholas served as a group leader for an outreach program called facilitated study group (FSG) located at University of Massachusetts and Roxbury Community College.

The long-term goal of this program is to produce more underrepresented minority researchers with PhDs. Dr. Nicholas is a member of the Society for Neuroscience and was a member of the Harvard Postdoctoral Association Governing Board and Harvard Biotechnology Club. He was awarded a NRSA Postdoctoral Fellowship from National Institute of Health and the Neuroscience Scholar Award from the Society for Neuroscience. Dr. Nicholas received his Ph.D., M.S. in neuroscience from Florida State University in 2005 and a B.S. from Florida A&M University in 1999.

Claudia Rankins, Program Director, Human Resources Development (HRD), NSF

Claudia Rankins is a Program Officer in the Directorate for Education and Human Resources at the National Science Foundation. She manages the Historically Black Colleges and Universities Undergraduate Program (HBCU-UP) which provides awards to
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enhance the quality of undergraduate science, technology, engineering and mathematics (STEM) education and research at HBCUs as a means to broaden participation in the Nation’s STEM workforce.

Dr. Rankins is on leave from Hampton University, where she is an Endowed Professor of Physics and has held positions as Dean of the School of Science, Assistant Dean for Research, and Chairman of the Department of Physics. She also directed STEM enrichment and research programs for students ranging from middle school through post baccalaureate studies.

Her formal education includes military training, certification as translator and interpreter for German, French and English, a BS in Mathematics, an MS in Statistics, an MS in Physics, and a Ph.D. in Physics.

Since 1998, Dr. Rankins secured over $10 million in external grants that supported pre-college activities as well as undergraduate education and research in STEM. Dr. Rankins has served on a number of boards and committees related to STEM education. She currently is the Executive Secretary of the National Science and Technology Council Subcommittee on Education.

Richard Weibl, Director, Center for Careers, AAAS

Ric Weibl is director of the Center for Careers in Science and Technology at the American Association for the Advancement of Science (www.aaas.org). He works with AAAS career development programs to strengthen their offerings and creates new partnerships with external groups to support the career aspirations and development needs of future and current scientists. Weibl joined AAAS in 2005 following a tour of service in the U.S. Peace Corps in the North West Province of South Africa.

Before the Peace Corps, he served as U.S. editor for Science’s Next Wave (www.sciencecareers.org) and as editor of Next Wave’s Postdoc Network (now the National Postdoctoral Association @ www.nationalpostdoc.org). From November 1996 to June 2001, he was manager of the national Preparing Future Faculty (www.preparing-faculty.org) program and Director of Programs, Education and Institutional Initiatives at the Association of American Colleges and Universities. He has served in research and administrative positions at Antioch College, The Ohio State University, Marquette University, Longwood College, and The University of Georgia.

James Stith, Vice President Emeritus, American Institute of Physics (AIP)

James H. Stith is Vice President Emeritus for the American Institute of Physics (AIP). While an officer of the Institute, he had oversight responsibilities for AIP’s Magazine Division, the Media and Government Relations Division, the Education Division, the Center for the History of Physics, the Statistical Research Division and the Careers Division. His doctorate in physics was earned from The Pennsylvania State University, and his masters and bachelors in physics were received from Virginia State University. A physics education researcher, his primary interests are in Program Evaluation, and Teacher Preparation and Enhancement.

Stith was formerly a Professor of Physics at The Ohio State University and Professor of Physics at the United States Military Academy. He has also been a Visiting Associate Professor at the United Air Force Academy, a Visiting Scientist at the Lawrence Livermore National Laboratory, a Visiting Scientist at the University of Washington, and an Associate Engineer at the Radio Cooperation of America.

He is a past president of the American Association of Physics Teachers, past president of the National Society of Black Physicists, a Fellow of the American Association for the Advancement of Science, a Fellow of the American Physical Society, a Chartered Fellow of the National Society of Black Physicists, and a member of the Ohio Academy of Science. He was named a Distinguished Alumni of Penn State (The Alumni Association’s highest award), an Honorary Member of Sigma Pi Sigma (its highest award) the physics honor society, a National Academies Education Mentor in the Life Sciences and a ScienceMaker (by HistoryMakers). Additionally, he serves on a number of national and international advisory boards and has been awarded a Doctor of Humane Letters by his alma mater, Virginia State University. He is married and has three adult daughters and two grandchildren.
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| Oludurotimi Adetunji  
The Ohio State University |
| Krishan Agrawal  
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| Courtni Allen  
National Institutes of Health |
| Leigh Arino de la Rubia  
Tennessee State University |
| George Armstrong  
Tougaloo College |
| John Barimo  
University of the Virgin Islands |
| Hester Barry  
Southern University at Shreveport Louisiana |
| Melissa Baumann  
Michigan State University |
| Matthew Benacquista  
The University of Texas Brownsville |
| Shakhawat Bhuiyan  
Jarvis Christian College |
| Suely Black  
Norfolk State University |
| Gregory Bogin  
Colorado School of Mines |
| Tony Bryant  
Virginia State University |
| Anissa Buckner  
University of Arkansas at Pine Bluff |
| Khalilah Burton  
J. F. Drake State Technical College |
| Chellu Chetty  
Savannah State University |
| Morris Clarke  
Winston-Salem State University |
| Kavan Clifford  
Johns Hopkins University School of Medicine |
| John Coleman  
Langston University |
| Gail Coover  
University of Wisconsin |
| Paul Cotae  
The University of the District of Columbia |
| Cedrick Daphney  
Atlanta Metropolitan College |
| Carol Davis  
North Dakota State University |
| Kimberly Davis  
Talladega College |
| Agnes Day  
Howard University College of Medicine |
| Sarwan Dhir  
Fort Valley State University |
| Dale Didion  
EnergySolutions |
| Freddie Dixon  
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| Robert Drummond  
Johns Hopkins School of Medicine |
| Cyntrica Eaton  
Norfolk State University |
| James Ford  
Georgia Institute of Technology |
| Doretha Foushee  
North Carolina A&T State University |
| Matthew George, Jr.  
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| Timothy Green  
Brookhaven National Laboratory |
| Patrice Gregory  
University of Maryland College Park |
| Sasan Haghani  
University of the District of Columbia |
| Ahmasi Harris  
BAE Systems |
| Kelley Harris-Johnson  
University of Wisconsin-Madison |
Judges

Carolyn Henderson  
J. F. Drake State Technical College

DeMarc Hickson  
Jackson State University

Gail Hollowell  
North Carolina Central University

Toby Horn  
Carnegie Academy for Science Education

Danny Hubbard  
Grambling State University

James Hunter  
Morgan State University

Valencia Ingram  
Norfolk State University

Arundhati Jayaro  
Albert Einstein Fellow, Virginia

Marcus Jones  
J. Craig Venter Institute

Murty Kambhampati  
Southern University at New Orleans

Alvin Kennedy  
Morgan State University

Tina King  
Albert Einstein Fellow, Tennessee

George Robert King  
Tennessee Schools

Jonathan Lambright  
Savannah State University

Mulatu Lemma  
Savannah State University

Carol Linder  
New Mexico Highlands University

Arlene Maclin  
AAAS Consultant

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University of the District of Columbia

George Mbata  
Fort Valley State University

James McGee  
Kishwaukee College

Sydika McKissic  
Vanderbilt University

Beronda Montgomery  
Michigan State University

Dr. C. R. Nair  
Paine College

Felecia Nave  
Prairie View A&M University

Esther Ososanya  
University of the District of Columbia

Colette Patt  
University of California, Berkeley

Reginald Perry  
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University of New Orleans

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Tuskegee University

John Rand  
Kapiolani Community College

Samir Raychoudhury  
Benedict College

Syed Raza  
Talladega College

Karen Redden  
University of the District of Columbia

Yenumula Reddy  
Grambling State University

Muhammad Shafi  
LeMoyne-Owen College

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Jean H. Shin  
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Bernard Singleton  
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Judges

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Rosie Sneed  
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Hattie Spencer  
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Alicia Washington  
Howard University

Richard Weibl  
AAAS

Mary Whiteford  
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Table #13
American Association for the Advancement of Science (AAAS)
AAAS Center for Careers
1200 New York Avenue NW
Washington, DC 20005

Contact: Ric Weibl, Rweibl@aaas.org

AAAS has a wide variety of career resources for aspiring and working scientists and engineers. From the Science & Technology Policy Fellowships for post-PhD folks to summer internships for persons with disabilities and those interested in science journalism. The on-line resources of Science Careers include the funding resource GrantsNet, CTSciNet, and MySciNet.

Table #29
American Chemical Society
1155 Sixteenth Street, NW
Washington, DC 20036

Contact: Steven Meyers, s_meyers@acs.org

With more than 163,000 members, the American Chemical Society (ACS) is the world’s largest scientific society and one of the world's leading sources of authoritative scientific information. A nonprofit organization, chartered by Congress, ACS is at the forefront of the evolving worldwide chemical enterprise and the premier professional home for chemists, chemical engineers and related professions around the globe.

For more information, please visit us on the web at www.acs.org or call the ACS at (800) 848-6538.

Table #73
American Society for Microbiology / Annual Biomedical Research Conference for Minority Students
American Society for Microbiology
1752 N. Street, NW
Washington, DC 20038

Contact: Irene Hulede, IHULEDE@asmusa.org

The American Society for Microbiology (ASM) Education Board offers a variety for programs for undergraduate students, postbacs, graduate students, and postdoctoral scientists. Programs include fellowships, institutes and conferences. ASM also manages the Annual Biomedical Research Conference for Minority Students (ABRCMS), a premier conference for students interested in careers in the biomedical and behavioral sciences.

For more information visit www.asm.org and www.abrcms.org.

Table #62
Carnegie Mellon University
5000 Forbes Avenue
530 B Warner Hall
Carnegie Mellon University
Pittsburgh, PA 15235

Contact: Stephanie Hughes, grad-ed@cmu.edu

Carnegie Mellon is a research university with a proud heritage of outstanding graduate and undergraduate education, and our programs are ranked among the top in the country. All of our seven colleges and schools offer Master’s and Doctoral degrees and several offer programs at locations around the world.

A cornerstone of our graduate education has been research with a focus on advancing knowledge and finding meaningful solutions to significant problems of society. This real-world, hands-on approach has made Carnegie Mellon home to excellent faculty and students in engineering, computer science, the natural sciences, humanities and social sciences, business administration and the fine arts.

This philosophy has also been the basis for interdisciplinary study and research to an extent that is rarely found elsewhere. Carnegie Mellon houses a myriad of interdisciplinary research facilities that combine expertise in diverse fields to produce exciting new areas of exploration.

Our commitment to diversity in our research and in our student population truly makes Carnegie Mellon a unique place to carry out your graduate education.

Table #6
Columbia University Graduate School of Arts and Sciences/
CUMC Biomedical PhD Programs
535 W. 116th Street
102 Low Library, MC 4304
New York, NY 10031

Contacts: Barbara Nesmith, bsn2107@columbia.edu
Fred Loweiff, fl12@columbia.edu

Columbia University is proud to have one of the oldest and most distinguished graduate schools in the United States. Situated on a beautiful campus in New York City, in close proximity to many of the great cultural and economic institutions of the United States, the Graduate School of Arts and Sciences (GSAS) is an ideal place to pursue graduate education. GSAS’s outstanding faculty, educated in the U.S. and abroad, provide an unparalleled level of teaching and scholarship. GSAS offers M.A. and Ph.D. degrees in various fields of study in the humanities, social sciences, and natural sciences. The preeminence of graduate studies at Columbia is reflected in the size and
Exhibitor Descriptions

diversity of the Graduate School, with over 3200 students enrolled in 87 GSAS degree programs.

In the natural sciences, GSAS offers doctoral programs in astronomy, biological sciences, biomedical sciences, chemistry, chemical physics, earth & environmental sciences, ecology and evolutionary biology, mathematics, physics, psychology, and statistics. GSAS offers terminal masters degrees in Biotechnology, Climate and Society, Conservation Biology, Earth & Environmental Sciences, Journalism, Mathematics of Finance, Philosophical Foundations of Physics, and Statistics.

Students admitted to one of the Graduate School of Arts and Sciences Ph.D. programs typically receive multi-year funding packages that cover tuition, fees, and living expenses.

We invite you to explore the possibilities for graduate study at Columbia’s Graduate School of Arts and Sciences at http://www.columbia.edu/cu/gsas/pages/pstudents/main/wel/index.html.

Table #2
Columbia University School of Engineering and Applied Science
500 West 120 Street, MC 4708
MC 4708
New York, NY 10027

Contact: Tykeia Robinson, tnr2107@columbia.edu

Columbia University School of Engineering and Applied Science offers graduate degrees in applied physics, applied mathematics, biomedical engineering, chemical engineering, civil engineering, construction engineering management, engineering management systems, engineering mechanics, computer engineering, computer science, earth and environmental engineering, electrical engineering, financial engineering, industrial engineering, operations research, materials science engineering, medical physics, mechanical engineering, metallurgical engineering, mining engineering, and solid-state science engineering.

Our academic programs allow students to advance knowledge in classical engineering or applied science disciplines or delve into new, exciting interdisciplinary fields. Degrees can be pursued on a full-or part-time basis. Distance education and MS/MBA programs are also available. A joint master’s degree program in Computer Science and Journalism is also available.

For more information, please visit: www.engineering.columbia.edu

Table #15
Emory University School of Medicine MD/PhD Program
1648 Pierce Drive
Suite P375
Atlanta, GA 30322

Contact: Rebecca Sandidge, rsandid@emory.edu

The MD/PhD Program (Medical Scientist Training Program) provides the initial training (pre-doctoral) for a career in academic medicine. It is designed to provide highly qualified students with the in-depth, high-caliber research training and medical education that will be required of future academicians. A minimum of six years is required to complete the combined program.

Students applying to this program should have an outstanding academic background, as well as significant research experience as an undergraduate and/or postgraduate. Application to the program is accomplished through AMCAS (deadline, October 15th) and the Emory School of Medicine. All supplemental materials and letters of recommendation must be received by the Emory Medical School Office of Admissions by December 1st. Tuition and stipend support are provided for all students accepted into the MD/PhD Program.

This program is supported in part by an NIH Medical Scientist Training Program grant. Interested applicants may obtain additional information via email: mdphd@emory.edu or the web: http://med.emory.edu/education/mdphd.

Table #16
Georgia Tech
NSF Center MDTR - Georgia Tech, University of Arizona, University of Washington
School of Chemistry
Georgia Tech
901 Atlantic Dr.
Atlanta, GA 30332-0400

Contacts: Olanda Bryant, olanda.bryant@chemistry.gatech.edu
Ariel Marshall, amarshall8@gatech.edu

CMDITR has opportunities available for summer research internships, graduate school enrollment and postdoctoral opportunities. CMDITR provides a highly integrated, interdisciplinary, multi-institutional research infrastructure for scientists and students in: Chemistry, Physics, Optical Sciences, Materials Science & Engineering, Mechanical Engineering, Electrical Engineering, and Applied Physics.
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Table #69
Harvard School of Public Health
677 Huntington Avenue
Harvard School of Public Health
Boston, MA 02115

Contact: Felisa Nobles, fnobles@hsph.harvard.edu

Public health professionals monitor and diagnose the health concerns of communities and promote health practices and behaviors to assure populations stay healthy. Our overarching mission is to advance the public's health through learning, discovery, and communication. Stop by our booth to learn about our master's and doctoral level degree programs that extend across the biological, quantitative, and social sciences.

Additionally, visitors to our booth will learn about the Department of Epidemiology's Center for Communicable Disease Dynamics, which is a hub for education, outreach and policy through which students are encouraged to study modeling and other quantitative aspects of infectious disease.

Table #17
Indiana University
130 S Woodlawn Ave
111 Kirkwood Hall
Bloomington, IN 47405

Contacts: Constance Brown, agep@indiana.edu
Lesa Huber, lehuber@indiana.edu
Yolanda Trevino, ytrevino@indiana.edu
Garfield Warren, gtwarren@indiana.edu

Indiana University is a member of the Midwest Crossroads AGEP Alliance. We invite you to meet with faculty representatives from various STEM disciplines from the Bloomington campus. At Indiana University, we have in place a strategic plan to increase enrollment, improve retention, and prepare and encourage students to enter the academy.

The key elements are:

- Recruiting- Linkages and partnerships with the Indiana LSAMP, off campus visits by AGEP faculty, staff, and students, and disseminate information on graduate school opportunities.
- Retention- Through the use of minority student organizations to ensure that incoming graduate students have an instant peer network, and a network of AGEP professors who are committed to graduating minority PhD students in being developed.
- Enrichment- Through college pedagogy courses, workshops & seminars, and Preparing Future Faculty programs which are promoted in faculty preparation; developing post-doctoral partnerships with U.S. National Laboratories to provide exposure and prepare graduates for faculty positions.

Table #19
Institute for Broadening Participation (IBP)
NASA One Stop Shop Initiative (OSSI)
281 Main Street
PO Box 607
Damariscotta, ME 04543

Contacts: Liv Detrick, ladetrick@gmail.com
Triska Holly, htriska@hispanicfund.org

NASA’s One Stop Shop Initiative (OSSI) provides students at all Institutions of Higher Education (IHE) access to a portfolio of internship, fellowship, and scholarship opportunities offered by NASA Mission Directorates and Centers. The OSSI LaunchPad at http://intern.nasa.gov will lead students to the Student On-Line Application for Recruiting (SOLAR) system, which provides the ability to search and apply for up to 15 NASA internship, fellowship and scholarship opportunities. A student’s completed application places him or her in the applicant pool for consideration by mentors. Undergraduate and graduate students interested in science, technology, engineering or mathematics are especially encouraged to apply, but opportunities for students in other disciplines are also available.

The Hispanic College Fund and the Institute for Broadening Participation are two of four organizations taking the lead in recruitment for OSSI.

Table #20
Iowa State University
1137 Pearson Hall
Ames, IA 50010

Contacts: Thelma Harding, tlhardi@iastate.edu
Adin Mann, jamann@iastate.edu

Graduate study in one of more than 120 graduate programs at Iowa State gives you one-on-one mentoring that focuses on your needs and aspirations, together with all the resources of one of the world’s most respected research institutions, including:

- World-class computing facilities across all major platforms;
- Network connections in all classrooms and residence-hall rooms;
- More than 580 campus wide public wireless access points; and
Exhibitor Descriptions

- A comprehensive research library housing millions of books, monographs, serials, and microform, film, and video units

Along with your major professor and study committee, you will collaborate in a student-friendly environment with faculty members who are leaders in their fields. Whether in seminars, research labs, studios, or internships, you will learn in small dynamic groups of peers and faculty.

For program-related requirements, consult the Graduate College’s website at www.grad-college.istsate.edu.

Table #54
Massachusetts Institute of Technology
77 Massachusetts Avenue
Building 3-138
Cambridge, MA 02139

Contacts: Christopher Jones, mmorta@mit.edu
Susan Brighton, mmorta@mit.edu

The Massachusetts Institute of Technology (MIT) consists of six schools: Science, Engineering, Architecture and Planning; Humanities, Arts and Social Sciences; Sloan School of Management; and the Whitaker College of Health Sciences and Technology. Increasing the representation of African Americans, Hispanic Americans, Native Americans, and other underserved and underrepresented segments of the population in the graduate study of science and engineering is critical to the achievement of MIT’s mission.

This mission includes providing the intellectual stimulation of a diverse campus community for all of our students and serving the nation by contributing to the creation of a diverse pool of highly qualified scientists, engineers and academics.

Table #45
Michigan State University
BEACON Center - An NSF Center for the Study of Evolution in Action

MSU - BEACON Center
1441 Biomedical Physical Science
East Lansing, MI 48824

Contacts: Percy Pierre, pierre@msu.edu
Louis Mead, lsmead@msu.edu

The BEACON Center for the Study of Evolution in Action is an NSF Science and Technology Center founded with the mission of illuminating and harnessing the power of evolution in action to advance science and technology and benefit society. Research at BEACON focuses on biological evolution, digital evolution, and evolutionary applications in engineering, uniting biologists who study natural evolutionary processes with computer scientists and engineers who are harnessing these processes to solve real-world problems.

The key insight underlying the Center is that transformative discoveries in both computing and biology are possible through studying evolution as it happens, in both natural and digital domains. BEACON is headquartered at Michigan State University, with partner institutions at the University of Texas at Austin, the University of Washington, North Carolina A&T State University, and the University of Idaho.

Table #55
Johns Hopkins University /Arts, Sciences, and Engineering
shriver Hall 28
3400 North Charles Street
Baltimore, MD 21218

Contact: Christine Kavanagh, christinekavanagh@jhu.edu

Since its founding in 1876 as the nation’s first research university, Johns Hopkins has nurtured a community of learners who push ever outward the boundaries of knowledge and use their Hopkins education to make a meaningful difference in the world.

The schools of Arts and Sciences and Engineering, located on Hopkins’ Homewood campus in the vibrant city of Baltimore, offer comprehensive graduate education in 36 programs that span the humanities, social and natural sciences, and engineering. Graduate students work as junior investigators alongside world-renowned Hopkins faculty members, and in so doing, they engage in exciting original research and an intensity of academic experience unlike any other.

Immersed in this remarkably collaborative and richly diverse environment, graduate students in Arts and Sciences and Engineering are guided by the university’s founding principle of “expanding knowledge and putting that knowledge to work for the good of humanity.”

Table #27
Lawrence Berkeley National Laboratory, Center for Science and Engineering Education
1 Cyclotron Road
MS7R0222
Berkeley, CA 94720

Contact: Colette Flood, CLFlood@lbl.gov

As a U.S Department of Energy Laboratory, Berkeley Lab conducts unclassified research across a wide range of scientific disciplines.
Michigan State University / The Graduate School
116 Linton Hall
The Graduate School
East Lansing, MI 48824

Contacts: Steven Thomas, deshawn@msu.edu
Julius Jackson, jhjackson@grad.msu.edu
Tony Nunez, nunez@msu.edu

Michigan State University offers a Summer Research Graduate Program. The Summer Research Opportunities Program (SORP) is a gateway to graduate education at Michigan State University (MSU). The goal of the program is to increase the number of domestic undergraduate students who pursue graduate study and careers in teaching and research at colleges and universities. MSU SROP helps prepare undergraduate students for graduate study through intensive research experiences with faculty mentors and academic enrichment activities.

Table #26
NASA / Marshall Space Flight Center
HS30
Marshall Space Flight Center,
Huntsville, AL 35812
http://www.nasa.gov/centers/marshall/home/index.html

Contacts: Chrissa Hall, chrissa.k.hall@nasa.gov

From advanced materials, avionics and optics research – to propulsion, robotics and systems engineering, Marshall proves it is more than a rocket center. Marshall has the unique expertise and experience to develop and operate the space systems America needs to get back to the moon, on to Mars and beyond.

The Marshall Space Flight Center in Huntsville, Ala., is a key contributor to significant NASA programs, continuing a legacy of accomplishment that includes the Saturn V rocket that launched America’s astronauts to the moon; the propulsion system for the space shuttle; and the Hubble Space Telescope. As it has throughout its history, Marshall is playing a critical role in maintaining America’s preeminence in space.

Marshall conducts programs for college/university undergraduates and for graduate students, including work-study (cooperative education), internships (10 – 15 weeks in summer, fall and spring), fellowships (Graduate Students Researchers Program and Harriet Jenkins) and competitions (Great Moonbuggy Race and University Student Launch Initiative).

Programs for Undergraduates:
- Cooperative Education
- Internships:
  - Undergraduate Student Research Program, NASA
  - Academy, Space Grant Internships, NASA Robotics Academy

- Minority
- University Research and Education Programs, and Motivating Undergraduates in Science and Technology
- Competitions: Great Moonbuggy Race and University Student Launch Initiative

Programs for Graduate Students:
- Cooperative Education
- Internships such as NASA Academy and NASA Robotics Academy

Fellowships: Graduate Student Researchers Program and Harriet Jenkins

Detailed information on the college/university opportunities listed above can be found at http://education.nasa.gov/edoffices/centeroffices/marshall/home/index.html

Table #28
National Research Council of the National Academies,
Fellowship Programs
500 5th Street NW
Keck 568
Washington, DC 20001

Contacts: Jane Dell’Amore, JDellamo@nas.edu
Christine O’Brien, cobrien@nas.edu

The National Research Council of the National Academies (NRC/NA) offers competitive awards four times annually for independent graduate, postdoctoral and senior scientific research to be conducted at participating U.S. federal laboratories and affiliated institutions. Awards include generous stipend, relocation, professional travel and health insurance.

Deadline dates, list of participating laboratories, and instructions for applying online can be found at www.nationalacademies.org/rap. Applicants must contact Research Adviser(s) at the lab(s) prior to their application deadline to discuss research interests and funding possibilities. All contact information is on the website. Questions may be directed to 202-334-2760 or rap@nas.edu.

The NRC/NA also conducts the Ford Foundation Fellowship Programs which offer fellowship awards annually at the predoctoral, dissertation and postdoctoral levels. Awards are open to all U.S. citizens who are committed to research and teaching at the college or university level. Online applications and instructions will be on the Web site on or around September first 2011 at: www.nationalacademies.org/ford. Questions may be directed to 202-334-2872 or infofell@nas.edu.
Exhibitor Descriptions

Table #11
National Science Foundation Science & Technology Centers
3563 Boelter Hall
Box 951596
Los Angeles, CA 90095

Contact: Wes Uehara, wuehara@cens.ucla.edu

The Science and Technology Centers (STC): Integrative Partnerships program supports innovative, potentially transformative, complex research and education projects that require large-scale, long-term awards. STCs conduct world-class research through partnerships among academic institutions, national laboratories, industrial organizations, and/or other public/private entities, and via international collaborations, as appropriate.

The STCs are currently recruiting applicants for our Summer Undergraduate Internship Program.

Table #1
North Carolina State University Graduate School
NC State University
The Graduate School
Campus Box 7102
Raleigh, NC 27695

Contact: David Shafer, david_shafer@ncsu.edu

NC State offers over 160 Master’s degree and more than 60 doctoral degrees and is nationally recognized as a leader in science, technology, engineering, and mathematics. We offer a full range of degree options - including graduate degrees, certificates and minors - in all traditional disciplines as well as many areas where emerging disciplines interface, including genomics, biotechnology, biomedical engineering, nanotechnology, natural resources, and geographic imaging science.

NC State boasts a talented graduate student body of over 7,300 Master's and doctoral students who reflect a richness and diversity that energize this community of scholars. They come from all 50 states and from over 100 different countries. In 2009-2010, we conferred more than 1,790 Master's and more than 425 doctoral degrees.

Table #22
Penn State University /College of Medicine MD/PhD Program
500 University Drive
Mail Code R130
Hershey, PA 17033
www.pennstatehershey.org/web/mdphd/home

Contact: Robert Levenson, rlevenson@hmc.psu.edu

The MD/PhD program is designed to train the next generation of physician scientists. The program is approximately 8 years in length and is divided as follows: two years of medical school, followed by 4 years of laboratory based research, followed by the last two years of medical school.

The goal of the program is to obtain training in translational medicine so that the research done in the laboratory can ultimately be utilized to develop better treatments for human disease.

Categories: Biochemical Sciences, Cell Biological Sciences, Developmental Biological Sciences, Microbiological Sciences, Molecular Biological Sciences, Neuroscience, Physiological Sciences

Table #5
Prairie View A&M University - Gifted Black STEM Research Study
PO Box 519
MS 2505
Prairie View, TX 77446

Contacts: Felecia Nave, fmnave@pvamu.edu
Chance Lewis, chance.lewis@tamu.edu

Investigators from Prairie View A&M University and Texas A&M University were awarded a National Science Foundation (NSF) grant to investigate ways to contribute to the knowledge base that will lead to the enhancement of STEM education at HBCUs. The team was awarded $1M over three years to identify factors that most significantly contribute to the success of academically gifted African American students in STEM disciplines enrolled at HBCUs.

The investigators hope through the implementation of this project, to be able to understand how to structure successful collegiate experiences at institutions to increase the quantity and quality of students who graduate with STEM degrees. The project is in its final phase, which consists of the administration of an electronic survey to students and faculty in STEM majors at HBCUs.

Table #70
Purdue University
Midwest Crossroads Alliance for Graduate Education and the Professoriate (AGEP)
Hovde Hall, Room 148
610 Purdue Mall
765-496-1123
West Lafayette, IN 47907-2040

Contact: Kathy Sears, ksears@purdue.edu
The Alliance for Graduate Education and the Professoriate (AGEP) program is a National Science Foundation (NSF) initiative used to significantly increase the number of domestic students receiving doctoral degrees in science, technology, engineering and mathematics (STEM) fields, with special emphasis on those population groups underrepresented in these fields (i.e. African-Americans, Hispanic-Americans, American Indians, Alaska Natives, Native Hawaiians or other Pacific Islanders).

Purdue University, Indiana University and Northwestern University have partnered to develop the Midwest Crossroads AGEP, with Purdue University being the lead alliance institution.

Table #24
Stony Brook University
The Center for Inclusive Education
Melville Library E-1340
Z-3387
Stony Brook, NY 11794-3387

Contacts: Toni Sperzel, toni.sperzel@stonybrook.edu
Shayri Greenwood, shayri.greenwood@notes.cc.sunysb.edu

Stony Brook University, located in Stony Brook, New York is internationally recognized as a major research university offering the finest graduate degree programs available. Our collaborative relationships with Brookhaven National Laboratory and Cold Spring Harbor Laboratory make the University an ideal choice for students interested in the sciences.

The Center for Inclusive Education, a division of the Graduate School, is home to three graduate level initiatives aimed at increasing the participation of underrepresented students in graduate study and the professoriate: The State University of New York Alliance for Graduate Education and the Professoriate (SUNY AGEP); The prestigious state funded W. Burghardt Turner Fellowship; and the GEM Fellowship program.

With a combined budget of about $1.5 million per year, the CIE currently provides direct services for 160 students in 36 graduate and professional programs across all disciplines. The Center’s mission is to pro-mote action and knowledge that broadens the participation of disadvantaged Americans in higher education, the scientific work force and the Academy.

For information on admissions, fellowships, campus visits and application fee waivers please visit our booth.

Table #41
The Black EOE Journal
6845 Indiana Avenue
Suite 200
Riverside CA 92506
www.blackoejournal.com

Contact: Heather Tormey, heathert@blackoejournal.com

The Black Equal Opportunity Employment Journal is America’s leading African-American Business and Career magazine. Our mission is to be the epicenter of information for African-Americans seeking employment and business opportunities within corporate America. Our goal is to connect, educate and promote equal opportunity thus creating a more diverse environment. Our motto is “Strength in Diversity.”

Every issue of the quarterly published magazine celebrates the accomplishments of African-Americans, honor, proud traditions and spotlights ways to enhance everyday life. If you’re seeking an exciting magazine to educate, employ, and connect with thousands of professional African-Americans with diverse backgrounds then Black EOE Journal is for you.

Table #68
The Graduate Center, CUNY
365 Fifth Avenue
New York, NY 10016

Contact: Lorraine Towns, ltowns@gc.cuny.edu

The Graduate Center is the doctorate-granting institution of the City University of New York (CUNY). Students and faculty pursue a joint enterprise of expanding boundaries of knowledge in over 30 doctoral programs in the humanities, natural and social sciences.

The CUNY Graduate Center offers fellowship opportunities for graduate students in science, technology, engineering and mathematics (STEM) fields through its NIH Bridges-to-the-Doctorate Program for master’s students and NSF Alliances for Graduate Education and the Professoriate (AGEP) Program for doctoral students. NSF/AGEP is a network of over 100 universities dedicated to increasing minority doctoral degree production.

Table #7
The Ohio State University / College of Arts and Sciences
230 N. Oval Mall
186 University Hall
Columbus, OH 43210
http://artsandsciences.osu.edu/

Contact: Oludurotimi Adetunji, adetunji.1@osu.edu

The College of Arts and Sciences is a dynamic fusion of the arts; humanities; natural, mathematical, social, behavioral sciences. Our 39 departments, more than 20 world-class research centers and 2,000+ faculty and staff members are engaged in pioneering research, innovative teaching, community service, and putting students first.
Exhibitor Descriptions

Table #23
The Ohio State University / Graduate School
230 N. Oval Mall
247 University Hall
Columbus, OH 43210

Contact: Cyndi Freeman, papio.1@osu.edu

The Ohio State University is one of the world's best comprehensive, public research universities, and it attracts high-achieving faculty and graduate students with its state-of-the-art facilities and abundant research opportunities. Ohio State’s 10,000 graduate students have access to a large and dynamic university environment, outstanding academic and professional development resources, and the cultural and recreational opportunities of Columbus, Ohio, one of the country's fastest-growing cities.

Brandon Jones, jones.brandon@epa.gov (STAR Graduate Fellowship Program)

EPA is continuing to offer undergraduate and graduate fellowships to students in environmentally related fields of study. Students conducting research in the physical and biological sciences, as well as the social sciences and engineering, are eligible to apply. Minority applicants are especially encouraged to apply since the number of minority applicants has historically been low. The application period for STAR Graduate and GRO Undergraduate Fellowships will open fall 2011. Awards will be determined in spring 2012 for 2012-2013 academic years. See http://www.epa.gov/ncer/fellow/ for more details.

Table #21
The Pennsylvania State University / Huck Institutes of the Life Sciences and MD/PhD Program
101 Life Sciences Building
The Pennsylvania State University
University Park, PA 16802-2123

Contacts: Michael Radis, mwr1@psu.edu
Joyce Hopson-King, juh4@psu.edu

The Huck Institutes of the Life Sciences at The Pennsylvania State University is an umbrella unit for 11 interdisciplinary life sciences programs Including: Bioinformatics and Genomics, Cell and Developmental Biology, Chemical Biology, Ecology, Genetics, Immunology and Infectious Diseases, Molecular Medicine, Molecular Toxicology, Neuroscience, Physiology, and Plant Biology. These programs involve over 300 faculty from 8 of the 10 colleges within Penn State University more than 300 graduate students. Programs are located at both the University Park and Hershey College of Medicine campuses in central Pennsylvania.

Students receive training and experience as college teachers, rotations through several labs, as well as receiving full funding for their education.

Table #33
University of Arkansas, Graduate School
346 N Arkansas Ave #50
Fayetteville, AR 72701

Contacts: Shani Fard, sfarr@uark.edu
Alfred Dowe, atdowe@uark.edu
David Paul, dpaul@uark.edu
Carl Riley, criley@uark.edu

The Graduate School assists post-baccalaureate students with the opportunity to further their educational goals through programs of study, teaching, and research in an environment that promotes freedom of expression, intellectual inquiry, and professional integrity. Additionally, the Graduate School assists the development of degree programs that are relevant and responsive to the needs of its students and the student's


Table #18

University of California, Berkeley
101 Durant Hall MC 2920
Berkeley, CA 94720

Contact: Colette Patt, acchan@berkeley.edu

U.C. Berkeley is launching two new programs, The Berkeley Science Network (BSN) and Berkeley Science Connections (BSC). BSN is supported by the Mitchell Kapor Foundation and BSC is supported by the NSF-Innovation through Institutional Integration program.

With entry points for students at each transitional education step, both programs aim to strengthen the pipeline of students of color in the science disciplines where African Americans, Latinos, Native Americans and Pacific Islanders are most severely underrepresented in academia and industry: mathematics, physical science and computer science.

Together, these programs offer an array of new opportunities for students to engage in research and study in the MPSC fields at Berkeley, all in a context of belonging to a dynamic cross-generational community of scientists of color that provides vital opportunities and uses many modes of encouragement to help students advance into successful science careers.

BSN is creating a vibrant academic and social network across generations of scientists of color, from aspiring high school students to undergraduates, graduate students, post-doctoral students, and faculty, by providing formal mentoring, networking, professional development activities along with the full range of opportunities needed to advance in science. BSC provides increasingly intensive and advanced research opportunities that facilitate entry into the MPSC fields at Berkeley and into the two new programs.

For example:

• The Explorations in Research Workshop for rising juniors and rising seniors at the undergraduate level. This is a one-week residential program that offers immersion in research in one of the MPS fields each summer.

• Summer Research Opportunities for rising seniors provide a mentored research experience in our 6-week residential summer program on campus.

• MPSC Application Conference for graduating seniors who wish to visit and consider UC Berkeley for their doctoral studies.

Table #14

University of California, Los Angeles (UCLA) /Graduate Division
1252 Murphy Hall
Box 951419
Los Angeles, CA 90095-1419

Contact: Jozen Gibson, jgibson@gdnet.ucla.edu

The UCLA Graduate Division is responsible for the overall quality and progress of graduate education at UCLA and serves as the administrative core for graduate recruitment and admissions. Please visit http://www.gdnet.ucla.edu/departments.html for a listing of graduate programs offered at UCLA.

Table #75

University of California, San Diego / Office of Graduate Studies
UCSD-Office of Graduate Studies
Stu. Ser. Ctr. - 4th Fl.
9500 Gilman Dr. #0003
La Jolla, CA 92093

Contact: Veronica Henson-Phillips, vhensonphillips@ucsd.edu

UC San Diego is one of the premier research universities in California. The National Research Council’s (NRC) 2010 study ranks the UC San Diego Division of Biological Sciences doctoral program number one in the U.S. UCSD’s annual research funding is $627 million. The National Science Foundation ranks UCSD 5th in the nation in federal R&D expenditures.

The Office of Graduate Studies provides a wide range of services to prospective and existing UCSD graduate students and campus departments on all graduate education matters including: diversity outreach and recruitment; graduate admissions; enhancing the quality of graduate student life; student financial support, fellowships, and traineeships; graduate student advising and advocacy; retention programs; development and oversight of graduate degree programs.

Table #10

University of Cincinnati College of Medicine - Biomedical Sciences
231 Albert Sabin Way
MSB Suite 2005
ML 0548
Cincinnati, OH 45267-0548

Contact: Laura Hildreth, Laura.Hildreth@uc.edu

communities - state, nation and world - and the demands of technology, while maintaining a high standard of excellence in graduate education.

• Summer Bridge for entering graduate students offers a summer opportunity to gear up for the first year of the doctoral program.
Graduate Programs in Biomedical Sciences:

Prepare yourself for a career in biomedical research by training under the mentorship of nationally renowned faculty on the cutting edge of biomedicine. Ranked in the top 8% of faculty nationwide for sponsored funding; with nearly $300 million in research awards to support our postdoctoral fellows and graduate students. All PhD students receive 100% Tuition and Fees, paid health insurance and a generous annual stipend.

PhD Programs:
1. Biomedical Sciences Flex Option (PhD)
2. Biomedical Engineering (MS, PhD)
3. Cell & Cancer Biology (PhD)
4. Environmental Health:
   a. Epidemiology (MS, PhD)
   b. Biostatistics (MS, PhD)
   c. Environmental & Occupational Hygiene (MS, PhD)
   d. Occupational & Environmental Medicine (MS, PhD)
   e. Environmental Genetics and Molecular Toxicology (PhD)
5. Immunobiology (MS, PhD)
6. Molecular & Developmental Biology (PhD)
7. Molecular, Cellular & Biochemical Pharmacology (PhD)
8. Molecular Genetics, Biochemistry & Microbiology (MS, PhD)
9. Neuroscience (PhD)
10. Pathobiology & Molecular Medicine (PhD)
11. Physician Scientist Training Program (MD/PhD)
12. Systems Biology and Physiology (PhD)

MS Programs:
1. Medical Physics (MS)
2. Master of Public Health (MPH)
3. MS in Clinical and Translational Research
4. MS in Physiology (1-yr MedPrep program)

Table #36
University of Illinois at Urbana-Champaign
Graduate College
204 Coble Hall
801 S. Wright Street
Champaign, IL 61820

Contact: Ave Maria Alvarado, amalvara@illinois.edu

The University of Illinois at Urbana-Champaign (Illinois) offers more than 100 graduate and professional programs and numerous interdisciplinary and joint degree programs. The University enrolls over 9,000 graduate and professional students and is among the top five universities in the number of earned doctorates awarded annually in the US.

Illinois has earned a reputation as a world renowned leader in research, teaching, and public engagement. Our programs in science, technology, engineering, agriculture, and mathematics (STEAM) have helped to build Illinois’ reputation as one of the nation’s premier public universities. A preeminent faculty propels many academic programs to be ranked among the best in the world. There are numerous resources and opportunities for students that make Illinois a world-class university.

The University of Illinois Library is one of the largest public university libraries in the world; the Beckman Institute for Advanced Science and Technology is a model for interdisciplinary research in human-computer intelligence, biological intelligence, and molecular and electronic nanostructures; the Institute for Genomic Biology is dedicated to transformative research in Agriculture, Human Health, the Environment, and Energy Use and Production; the University is home to the National Center for Supercomputing Applications (NCSA); and our Summer Research Opportunities Program (SROP) and the Summer Pre-Doctoral Institute (SPI) are among numerous programs that encourage and support the participation of students from underrepresented populations in graduate study at Illinois.

For more information, contact: Ave M. Alvarado, Director of Educational Equity Programs at gradeeprograms@illinois.edu.

Table #63
University of Massachusetts Amherst / The MassNanoTech Institute / Northeast AGEP
710 North Pleasant St.
Amherst, MA 01003

Contact: Michael Westort, mwestort@research.umass.edu

The MassNanoTech Institute is the University of Massachusetts Amherst’s campus-wide initiative for nanoscale science and engineering. It provides administrative and industry outreach services to the Center for Hierarchical Manufacturing (CHM), a NSF Nanoscale Science and Engineering Center.

The campus has built a strong reputation for innovation in nanoscale research with breadth across many departments. Nearly 30 faculty investigators from ten departments in three colleges in the CHM alone are working in the field of nanotechnology, generating over $46 million in research funding since 2006 from a variety of federal and industry sources.

Ongoing efforts include multiple prestigious NSF awards, licensing of key technology, acquisition of specialized characterization equipment, and the education and training of many talented graduate students working on innovative technologies in individual faculty labs. MassNanoTech provides a single point of contact for academic and industry collaborators.
Table #4
University of Minnesota
Combined MD/PhD Training Program (MSTP)
B681 Mayo, MMC 293
420 Delaware Street SE
Minneapolis, MN 55455

Contact: Nicholas Berg, nick@umn.edu

The University of Minnesota’s Combined MD/PhD Training Program provides talented students with rigorous training for careers directed at the interface of basic science research and medicine. We are looking for exceptional individuals who have research experience and high a motivation and commitment to careers in which active biomedical research will play a role side-by-side with clinical practice.

Our Program is an N.I.H. supported MSTP housed in one of the top public research universities in the country. We are committed to providing our students with an outstanding training environment with well coordinated transitions between the graduate and medical phases of training.

Table #9
University of Minnesota Graduate School & Biomedical Sciences Graduate Programs
G-254 Mayo
MMC293
420 Delaware Street SE
Minneapolis, MN 55455

Contacts: Jon Gottesman, orbs@umn.edu
Derek Maness, dmaness@umn.edu

The University of Minnesota is one of the most comprehensive public universities in the United States and ranks among the most prestigious (according to the Center for Measuring University Performance every year since 2002). It is both the state land-grant university, with a strong tradition of education and public service, and the state’s primary research center, with faculty of national and international reputation. The University ranks among the top 10 public institutions in NIH funding. The Biomedical Sciences Graduate Programs offer training in six areas culminating in the Ph.D:

- Biochemistry, Molecular Biology & Biophysics
- Integrative Biology & Physiology
- Microbiology, Immunology & Cancer Biology
- Molecular, Cellular, Developmental Biology & Genetics
- Neuroscience
- Pharmacology

To find out more about these Biomedical Science Programs visit http://orbs.umn.edu/ERN and investigate our outstanding multidisciplinary degrees that provide a broad core curriculum designed to prepare students for careers in academia, industry, government and research. All students receive full financial support, free tuition and benefits.

Table #64
University of Missouri / Graduate Life Sciences Programs
150c Bond Life Sciences Center
1201 Rollins St.
Columbia, MO 65211

Contacts: Debbie Allen, allenweb@missouri.edu
Mark Hannink, hanninkm@missouri.edu

The joy of discovery and innovation have propelled the University of Missouri to one of the top-ranked Life Sciences research institutions in the 21st Century. Our Ph.D. programs emphasize interdisciplinary collaboration and innovation. MU is a major research campus with shared resources from Medicine, Engineering, Agriculture, Veterinary Medicine, Health Professions, Journalism, Business and Law. Research core facilities and a nuclear reactor bolster the research resources at MU.

Committed to graduate student success, we promote strong mentorship connections and career-directed resources. A comprehensive support package is offered, including stipend, paid tuition, health insurance and travel funding. Columbia, Missouri is an excellent, diverse and affordable city with impressive amenities.

Learn more: http://lifescigradprograms.missouri.edu/ and http://www.missouri.edu/research/
Email: gradlifesci@missouri.edu

Table #71
University of Pennsylvania / Biomedical Graduate Studies
421 Curie Boulevard
160 BRB II/III
Philadelphia, PA 19104

Contact: Arnaldo Diaz, diaza@mail.med.upenn.edu

The University of Pennsylvania School of Medicine is the nation’s first, with the Hospital of the University of Pennsylvania being the nation’s first built medical school.

Biomedical Graduate Studies was established in 1985 and serves as the academic home students pursuing a PhD in the basic biomedical sciences. BGS is composed of more than 600 faculty members and provides training through seven graduate groups -
Exhibitor Descriptions

Biochemistry and Molecular Biophysics, Cell and Molecular Biology, Epidemiology and Biostatistics, Genomics and Computational Biology, Immunology, Neuroscience, and Pharmacology.

In addition to our graduate programs, BGS is pleased to offer research training for individuals at the undergraduate and post-baccalaureate levels. www.med.upenn.edu/bgs

Table #35  
University of Pennsylvania  
3231 Walnut Street  
Philadelphia, PA 19104  

Contact: James McGonigle, jmcgon@seas.upenn.edu  

The Nano/Bio Interface Center and the School of Engineering and Applied Science provide information regarding research opportunities and programs related to a wide variety of graduate studies. These include Mechanical, Electrical, Materials, Chemical, Computer, and Bioengineering. Summer research experiences for undergraduates (REU) are also available.

The University of Pennsylvania (PENN) is a located in Philadelphia, Pennsylvania on a beautiful urban campus in a dynamic city. With 165 research centers and institutes, research is a substantial and esteemed enterprise at Penn. As of fiscal year 2010, the research community includes over 3,800 faculty and over 1,000 postdoctoral fellows, over 5,400 academic support staff and graduate assistants, and a research budget of $814 million. The scale and interdisciplinary character of our research activities make Penn a nationally-ranked research university.

Table #44  
University of Pittsburgh ~CMU  
Quality of Life Technology Engineering Research  
7180 Highland Drive  
Building 4, 151R1-H  
Pittsburgh, PA 15206  

Contacts: Shelly Brown, SRBROWN@PITT.EDU  
Mary Goldberg, MRH35@PITT.EDU  

The National Science Foundation Quality of Life Technology Engineering Research Center is creating intelligent systems that enable older adults and people with disabilities to live independently.

Table #53  
University of South Florida  
College of Engineering  
University of South Florida  
4202 E. Fowler Avenue, ENB 118  
Tampa, FL 33620  

Contact: Bernard Batson, bbatson@usf.edu  

The University of South Florida is one of the nation’s top 63 public research universities and one of only 25 public research universities nationwide with very high research activity that is designated as community engaged by the Carnegie Foundation for the Advancement of Teaching. USF was awarded $394.1 million in research contracts and grants in FY 2009/2010. The university offers 232 degree programs at the undergraduate, graduate, specialist and doctoral levels, including the doctor of medicine.

Table #3  
University of the District of Columbia (UDC)  
4200 Connecticut Avenue NW  
Washington, DC 20008  

Contacts: Beverly Karplus Hartline, bhartline@udc.edu  
Akua Sewer-Gunthrope, asewe-gunthrope@udc.edu  

The University of the District of Columbia is a land-grant institution and the only public university in the nation’s capital. Building on 160 years of quality, affordable, and accessible higher education, the University serves the 21st-century academic needs of the people of the District of Columbia and nation. The selective Flagship offers baccalaureate, graduate, and professional degrees through five colleges and schools: College of Arts and Sciences; College of Agriculture, Urban Sustainability and Environmental Sciences (CAUSES); School of Business and Public Administration; School of Engineering and Applied Sciences; and the David A. Clarke School of Law. The open-admission Community College of the District of Columbia provides associate’s degrees and workforce development. The University provides undergraduate and graduate education with a global focus; offers exceptional research-driven graduate and professional programs of importance to DC and the Nation; and provides an economic engine for the region.

Students at UDC have extraordinary opportunities to engage in resumes building research, service projects, and internships only available in the nation’s capital. UDC is a member of Internet2; has a cancer research partnership with Georgetown University; has an information assurance research center; administers the DC Water Resources Research Institute; operates an Agricultural Experiment Station; and has a long-standing Center for Applied Research and Urban Policy.
Table #12  
University of Washington  
PhD Program in Molecular and Cellular Biology  
T466 HSB, Box #357275  
University of Washington  
Seattle, WA 98195-7275  

Contact: Mary T. Duffey, tduffey@u.washington.edu

Recognizing the need for highly trained scientists conversant across disciplines, the University of Washington (UW), the Fred Hutchinson Cancer Research Center (FHCRC), the Institute for Systems Biology (ISB) and the Seattle Biomedical Research Institute (SBRI) have collaborated to create an interdisciplinary PhD research program in Molecular and Cellular Biology (MCB).

For more than 15 years, MCB has combined the strengths of the FHCRC together with ten UW biomedical research departments--from Biochemistry to Pharmacology--to foster an innovative and flexible, education-training program for graduate students interested in biomedical problems that cross disciplinary boundaries. Recently, ISB and SBRI have joined this collaborative effort.
Science Magazine’s College Inquiry Science Prize

Science education is being redefined in ways that encourage all students to actively participate in scientific inquiry. And, for the first time in science, it is possible for advanced high school and undergraduate students to work with some of the same data and tools as research scientists. How can science, and science education efforts, capitalize on these new and unprecedented opportunities?

One approach is through Science Magazine’s Science Prize for Inquiry-Based Instruction, which has been established to encourage innovation and excellence in education by recognizing outstanding inquiry-based science education modules. The contest will recognize any inquiry-based exercise associated with an introductory-level college course in science (but only one entry per academic department may be submitted).

Winners will be selected by the editors of Science and a judging panel composed of outstanding teachers and researchers in relevant science fields. Individuals responsible for the development of the winning resources will be invited to write a short essay that describes the resource for publication in Science in 2012.

Winning applicants must be willing to provide complete instructions for implementing their module. The resource must contain no copyright restrictions. And, to make the module easily portable, it should require only modest resources (supplies, equipment, or specialized expertise).

Nominate a Project

Note: Only one entry per academic department will be accepted.

To Nominate Your Own Project
Self-Nominations must be submitted by April 15, 2011.

To Nominate Someone Else’s Project
External Nominations must be submitted by February 28, 2011.

How to Submit
E-mail ScienceEducation@aaas.org for applications.

Questions?
Questions regarding a module’s eligibility may be e-mailed to Dr. Melissa McCartney at mmccartn@aaas.org.
# Abstracts

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Undergraduate Abstracts for Oral Presentation

BIOLOGICAL SCIENCES

OA #1
TMPRSS2-Ets Related Gene Fusions in Mouse Models for Prostate Cancer

Nicola Eva Abdul, University of the District of Columbia

The TMPRSS2-Ets related gene (ERG) fusions in mouse models for prostate cancer are of extreme importance, due to their high prevalence among prostate cancer patients. These translocations involve the removal of a 3 Mb DNA sequence resulting in the fusion of TMPRSS2 and Erg, which gives rise to the overexpression of ERG. The cause of the gene fusions alone is not understood. In this study, we examined the proteins from biological factors such as SV40-virus-caused rearrangements in mouse models. We demonstrate, in this presentation, that the chromosomal rearrangements do happen at a very low frequency in the TRAMP mouse model.

We obtained 50 TRAMP mouse prostate tumor sections from Dr. Partha Benerjee, Georgetown University, Washington DC. These slides were analyzed for the presence of ERG by immunohistochemistry using ERG monoclonal antibodies. Our control wild type mice express ERG in the endothelial cells and positive control (ERG Transgenic Mice) expresses ERG in the nucleus of luminal epithelial cells. ERG expression in prostate shows mostly in the endothelial cells. We could detect ERG in the luminal epithelial cells of only 1 out of 50 TRAMP mouse prostates. Further experimental analysis needs to be done to confirm if these results are accurate.

Depending on the results of our final analysis, we could have a therapeutic target of prostate cancer. It is important that we know about virus-induced chromosomal instability, because this indicates a direct cause of up regulation of ERG and reiterates the importance of ERG as a therapeutic target.

OA #2
Characterization of Tissue-Specific Activities of Three Plant Promoters

Jessica Abercrombie, Claflin University / ArborGen

The role of a series of three promoters fused to a GUS gene transformed in Arabidopsis for function and tissue specificity was examined. The promoters used were BSP1 and BSP2, which originated from P. trichocarpa, and VSP2, which came from the Arabidopsis. GUS is a reporter gene that reports the activity of the promoter on which it is fused. When a promoter fused to GUS is functioning, a blue color is visible. The importance of this research lies the fact that promoters with tissue specificities allow researchers to deliver targets, such as gene expression and proteins, to different tissues of plants during the engineering of crops and trees.

Seeds were grown and transferred to pots, as well as stained with a substrate. DNA was isolated and purified to test for transformation by PCR. The promoter and the gene segments of PCR were amplified to see if they were present. In conclusion, the plants were confirmed to be transformed and showed promoter activity. In the BSP1GUS, BSP2GUS, and VSP2GUS plants, the promoter was either expressed in the vascular region, the leaves, or in the growing point of the cells where active division takes place. In the future, I would like to analyze the growth of the second generation (T2) Arabidopsis seeds to see if this research could be beneficial to the speed in the production of engineered crops and trees. [I would like to acknowledge the LSAMP program for funding and Claflin University for preparing me to do research. I want to thank ArborGen for presenting me with this opportunity.]

OA #3
Taste Transduction Mechanisms In A Newly Identified Signaling Pathway

Chiamaka Agbasionwe, University at Buffalo, NY

Taste receptor cells (TRCs) are housed in taste buds that are located on the tongue and within the oral cavity. TRCs detect chemical stimuli from potential food items and translate that information into electrical signals that are transmitted to the brain for processing, thus resulting in our sense of taste.

Currently, two distinct signaling pathways are known to be involved in transducing different taste qualities in mammalian taste systems. Transduction of sour and salty stimuli by the TRCs depends on calcium influx through the voltage-gated calcium channels, while bitter, sweet, and umami taste signals are formed in response to the activation of G-protein coupled receptors (GPCRs). GPCRs activate a signaling pathway that depends on calcium release from internal calcium stores, which activate a transient receptor potential channel, TRPM5. TRPM5 activation causes neurotransmitter release through a hemichannel which transmits the taste signal to the brain.

Recently, we identified a new population of taste cells in mice that detect bitter, sweet, and umami stimuli through a distinct GPCR-signaling pathway that does not use TRPM5. Due to similarities between this newly identified population of taste cells and the taste cells that use the TRPM5 signaling pathway, we hypothesize that the newly identified signaling pathway may use another transient receptor potential channel, TRPM4, which is a close relative of TRPM5, to transduce evoked chemical signals.
We are using molecular and immunocytochemical analyses to determine the expression of TRPM4 in mouse taste cells. We isolated mRNA from mouse TRCs and analyzed it using reverse transcription and polymerase chain reactions (RT-PCR) to determine if TRPM4 is expressed in these cells. Immunocytochemical analyses are used to determine if the TRPM4 protein is expressed in taste cells and where it is localized within the taste bud.

To date, our studies have shown that TRPM4 is expressed in TRCs and studies are currently underway to determine its expression pattern within these cells. This work will lay the groundwork for future studies that will determine the physiological role of TRPM4 in the transduction of taste stimuli. Understanding the transduction mechanisms of the newly identified signaling pathway will further our understanding of how the peripheral taste system transmits the appropriate stimulus signals to the brain. [This work is supported by NSF 0917893 to KM.]

**OA #4**

**Visual Communication Signals of Northern Cricket Frogs - Acris Crepitans Blanchardi**

Sarah Ballard, Langston University  
Eva Horne, Kansas State University

The aim of my research is to understand why the Northern Cricket Frogs on the Konza Prairie visually communicate with one another in addition to common vocal interactions.

Some brightly colored tropical species of frogs developed visual signals to communicate in an environment with overwhelming ambient noise (waterfalls, loud streams). However, Konza Prairie Cricket frogs live at the edges of ponds in a relatively quiet environment. During observation of interactions between cricket frogs, I identified 6 visual behaviors. These behaviors were described as agonistic behaviors in a review paper dealing with multiple species of visually displaying frogs. I was unable to determine if the cricket frog interactions included only male frogs, were calling site defenses, or competition for mates. I assumed the behaviors have a function in sexual selection because they appeared to occur only during breeding season.

In the future, we would like to determine the exact mating season of the Konza Prairie cricket frog and gender of interacting frogs. If the interactions are only male, we would like to determine what female frogs do during these displays (are they participating, watching, or absent), and whether this behavior happens at other ponds on the prairie. [This research was supported by The Summer Undergraduate Research Opportunity Program and the Kansas IDeA Network of Biomedical Research Excellence program.]

**OA #5**

**Localization of Glycogen Synthase Kinase-3 Beta (GSK3 beta) in Planaria**

Lynda Biaou, University of the District of Columbia  
Carolyn Cousin, University of the District of Columbia

Planarians are free-living freshwater flatworms from the class Turbellaria in the phylum Platyhelminthes. These flatworms are bilaterally symmetrical and have the ability to aggressively regenerate. These regenerative properties have been a subject of interest for many years. Because Glycogen synthase kinase-3 (GSK3) is a key element in several signaling cascades that involve pattern formation and neuronal organization, it appears to be an excellent candidate that would likely play a role in neuronal regeneration in planarians. GSK-3 is a serine/threonine protein kinase that mediates the addition of phosphate molecules on certain serine and threonine amino acids, in particular, cellular substrates. In mammals, GSK-3 is encoded by two genes GSK-3 alpha and beta. Further supporting this premise that GSK3 is involved in neuronal organization is the results obtained from treatment of 1-azakenpaullone, a synthetic GSK3 inhibitor.

These results suggest that GSK3 is essential for normal differentiation and morphogenesis of the nervous system. As an initial step in studying the process of regeneration in planaria, we have chosen to examine the morphology of the nervous system by localizing GSK3 beta using immunocytochemistry. The beta form of GSK 3 has been found to be instrumental in neuronal regeneration of the ladder-shaped nervous system, with its two nerve cords governed by the central ganglia.

The objective of our project is to localize the enzyme (GSK3) in the nervous system of the planaria. Two types of planaria were employed in this study, a planaria that had recently been excised through the midbody and a planaria that has not undergone regeneration. These organisms were fixed in 1% glutaraldehyde buffered with 0.75M Sorensen’s buffer for 45 minutes at room temperature. The tissues were subsequently washed in 0.75M Sorensen’s buffer (3X) for ten minutes, dehydrated in ascending concentration of ethanol, and were infiltrated in LR-White resin with ascending mixtures of ethanol/resin. The tissues were embedded in pure LR white resin. Ninety nanometer sections were made using a LEICA ultra microtome and placed on nickel grids covered with formvar grids. The grids were incubated in blocking buffer, and then incubated in human anti GSK3 beta (1/500). They were then washed with buffer A, placed in 10 nm gold-conjugated goat anti-human serum on paraffin for two hours at room temperature, and viewed, in 100 CX JEOL transmission electron microscope at 80 KV.

Both the regenerating and nonregenerating specimen were positive for GSK3 beta; however, the reaction of the regenerating planaria appears to be more intense. In conclusion the presence of a more intense reaction in the regenerating...
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planaria strongly supports GSK3 beta playing a role in the morphogenesis of the nervous system in planaria. [Supported by NIH Grant 1R25CA129.]

OA #6
Validation of 454 Sequence-Derived Transcription Factors in the Common Bean (Phaseolus vulgaris L.)

Nickolas Bradley, Fort Valley State University
Kalpalatha Melmaeie, Zhanji Liu, Adrianne Brown, and Venu Kalavacharla, Delaware State University

The common bean (Phaseolus vulgaris) is an essential crop to cultures all over the world shows a broad range of adaptation to the most varied climatic conditions and is an important source of dietary protein. The diseases caused by the rust fungus Uromyces appendiculatus affects bean production in the United States and all over the world. Approximately 2,500 transcription factors derived from bean 454 transcriptome sequencing were identified previously.

The objectives of this research were focused on validation of the Transcription Factors (TFs) b-Zip, NAC, and MADS factors on genomic DNA of the genotype Sierra during rust fungal infection at 0hrs, 6hrs, 24hrs, and 48 hours after inoculation. Thirty seeds of each genotype’s were germinated and later planted in to the greenhouse. The plants were inoculated with rust fungus spores at 10 days after germination and the samples were collected in the liquid nitrogen at 0hrs, 6hrs, 24hrs, and 48hrs after the inoculation. RNA was extracted from the individual treated samples for Reverse Transcription PCR to make cDNA as a template for Real-Time PCR experiments to determine temporal gene expression patterns.

Our results indicate the three gene specific to B-zip transcription factors and other TFs derived from 454 sequences were successfully amplified from the five bean genotypes. Inoculation of bean genotypes with the rust fungus was carried out but was not successful and needs to be repeated. In addition, total RNA was extracted from zero and six hrs samples (as a practice experiment), and cDNA was made from the above RNA. This showed that the 454 sequences were valid sequences present in the genome. Gene expression studies need to be conducted using Real-Time PCR. [This research was supported, in part, by a grant from NSF HBCU-UP (HRDR-0625289) awarded to Sarwan Dhir PhD, Director for the Center for Biotechnology, Fort Valley State University, Fort Valley, GA 31030.]

OA #7
Neuroprotective Effects of Resveratrol in SH-SYSY Cells: Implications for Parkinson’s Disease

Rhondee’ Caldwell, Norfolk State University

Parkinson’s disease (PD) is a neurodegenerative disease that is caused by the loss or damage of dopaminergic cells in the substantia nigra. It is characterized by tremor, rigidity, and postural instability. Salsolinol, a condensation product of dopamine metabolite and acetyl aldehyde, has been shown to have selective toxicity for the nigral dopaminergic cells and high levels of this compound are found in the urine and cerebral spinal fluid of some PD patients. Rotenone, a pesticide, may also cause damage to dopaminergic cells. Indeed, a higher incidence of PD is observed in farmers who use this pesticide. On the other hand, resveratrol, a polyphenolic compound abundant in the skin of grapes, may have neuroprotective properties.

The aim of this study was to determine whether the combination of salsolinol and rotenone in low doses would result in additive toxicity and whether such toxicity could be prevented by pretreatment with resveratrol. SH-SYSY cells derived from human neuroblastoma cells, believed to be representative of nigral dopaminergic cells, were used. These cells were plated in a 96-well plate, and following 80-90% confluency, they were treated with salsolinol [50-600μM] and rotenone [50-600μM] alone or in combination to establish toxic dose-response relationships. The cells were then pre-treated with resveratrol (10μM) for 1 hour prior to toxic doses of salsolinol, rotenone, or their combination. Cell viability was measured 24 hours later using MTT assay. Exposure of SH-SYSY cells to salsolinol (50μM) resulted in 20% cell death, and exposure to rotenone (50 μM) resulted in 30% cell death. The combination of salsolinol and rotenone produced an increased cell death of 60%. Resveratrol pretreatment reduced cell toxicity produced by the salsolinol, rotenone, or their combination. These results suggest therapeutic potential of resveratrol in PD. Future research includes in vivo studies of this research.

OA #8
Androgen Receptor Regulates NEDD4-1, an Oncogenic Protein, in Human Prostate Cancer Cells

Juliet Chijioke, University of the District of Columbia
Deepak Kumar, University of the District of Columbia
Hua Li, Albert Dobil, and Shiv Srivastava, Center for Prostate Disease Research, Department of Surgery, Uniform Services University of the Health Sciences, Rockville, MD

The androgen receptor (AR) is a male hormone receptor and a nuclear transcriptional factor that plays an essential role in the differentiation and growth of the prostate gland. The stability of the AR depends on the MDM2-p53 stress response pathway, and the PMEPA1-NEDD4-1 feedback loop, to maintain its overall homeostasis. In the PMEPA1-NEDD4-1 feedback loop, AR transcriptionally activates PMEPA1, which in turn provides a docking platform to recruit NEDD4-1 E3 ubiquitin ligase and to induce the proteasomal-mediated degradation of AR. PMEPA1 is bound to WW domain of the NEDD4-encoded protein, to be
involved in proteasome-mediated degradation. PMEPA1 down-regulates AR and AR transcripational targets, and loss of PMEPA1 results in an elevated AR level in prostate cancer cells. However, the combined mechanism of PMEPA1 and NEDD4-1 degradation of AR is still not clear.

The aim of this project was to detect NEDD4-1 functions in order to understand how PMEPA1 recruits NEDD4-1 to alter Androgen receptor Signaling and AR protein levels in prostate cancer (CaP) cells.

Methods: AR positive prostate cancer cell lines LNCaP and VCaP were treated with synthetic androgen R1881 for 24 hours. The AR, PMEPA1 and NEDD4-1 were knocked down with specific small interfering RNA (siRNA) in LNCaP and VCaP cells. Androgen receptor (wild-type and T877A-point-mutated) were over-expressed in LNCaP cells with adenovirus. Western blot was applied to detect the protein level of AR, PMEPA1, NEDD4-1 as well as AR responsive gene PSA.

Results: NEDD4-1 is androgen responsive in both LNCaP and VCaP cells. The overexpression of wild-type and T877A mutated AR induces the expression of NEDD4-1 in LNCaP cells. And knockdown of AR leads to down-regulation of NEDD4-1 in LNCaP cells. Furthermore, loss of PMEPA1 in LNCaP cells induces expression of NEDD4-1 in an androgen-dependent manner.

Conclusions: NEDD4-1 is androgen-inducible, and the loss of PMEPA1 might lead to the activation of NEDD4-1 through elevated AR signaling, a key event in tumorigenesis of human prostate cancer. Whether PMEPA1 corporates with NEDD4-1 to maintain expression level of AR as well as manipulates prostate cancer cell growth, needs to be further addressed in human prostate cancer samples. [Acknowledgement: This research is supported by the National Cancer Institute grant to Dr. S.Srivastava (Grant No. R01CA106653).]

OA #9
SNP Analysis on Human Cell Line DNA Using Real-Time

LaTisha M. Clark, Claflin University
Jianguo Chen, Claflin University
Mentor: J. Chen / HBCU-UP Summer Internship Program

The objective of this project is to profile the DNA genotype of human cell lines. The genotype can be used to prevent mislabeling of cell lines in the laboratory. Single nucleotide polymorphisms (SNPs) are used to genotype cell line DNA. SNPs are DNA sequence variations that occur in a single nucleotide.

TaqMan probes are used to detect the SNPs. Each SNP is detected by two TaqMan probes from Real-Time PCR reaction. One of the probes is FAM fluorescent dye labeled, and the other one is VIC fluorescent dye labeled. The genotype of the SNP is reported by, fluorescent signal of Real-Time PCR. If one fluorescent signal is detected, the SNP genotype is homozygous. If two fluorescent signals are detected the SNP genotype is heterozygous.

In the experiment, three TaqMan probes were used to genotype five human cell lines. The results show that SNP genotyping is a quick and easy method for profiling genotypes of human cell lines.

OA #10
Role of MicroRNAs in Trail-Induced Death in Hepatocellular Carcinoma Cells

Brandon Crumsey, Fort Valley State University
Nancy Guillen and Douglas A. Lauffenburger, Massachusetts Institute of Technology

MicroRNAs are 20-24 nucleotide RNAs originating from hairpin precursors, that are responsible for mediating post-transcriptional silencing of about 30% of protein coding genes in mammals. They are involved in important cellular functions such as apoptosis, proliferation, differentiation, and cell maintenance. Two microRNAs, miR-122 (a liver-specific microRNA) and miR-192 (found to act as a tumor suppressor in colon cancer), were used to test the effects of their expression levels on cell death and survival behavior. The project goals were to regulate microRNA levels in cancerous liver cell lines and to establish whether there are correlations between microRNA expression and cell response.

We used a sponge treatment in the Huh 7 liver cells to decrease microRNA levels, and a mimic treatment was used to increase its levels or to modify its levels. The liver cells were first plated in Eagle minimum essential media containing fetal bovine serum (FBS) that allows the cells to grow and survive on antibiotics such as penicillin and streptomycin. On the 2nd day, the fresh media was added with no FBS or antibiotics and the liver cells were transfected with either the sponge or mimic treatments. On the third and fourth days, the cytokines IFNγ and TRAIL were introduced to induce cell death in the liver cell lines.

There were five cytokine treatment groups: a no treatment control, IFNγ only, TRAIL only, TRAIL after 24 hours, and IFNγ on day 3 and then TRAIL 24 hours later on day 4. Once the liver cell lines were treated, we waited 24 hours to harvest them on the next day for data analysis. From our results, we tried to discover if there was a relationship between microRNA levels and cell response. For both miR-122 and miR-192, we concluded that the sponges were effective in reducing the availability of the microRNA to bind to target genes. The mimics increased microRNA levels and binded to target genes.

No strong evidence was shown to suggest that there is a causal correlation between increased or decreased miR-192 or miR-122
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OA #11
Exploring the Modulation of L-Aromatic Amino Acid Decarboxylase Expression in the Striatum of MPTP-PD Mouse Model

Warren Dean, V, Tennessee State University

Parkinson’s disease (PD) is a progressive neurodegenerative disorder of muscle movement characterized by tremors, muscular rigidity, bradykinesia, and postural and gait abnormalities. At present, there is no cure for PD, but a variety of medications provide a relief from the symptoms. One of the major therapeutic drugs for PD is L-3, 4- dihydroxy-phenylalanine (L-DOPA). On the contrary, long-term treatment of L-DOPA stimulates side effects such as motor fluctuations, wearing off, on-off phenomenon, and dyskinesias. The cause of these motor side effects of L-DOPA therapy is unknown. Studies performed previously in our lab led to investigation of the metabolic events L-DOPA treatment, including the role of L-DOPA on L-aromatic amino acid decarboxylase (LAAD), the enzyme that catalyzes the formation of DA from L-DOPA.

We propose that the chronic effect of L-DOPA causes cycles of downregulation followed by upregulation of LAAD, the enzyme that catalyzes the formation of dopamine from L-DOPA. To analyze the expression of the enzyme, LAAD, in the striatum and cortex, we used the Western Blot assay.

Our results have shown that chronically treating our MPTP-PD mouse model with L-DOPA led to an early decrease in the expression of LAAD in striatum, but the decrease in the expression of LAAD was followed by an increase 24 hr later. We believe that this feedback or allosteric downregulation in the expression of LAAD in the striatum may help to explain the fluctuation in the actions of L-DOPA. [This work was funded by the National Institutes of Health Institute of Neurological Disorders and Stroke. Grant 5R01NS041674-04.]

OA #13
Effects of Jak3 Inhibition on Follicular T Helper Cell Differentiation

Amber N. Grace, Tuskegee University / National Institutes of Health

CD4+ T helper (Th) cells are crucially involved in immune responses during infections and autoimmune diseases. Th cells become activated though contact with antigen-presenting cells, like dendritic cells. Cytokines present during initial activation of Th cells influence their differentiation into five major subsets: Th1, Th2, Th17, Treg, and follicular Th cells (FTh). The majority of lineage-defining cytokines use type I and type II receptors to mediate their signals into the target cell. These receptors signal through the Janus kinase (Jak) / signal transducers and activators of transcription (STAT) pathway. Jak family members include Jak1, Jak2, Jak3, and Tyk2. While Jak1, Jak2, and Tyk2 are ubiquitously expressed and associate with multiple cytokine receptor chains, Jak3 is only expressed in hematopoietic cells and associates only with the common γc chain receptor. The common γc chain is part of the receptors for the cytokines IL-2, IL-4, IL-7, IL-9, IL-15, and IL-21. The limited expression of Jak3 has made it an ideal target for inhibition in immune disorders. Interestingly, individuals with Jak3 mutations suffer from Severe Combined Immunodeficiency (SCID) but no other organ abnormalities.

We hypothesized that Jak3 inhibition should significantly impair T cell development, as well as proliferation and differentiation of Th cell subsets dependent on γc-associate cytokines IL-2, IL-4, and IL-21. We examined the effects of Jak3 inhibition on follicular helper T cell lineage differentiation. Purified or sorted...
naïve CD4+ T cells were stimulated with anti-CD3 and anti-CD28 mAb in the presence of IL-6, IL-21, IL-6, and IL-21, or with IL-12. After 3 days of culture we studied the expression of the FTH-associated cell surface markers CXCR5, ICOS, PD-1, CD25, CCR6, and CCR5 by flow cytometry. In addition, quantitative PCR was used to test for the expression of ICOS, IL-21, IL-21R, and IFN-γ. We found that while Jak3 inhibition upregulated factors, such as CXCR5, PD-1, and BCL-6, involved in FTH cell migration to lymph node follicles, other factors, such as ICOS and IL-21, were suppressed.

Our data suggests that Jak3 inhibition may compromise FTH cell function. Our data also suggests that Jak3 inhibition may be beneficial in disease settings where FTH cell function is implicated.

**OA #14**
**Mechanism of TNF-α Inhibition of Na⁺-glutamine Cotransport in Enterocytes (IEC-6)**

Ashley Griffin, LeMoyne-Owen College
Brittney Boyd, LeMoyne-Owen College
(Both authors have equal credits for work)

Tumor necrosis factor-alpha (TNF-α) is an important immunoregulatory cytokine involved in the inflammatory responses and is increased more than 200-fold during chronic intestinal inflammation. The most important amino acid in the bloodstream is glutamine. Glutamine is considered to be a key amino acid in rapidly dividing cells since its oxidation provides energy and its carbon and nitrogen provide precursors for several biosynthetic processes. Glutamine is the preferred fuel for the intestinal enterocytes and is also critical for mucosal cell integrity and gut barrier. Intestinal absorption of glutamine is the major source of exogenous glutamine for the increased glutamine metabolism in a catabolic state, such as infection or stress. The effect of TNF-α on Na⁺-dependent glutamine cotransport in enterocytes is unknown.

The purpose of this research is to determine the effect of TNF-α on Na⁺-dependent glutamine cotransport in enterocytes.

Rat intestinal epithelial cells (IEC-6) were grown on 6-well plates and 10-days postconfluent monolayers were used for [3H]-glutamine transport studies. IEC-6 cells were treated with placebo or TNF-α (25 ng/ml) for 24 hours. Na⁺/K⁺-ATPase activity was determined by measuring the inorganic phosphate formation. Since B⁰AT1 is the major Na⁺-glutamine cotransporter in Enterocytes, B⁰AT1 mRNA abundance was quantified by Real-Time PCR using Cells-to-CT kit. Western blotting for B⁰AT1 protein was performed using rat B⁰AT1 antibody using plasma membranes from control and TNF-α treated cells.

Na⁺-dependent glutamine cotransport is present in the IEC-6 cells. TNF-α inhibits Na⁺-dependent glutamine cotransport in IEC-6 cells (1.85±0.08 nmol/mg protein at 2 min in control cells and 0.45±0.006 nmol/mg protein in TNF-α treated cells, p<0.01, n=4). Na⁺/K⁺-ATPase activity was determined because it provides the favorable Na⁺ gradient for the cotransporter and was found not to be altered (control vs TNF-α 19.02±1.77 vs 18.03±1.55 nmol/mg protein, n=6).

Kinetic studies revealed that the mechanism of inhibition of B⁰AT1 by TNF-α was due to a decrease in the affinity of the cotransporter (Kₘ: control vs TNF-α = 3.5 ± 0.3 vs 8.5 ± 1.0 mM, p<0.01, n=3). Real-Time-PCR analyses demonstrated that B⁰AT1 mRNA abundance was unaffected by TNF-α treatment (n=6). Western blot studies revealed that B⁰AT1 protein level on plasma membrane was not altered.

These studies demonstrate that Na⁺-dependent glutamine cotransport is present in the IEC-6 cells and 75% inhibited by TNF-α. This inhibition is not due to an alteration in Na⁺ /K⁺-ATPase activity, but rather due to a decrease in affinity of the glutamine cotransporter. We conclude from these results that extreme stress also inhibits exogenous glutamine absorption. We speculate that TNF-α might regulate Na⁺-glutamine cotransport, B⁰AT1 by second-messenger-mediated signal transduction pathway. [Supported by NSF Grant # HRD-0414931.]

**OA #15**
**Regulation of the Rom2 Gene and its Role in the Signaling Transduction Pathway in Aspergillus Nidulans**

Tyra T. Hayes, Tougaloo College / Rhodes College
Darlene Loprete PhD, Tougaloo College / Rhodes College

The cell wall organelle in fungus defines and protects the shape of fungal cells against osmotic and structural stresses. The cell wall is also important for growth, differentiation, and reproduction. The calc2 mutation in A. nidulans orthologue of protein kinase C (PkcA) results in hypersensitivity to the chinot-binding agent Calcofluor White (CFW). In filamentous fungi, as in yeasts, hypersensitivity to CFW correlates with defects in cell wall integrity.

It has been previously shown that PkcA functions in both polarized growth and maintenance of cell wall integrity, and that it localizes to actively growing hyphal apices and forming septa in A. nidulans. It was discovered that the gene SccA in A. nidulans has the ability to suppress the calc2 mutation in PkcA.

We suspect ScCA is a stress receptor; this suggests that its normal function may be the same pathway in PkcA. From previous experiments in yeast, it is believed that the Rom2 gene is a part of this pathway and is in fact upstream from PkcA. Rom2 is a Guanine Exchange Factor (GEF) for Rho which is a GTPase. Rho-GTPases act as molecular switches cycling between an active (GTP-bound) and inactive (GDP-bound) state. Our purpose is to investigate the possible relationship ship between
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the Rom2 gene and PkcA by attempting to successfully and correctly “knockdown” the Rom2 gene.

In breaking this connection, we hope to understand what happens to the signal as it reaches PkcA. The natural promoter was genetically engineered out and replaced with an AlcA: Promoter using Phusion Pcr so that it can be controlled by switching it on or off and then it was grown on glucose and glycerol. To confirm that the AlcA:Promoter was in front of the Rom2 gene, a PCR was constructed with the correct primers (P1 and P6) on Genomic DNA and the AlcA:Promoter replacement. A southern blot analysis would also confirm that the AlcA:Promoter replacement was in front of Rom2 and not anywhere else.

Our Fusion Piece performed by Phusion Pcr show a 4.6kb weight which was large enough to conduct transformations. The AlcA: Promoter replacement didn’t grow on glucose plates, but grew on glycerol. A Pcr of the insertion read a weight of 5.0 kb and the genomic DNA read a weight of 3.1 kb.

Our results suggest glucose represses the Rom2 gene not allowing it to grow on those plates; this also happens with the PkcA gene under regulatable AlcA: Promoter conditions. An insertion weight of 5.0kb and the Genomic DNA weight read 3.1 kb. This lets us know that the insertion was successful. No Southern Blot Analysis was performed. [This research was funded by the National Science Foundation Grant (NSF) and conducted at Rhodes College located in Memphis, TN.]

OA #17
The Role of PkcA in Septum Formation in Aspergillus nidulans

Jordan Henley, Tougaloo College, MS

PkcA is a major protein within Aspergillus nidulans and is important in formation of the cell wall and septum. The ability to compromise PkcA function in a fungal cell will help to manipulate the growth of fungal cells. In order to accomplish this, the order of events surrounding PkcA use in fungal cells should be determined.

Further understanding of the role of PkcA in cell wall metabolism can also be gained by regulating PkcA expression and determining which domains of PkcA are important for proper localization and function. To this end, we replaced the PkcA promoter with the inducible AlcA promoter and expressed domain deleted PkcA-GFP chimeras. PCR and gel electrophoresis was used to ensure correct insertion of the AlcA promoter and GFP. We successfully tagged PkcA with GFP and accomplished AlcA promoter replacements.

Results presented here were obtained by observing the fungal strains through fluorescence microscopy. We will continue to work in creating expressed-domain-deleted-PkcA-GFP chimeras and to further determine the order of events surrounding PkcA use in fungal cells. [Acknowledgement of Funders: This research was funded by the National Science Foundation (NSF) and the Jackson Heart Study. This research from the Jackson Heart Study is supported by NIH contracts N01-HC-95170, N01-HC-95171, and N01-HC-95172 provided by the National Heart, Lung, and Blood Institute and the National Center for Minority Health and Health Disparities.]

OA #18
Dusky Dolphin (Lagenorhynchus obscurus) Vocalizations: Differences By Group Size and Presence of Other Species

Allison S. Jones, Alabama A&M University
Robin Vaughn, Texas A&M University at Galveston

In this study, dusky dolphin (Lagenorhynchus obscurus) vocalizations were analyzed during feeding bouts. Numbers of vocalizations per 2-min feeding interval were then compared to both dolphin group sizes and numbers of multispecies associates. The following multiple-species associates that most commonly feed with duskies were included: New Zealand fur
seals (Arctocephalus forsteri), spiny dogfish sharks (Squalus acantbias), common thresher sharks (Alopias vulpinus) and gannets (Morus serrator).

Foraging habits of the above predators were described to determine what behaviors affect the natural foraging of the dusky dolphin. Data was collected using video recordings from Admiralty Bay and Current Basin, New Zealand, in the winter of 2005 and the spring of 2006. There, dusky dolphins often herd schools of fish to the surface during feeding bouts, and they exhibit diverse prey-capture behaviors. Variations in numbers of vocalizations per feeding interval likely relate to behavioral variations that in turn may relate to the numbers of dolphins/multispecies associates.

The goal of this work is to develop hypotheses on how dolphin foraging behaviors relate to numbers of vocalizations. Through this study, it has been found that, number of dolphin vocalizations do not statistically relate to the presence of multispecies associates.

Additionally, it has been demonstrated that the behaviors perceived to be true were statistically the opposite. It is also hypothesized that multispecies feeding bouts have a great effect on dusky dolphin feeding and the amount of vocalizations emitted. Rather than the dusky pod decreasing in the presence of the New Zealand fur seal, we conclude that they may stay the same.

One hypothesis that could explain our findings is that fur seal numbers increase due to high activity feeding bouts, and that the dolphin numbers are also greater for these feeding bouts. Another hypothesis is that the dolphins may have gotten full, thus vacated the feeding bout. In this research, it has also been established that the more dolphins that are present, the more vocalizations made; we infer that they are echolocating off of fish for a prey capture attempt or using vocalizations for basic communication among the pod.

This research has provided information on the use of behavior and vocalizations of the dusky dolphin with regard to multispecies associations during recorded feeding bouts. Once we find how these species affect the behavior of the dusky dolphin, further analyses to predict how abnormal ocean disturbances, such as motorboats and technological equipment, can affect the ability of dusky populations to communicate among one another. [This research is supported by NSF Grants OCE 0851860 and HRD 0928904.]

OA #19
Gamma-Tocotrienol Modulates mTor Pathway and Induces Autophagy in MDA-MB 231 Breast Cancer Cells

Habib Kedir, University of the District of Columbia

Francisco R. Saenz, Anh Thu Tran, Simeng Suy, Irina Malyukova, and Deepak Kumar, University of the District of Columbia

Autophagy, an evolutionary-conserved mechanism in all eukaryotes, is employed to engulf and degrade long-lived proteins and defective organelles in response to nutrient deprivation or cellular stressor agents. The initiation stage of autophagy involves the formation of a double membrane vacuole, the autophagosome, which conjugates cytoplasmic proteins, and defective organelles such as mitochondria, endoplasmic reticulum, and ribosomes. Sequestered components are then transported to the lysosome during the maturation stage of autophagy for eventual degradation by lysosomal hydrolases following fusion with the lysosome.

In cancer cells, autophagy has a dual outcome: it is cytoprotective as well, as it leads to cell death depending on physiological conditions. Prolonged autophagy often results in cell death. In mammalian cells, the localization of microtubule-associated protein light chain 3 B (LC3 B), a homolog of yeast Atg8, into autophagosomal membranes has been accounted for as an assertion of the occurrence of autophagic vacuolization.

Here, we demonstrate that γ-Tocotrienol (γT3), primarily found in palm oil, cereal grains, and rice bran, induces apoptosis and autophagic response in the MDA-MB 231 human breast cancer cell line. Exposure of MDA-MB 231 cells to 40 and 80μM of γ-Tocotrienol for 24 hours, accompanied by a subsequent immunoblot analysis, indicates an up-regulation of LC3B II (14kDa), suggesting that γ-Tocotrienol induces autophagy in MDA-MB 231 cancer cells. Beclin-1is a key player protein involved in the induction of autophagy.

We asked if Beclin-1 inhibition will affect γT3 induced autophagy. siRNA knockdown of Beclin-1 successfully inhibited γT3-induced autophagy. We investigated whether mTor plays a role in γT3 induced autophagy. Our preliminary experiments demonstrate that γT3 was able to inhibit the activity of mTor in MDA-MB 231 human breast cancer cells. [Acknowledgments: This study was supported by the UDC Cancer Academy funded by the NCI, HBCU-UP program funded by the NSF and USDA grant from UDC Agricultural Experiment Station.]

OA #20
Isolation and Identification of Microorganisms From a Wastewater Treatment Plant

Thuraieh Khayou, California State University (CSU), Stanislaus Natscia Al Kass, CSU Stanislaus

Every day, millions of gallons of wastewater containing disease-causing microbes are treated and recycled. To prevent diseases or contamination of the environment, it is essential that the wastewater be properly treated. Sanitation treatment plants,
such as the Salida Sanitary District, use Intermittent Cycle Extended Aeration System (ICeAS) to enhance the growth of desirable microorganisms responsible for degrading the organic material in the wastewater. These treatment systems must maintain a balance of microorganisms to maximize the efficiency of digestion. To this end, in January 2010, the Salida Sanitary District modified their system by replacing all ICeAS tank diffusers and creating a permanent aerobic digester.

The intent of this project is to establish microbial parameters that will maximize the efficacy of the Salida Sanitary District treatment system. Determination of these parameters includes identification of the individual microorganisms comprising the microbial populations present at maximum proficiency and at minimum proficiency.

Over the course of two years, water samples were collected and analyzed to determine any changes within the diversity of the microbial population. Water analysis includes performing wet mounts, Gram stains, and endospore stains. The bacterial population was identified through biochemical tests and 16S rDNA sequence analysis.

Prior to modification of the treatment process, there was a high population of Nocardia and Microthrix, and a low population of protozoan. Bacterial isolates identified by microscopy, biochemical tests, and/or 16S rDNA sequence analysis are Citrobacter freundii, Bacillus cereus, B. subtilis, Aeromonas punctata, A. hydrophila, Zoogloea sp., Nocardia sp., Microthrix sp., Enterobacter sp., Pseudoxanthomonas sp., Acidovora sp., and an uncultured bacterium from the class Chloroflexi. After modification, microscopic observations revealed a decrease in the number of Nocardia and Microthrix species, but an increase in the diversity of other bacterial species and protozoan population.

The alterations made by the Salida Sanitary District greatly improved the efficiency of the wastewater treatment by establishing a balanced, diverse microbial population of protozoan and bacteria. Previous studies have determined that the efficiency of wastewater treatment is related not only to the bacterial population but also the protozoan population (Nicola et al., 1997).

OA #21
Exploring the Gene Networks Associated With the Putative: Chemopreventative Plant Kola Acuminata (Bizzy Nut)

Russell Ledet, Southern University
Wesley Gray, Southern University

Kola acuminata, also known as Bizzy Nut or Kola Nut, is a natural product that contains bioactive chemicals that possess hormonal properties. Work from our laboratory has shown that Bizzy may be chemopreventative toward both breast and prostate tumors. Tumor growth is influenced by several factors that result in differential gene expression and function. The gene network that is involved in the development of tumors from specific environmental factors is largely unresolved.

Furthermore, the gene networks associated with Bizzy’s chemopreventative and/or anti-tumor activity, which affect prostate and breast cancer development, has yet to be explored. Given that Bizzy contains putative chemopreventative and anticancer properties, we hypothesized that Bizzy will modulate the expression level of genes that are involved in tumor carcinogenesis pathways.

Therefore, the objective of this study is to generate a Bizzy-specific gene network map by identifying, analyzing, and characterizing Bizzy-responsive genes. As an initial step in accomplishing our objective, we have generated a putative Bizzy gene network with associated biochemical pathways. Regulation of these genes by Bizzy has been studied using PCR and western blot analysis.

We have expanded the gene network by generating a Bizzy-responsive prostate-specific regulatory network using a prostate-specific subtraction cDNA library. The plasmid DNA identity will be confirmed by electrophoresis and PCR. The cDNA library has been arrayed into several 384 gene clusters, and their size, location, DNA sequence, level of expression, and function will be determined. Two Bizzy-responsive cDNA (pDP1.3 and pAR) have been isolated and sequenced and their position in the network determined. Our initial Bizzy network demonstrates a correlation between genes involved in cell proliferation and apoptosis in the presence of Bizzy. The availability of this resource (Bizzy-specific gene map) will allow us to make conclusions concerning the efficacy of Bizzy in prostate cancer prevention.

OA #22
Unidentified Cross-Continental Gram-Positive and Gram-Negative Soil Bacteria Transported by Shoes from South Africa and Madagascar to the United States May Infect Perishable Food

Tiffany Mackey, Shaw University
Letitia Beckett and Mialy Rabe, Shaw University

It is estimated that 5,000 Americans die each year due to food poisoning. The Food and Drug Administration has attributed a great deal of illness to food contamination due to microbial growth in food spoilage. Statistics support the fact that food contamination from soil microbes and microbiota from animals, food handlers, and machinery are the most prevalent cause of illnesses. Foods are the most primitive transporter for transmitting diseases of the digestive system. Yet, many travelers transport soil microbes that can infect foods at home without their knowledge.
This study investigates the contamination of 2 different types of spoilage food ([1] liquid perishable (milk, Coca-Cola), (2) solid semiperishable (apples, hard cheddar cheese]) by 3 Gram-positive (A1, A2, A3) and 3 Gram-negative (B1, B2, B3) Soil bacteria with >100 CFU’s ( colony -forming units), from Madagascar and South Africa. The initial soil bacteria samples were obtained from 5gm soils adhering to 10 rubber shoes worn for 10 days at least 2 hours a day in Madagascar and South Africa in the summer of 2010.

Our research hypothesized that food infected with our Gram-positive and Gram-negative bacteria (experimental group) will have >20% higher CFU’s in both perishable and semiperishable food compared to the noncontaminated food items (control). Both the control group [liquid and solid perishable] and the experimental group were first examined for changes in organoleptic features (color, consistency of mucilaginous surface, and odor) at the beginning of the experiment. Their level of initial bacterial contamination was also determined prior to infection. The number of bacteria CFU’s was measured by transferring a random representative sample of m 10 gm solid food or plating a 1-ml random sample of liquid food into sterile pipette on Luria-Bertani (LB) medium containing 1.5% agar, with stock concentration at around 109 CFU ml1 that were incubated overnight at 37°C. During the experiment, all of the food items (liquid: 500 ml; solid: 100 gm) were respectively placed in a sterile beaker into (131x 12Wx10Hx) separate plastic containers C1, C2 and EXP1, EXP2 at room temperature 23 °C for 7 days. The CFU’s was again determined and the organoleptic assessed at the end of the 7-day experiment span.

The hypothesis was consistent with the result. Bacteria A1, A2, A3 B1, B2, B3 all significantly increased the CFU’s of the food items by >20% after infection. At the end of the experiment, the milk had an average 143 CFU’s, the Coca-Cola had average 95 CFU’s, the cheddar cheese had average 67 CFU’s and the apple average 110 CFU’s. However, the gram positive bacteria A1, A2, A3 infected more the food items by 7% compared to the Gram-negative ones.

For future research, the results presented in this experiment may be of importance for seeing the extent of food spoilage from bacteria in a longer time span (>7-days) for different types of perishable and semiperishable food. Further characterization of the bacterial contaminants would also clarify the potential pathogenic traits of the bacteria. All of the manipulations were performed under sterile conditions. [This study was supported in part, by a grant from NFS/ awarded to the Department of Natural Science and Mathematics at Shaw University; HBCU-UP University, Washington, D.C 20001, Dr.Greenfield’s South Africa Team.]

OA #23
Comparative Growth and Germination Rate Analysis of Transgenic Arabidopsis Plants Overexpressing Two Arsenic Hyperaccumulating Fern P. Vittata ACR3 Genes Which Exhibit Arsenic Tolerance

Uchenna Mbawuie, Syracuse University, Syracuse NY

The fern Pteris vittata, along with other members of the Pteridaceae, are unusual because they tolerate and hyperaccumulate extremely high levels of the toxin arsenic (As). The Arsenical Compound Resistance 3 (ACR3) gene encoding an arsenic transporter protein allows these ferns to sequester arsenic in the vacuole, a cellular storage compartment, thus allowing for arsenic tolerance. ACR3 genes are absent in flowering plants, such as Arabidopsis. In order to understand ACR3 genes whether when expressed in Arabidopsis, allows the Arabidopsis to tolerate As the P.vitatta ACR3 genes were overexpressed in Arabidopsis. The sufficiency of the 2 different transgenic genes, ACR-1 and ACR-3, were evaluated in wild type Arabidopsis by comparing the root growth, shoot weight and germination rate of Arabidopsis in As, containing media.

Higher concentrations of As decreased the growth and germination rate of the plant. The Arabidopsis plants that contained the ACR-3 exhibited the most arsenic tolerance, and the plants that contained ACR-1 exhibited the least arsenic tolerance. These were expected results because previous research has shown that knocking down the expression of ACR3, but not ACR-1, results in an arsenic-sensitive phenotype in P.vitatta, indicating that ACR3 plays a necessary role in arsenic tolerance in the gametophyte.

Our data suggests that ACR-3 and not ACR-1 plays a sufficient role for arsenic tolerance in Arabidopsis. Our data supports the hypothesis that the overexpression of the ACR3 genes into Arabidopsis cause arsenic tolerance and affect the plant growth and germination of this arsenic nonaccumulating plant.

OA #24
Characterization of DNA Adsorption to Solid Surfaces

Sara Nelson-Owens, Norfolk State University / Keck Graduate Institute

DNA purification/extraction is a critical step in nucleic acid testing of infectious diseases. Silica beads are the traditional solid support for DNA adsorption, but zirconia beads are denser and better for mechanical pathogen lysis, which is often required to liberate the pathogen’s genomic DNA. Preliminary experiments have shown that DNA will bind to zirconia surfaces, but it is not well understood what conditions will encourage the DNA to bind faster and in greater quantity.
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A zirconia-based solid phase extraction method has been used to adsorb DNA in the presence of a low pH glycine-containing binding buffer, which avoids the introduction of chaotropic salts that may inhibit downstream nucleic acid amplification. Cartridges filled with zirconia beads and DNA solution in the binding buffer was agitated for sufficient time to enable DNA adsorption to reach equilibrium. The amount of DNA adsorbed to the beads was determined based on quantifying the DNA left in solution using picogreen, an intercalating dye.

Results indicate that DNA binds to zirconia surfaces at low pH and moderately high univalent cation concentrations with the aid of low bivalent cation concentrations. Adding the bivalent cation circumvents the need to add large amounts of univalent cations to achieve optimal DNA binding.

To study the adsorption of DNA to quartz surfaces using these types of buffer systems, preliminary experiments were performed using quartz crystal microbalance. QCM results show that DNA will bind to the surface relatively quickly, although further investigations are required. Preliminary Raman spectroscopy experiments were performed to study the molecular nature of glycine and DNA adsorption to the surface. Although preliminary spectra were obtained, a more sensitive Raman system is required for detecting DNA and other agents at the surface at the appropriate limit of detection. [This project was funded by the National Science Foundation.]

OA #26
Improved Modeling of Ligands on a Symmetry Axis

ShaRhonda Pickett, Langston University, OK

X-ray crystallography is an experimental method that uses X-ray diffraction techniques to allow scientists to determine the structure of molecules, such as proteins, from their crystalline form. Once new models of protein structures are generated, they are stored in the Protein Data Bank (PDB).

However, the researchers at the Lawrence Berkeley National Lab have discovered that 2% of the models in the PDB are able to be moved to a higher-space group, meaning that the published structures have room for improvements. Moving the structures to higher-space groups will improve the models overall by removing duplicate protein chains and making it easier to place them into electron density. The labelit program allowed the movement of structures from lower-to-higher-space groups. Once transferred to the higher space group, four published structures went through refinement processes in Phenix.refine and the results were loaded into Coot, so that the new structures were visible and the rotamer outliers could be manually corrected. After fixing the outliers, the structures underwent further refinements to validate the data.

The results demonstrated that moving to a higher symmetry did not significantly improve the R-factors; however, the model geometry was improved as demonstrated by improved geometry clash scores. [Special acknowledgements to Jeff Head, Ralf Grosse-Kunstleve, Pavel Afonine, Nathaniel Echols, Langston University, National Science Foundation, Center for Science and Engineering Education, the Bioengineering Department of the University of California at Berkeley, Department of Energy.]

OA #25
PhuZ, the First Known Bacteriophage Tubulin

Duy Stephen Pham, University of California, Los Angeles / University of California, San Francisco

Tubulins are cytoskeletal proteins that form nucleotide-dependent filaments in order to perform various integral functions in both eukaryotic and prokaryotic cells, such as DNA segregation and cytokinesis. PhuZ, a bacteriophage homologue of tubulin, was recently identified, making it the first known bacteriophage cytoskeletal protein. PhuZ is encoded on the Pseudomonas chlororaphage 201 2-1, and the cellular function is unknown.

In order to understand the structure and mechanism of PhuZ filaments, we utilized X-ray crystallography, electron microscopy, and polymerization assays. We attempted to crystallize PhuZ-GTPS to visualize PhuZ in a filament conformation, but instead we solved the crystal structure of PhuZ-GDP to 2.35, improving the previous resolution from 2.75 and elucidating binding motifs in the tertiary structure. Through characterization of PhuZ polymerization, we will create a model and compare other tubulin-like proteins to further comprehend the different cellular functions of cytoskeletal proteins.

OA #27
Can Pheromone Traps Prevent Stink Bugs From Moving Into Crops?

Shannon Roberts, Fort Valley State University
Ted Cottrell, SE Fruit and Tree Nut Research Laboratory USDA ARS, Byron, GA
George N. Mbata, Fort Valley State University

The stink bug species is in the Order: Hemiptera and the Pentatomidae Family; this includes the Brown stink bug Euschisis servus (Say). Euschisis servus (Say) has attacked across the southeastern United States and has caused economic injury to many row and orchard crops, such as peaches and vegetables. In general, stink bug species are much harder to control with insecticides compared to pestiferous caterpillars, and among these stink bugs, E. servus is notoriously difficult to control.
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Previous research has shown that populations of adult *E. servus* are highly mobile, reacting to availability of food resources across the landscape. Thus, it was hypothesized that highly attractive pheromone traps could be placed around crop fields as a barrier to preventing adult *E. servus* from entering crops. The first step toward testing this hypothesis was to determine if a hexagonal grid of equidistant traps captured more adult *E. servus* in traps at the edge of the grid (i.e., at the edge of the crop), preventing movement to the center of the grid (i.e., into the crop).

Three hexagonal grids comprised of 37 stink bug traps were set up in three different fields at the USDA, ARS, Southeastern Fruit and Tree Nut Research Laboratory at Byron, GA. Within each grid, traps were spaced 10 meters apart. The stink bug traps, which were yellow pyramidal traps, were baited with a *Euschistus spp.* aggregation pheromone. Every Tuesday and Thursday from August 26, 2010, to October 26, 2010, stink bugs were collected from all traps, and the numbers were recorded, and the pheromone baits were changed weekly (every Tuesday).

Results from this study clearly show that *E. servus* was captured in similar numbers regardless of distance from the grid edge. This indicates that statistically there was no difference in the number of stink bugs caught around the edge than the ones caught in the interior. Therefore, the edge traps did not prevent *E. servus* from moving past traps at the edge of the grid and into the interior of the grid. From these results, our first test of the hypothesis indicates that pheromone traps would not keep *E. servus* out of orchards.

Future research should examine spacing between edge traps, such as placing edge traps closer together, and pheromone dosage in edge traps, such as increasing the dosage in edge traps. Additionally, *E. servus* should be sampled from orchards that do or do not have pheromone traps around them. [Acknowledgments: This study was partially funded by the NSF HBCU-UP program.]

**OA #28**  
Optimization of Agrobacterium-Mediated Genetic Transformation in Valeria (*Valeriana officinalis* L.)

*Katy Sanon, University of Virgin Islands, St. Thomas / Ft. Valley State University*  
*Sarwan Dhir and Seema Dhir, Center for Biotechnology, Fort Valley State University*  
*Amit Dhingra, Horticulture and Landscape Architecture, Washington State University*

Valeria (*Valeriana officinalis* L.) is a hardy, perennial, flowering plant used as an herbal medicine. The roots contain a compound, Valerian, that is used as an excellent remedy for anxiety, nervous tension, and insomnia. Tissue culture and genetic engineering methods have enabled us to develop desirable varieties of many cultivated plant species. Transient gene expression has a wide range of applications in molecular biology.

The goal of this work was to establish an optimal transient expression system using *Agrobacterium* for T-DNA gene delivery into different explants of *Valeriana* from which the whole plantlets can be regenerated. Leaf explants derived from one-month-old seedlings of in-vitro-grown plants of *V. officinalis* were infected by *A. tumefaciens* carrying a binary vector that harbors a *gusA* gene and an *nptII* gene. The infected leaf explants were incubated for three days before they were subjected to *gusA* histochemical assay. The transformability was determined as the percentage of leaf explants expressing the *gusA* gene and as the intensity of *gusA* expression per responsive leaf explant. A variety of parameters such as different acetosyringone concentrations during co-cultivation with *Agrobacterium* suspension, the length of pre-culture period of explants prior to infection, co-cultivation period, different bacterial density (OD) and duration of immersion periods were tested.

The results based on transient *gusA* gene expression of explants suggested that one week old leaf explants inoculated for 60 minutes with 0.4 OD, 150 μm acetosyringone and co-cultivated for 3-4 days in MS medium with 2, 4-D (1.0 mg/l) showed 80-90% transformation efficiency. Therefore, the investigation of factors that influence T-DNA delivery is an important step in genetic transformation of Valeria via *Agrobacterium* method. [This study was supported, in part, by a grant from NSF awarded to Sarwan Dhir PhD, Director for the Center of Biotechnology, HBCU-UP University, Fort Valley, GA.]

**OA #29**  
Activity in trans-Cinnamic Acid, a Putative Bioactive Component of *P. luminescens*

*Jatayah Sheed, Fort Valley State University, GA*  
*David Shapiro-Ilan, USDA-ARS, Byron, GA*  
*Charles L. Cantrell and David Wedge, USDA-ARS, University, MS*  
*George Mbata, Fort Valley State University*

Fungal diseases cause substantial economic damage to crops and ornamental plants. Currently, chemical fungicides are used to control these diseases. However, the chemicals in fungicides are harmful to both humans and the environment. Thus, in an attempt to keep humans and the environment healthy and safe, researchers have turned to naturally derived compounds to effectively control plant diseases.

Previous research has found that *Photobacterium* species of bacteria, which are natural symbiont of entomopathogenic nematodes, produce metabolites that are suppressive to a variety of fungal diseases. The identification of bioactive
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compounds in Photorhabdus luminescens may lead to the development of new environmentally friendly biofungicides. Recently, trans-cinnamic acid (TA) was identified as a significant component of P. luminescens metabolite extract.

We hypothesized that TA is one of the primary components responsible for P. luminescens’ antifungal properties. The antifungal activity of TA was compared with P. luminescens metabolites for suppression of pecan scab, Fusarium ovalbum in rash. Pecan scab is a serious plant pathogen that was previously shown to be highly susceptible to P. luminescens metabolites. Specifically, the following treatments were compared in a zone of inhibition assay: P. luminescens metabolites; and TA at 1x, 10x, and 100x dilutions (relative to the quantity of metabolites); and water and the metabolite’s solvent (acetone) were included as controls. The treatments were applied to the center of potato dextrose agar plates that contained a lawn of pecan scab. Zones of inhibition were determined 6 and 10 days after treatment.

The results indicated that 1x and 10x TA is active against pecan scab at a level similar to P. luminescens. Therefore, we conclude that trans-cinnamic acid is a bioactive constituent of the P. luminescens metabolite extract. Further testing will determine TA’s bioactivity against pecan scab under field conditions. Also, future studies will determine TA’s bioactivity against other fungal diseases. [This study was supported, in part, by an NSF HBCU-UP grant awarded to George Mbata PhD, Head of Biology Department, Fort Valley State University, Fort Valley, GA 31030.]

OA #30

Jerilynn L. St. Cyr, Southern University at New Orleans

Nitrogen (N), in humic substances, serves as a major N reservoir in soil; what role nitrogen plays in supplying the soil as a nutrient to the environment, how and at what rate the humic nitrogen is mineralized, and what role it plays in biogeochemical cycles, is poorly understood. The primary source of nitrogen in the humic substances is decomposition of organic matter broken down by microbes and fungi, ultimately resulting in changes to the chemical form of N present in soil.

This project is designed to establish baseline scientific information on soil N before construction of a solar farm on Long Island Pine Barren (LIPB). The specific objectives of this study are a) to identify N from the humus layer of the A-horizon, and b) to identify the chemical changes that N undergoes in the soil during degradation of organic material.

We used Near-Edge X-Ray Absorption Fine Structure (NEXAFS), a synchrotron-based spectroscopy of specific elements, to obtain electronic and structural information on nitrogen speciation. The total amount of N in the soil samples was quantified by comparing the spectra to a known standard of boron nitride.

Our results indicate an average of 0.35 percent N content in soil samples taken from various sites representative of different Pine Barrens subenvironments, with a range varying from ~0.1 to 1 percent. The initial hypothesis was that the chemical speciation of N in soils would vary among different site locations, due to the fact that vegetation and habitat type varied significantly. However, it was observed that N speciation was nearly identical in all samples. One possible explanation is that the organic form of N in all plant species present is similar; preliminary data supports this hypothesis.

Further research is needed to explore different parameters that will affect nitrogen concentration after and during degradation and to discover the chemical speciation of nitrogen after initial degradation. [This study was supported by NSF (grant # HRD-0928797 and DUE-0806894) and DOE, awarded to Jerilynn St. Cyr’s FaST internship and for facilities.]

OA #31
Screening Transformants With the Bleomycin Resistance Gene in Chlorella Protophotoceides

Whitley Stewart, Fort Valley State University, GA
Shayani Pieris & Donald Danforth, Plant Science Center, MO

A significant increase in the prices of petroleum products and the hazardous effects of global warming has made the use of biofuel necessary. Since the beginning of the Industrial Revolution, the burning of fossil fuels has substantially increased the levels of carbon dioxide in the atmosphere. Biofuel, on the other hand, does not cause pollution and can be absorbed by the environment. Biofuel, such as biodiesel, refers to a vegetable-oil or animal-fat-based diesel fuel consisting of long-chain alkyl (methyl, ethyl, and propyl) esters. Biofuel is one renewable resource that can be made by the use of microalgae.

Microalgae are photosynthetic microorganisms that convert sunlight, water, and carbon dioxide to algal biomass. Microalgae grow extremely rapidly and commonly double their biomass within a 24-hour period. Some microalgae store their lipids in the form of triacylglycerols (TAGs). Chlorella protothecoides is a type of microalgae that can be grown heterotrophically or mixotrophically under different culture conditions. When 7.5 mM of glucose is added to the wild type, there is an increase in cell count and lipid content. C. proto-thecoides has been transformed using the PSL18 plasmid-containing Actin promoter and terminator, as well as the DGAT gene with NPTII as a selective marker.

After the induction of 7.5 mM of glucose, the transformants had an increase in cell count and an even higher increase in lipid production. The phenotype does show evidence that the DGAT gene is working; however, using the RT-PCR does not show that
the DGAT mRNA is present. To confirm the presence of genes, transformants were screened by PCR with the same native Actin promoter and terminator region with the Bleomycin-resistance gene to prove that the Actin promoter and the terminator do work sufficiently. Our results indicate the presence of Bleomycin resistance genes in five independent transformant lines. [This research was supported, in part, by a grant from NSF HBCU-UP (#HRD-0625289) awarded to Dr. Sarwan Dhiri* Ph.D., Director for the Center for Biotechnology, Fort Valley State University, Fort Valley, GA 31030.]

OA #32
Systematics, Phylogeny, and Biodiversity of Wulffia
(Compositae: Heliantheae s.s.)

Tseday Zewdu Tegegn, University of the District of Columbia
Karen Redden, University of the District of Columbia
Vicki Funk, Smithsonian National Museum of Natural History

The hypothesis and importance of the project: Compositae (~25,000 species) is the largest family of flowering plants. Recent efforts have focused on the large-scale, tribal-level phylogenetic studies. However, less attention has been concentrated on understanding the phylogeny and the biodiversity at the generic level.

The main goal of this study is to examine the utility of two plastid genes on phylogenetic reconstruction and generic-level relationships among Wulffia and its most closely related genera. Wulffia baccata was chosen to test the placement of this genus within the tribe Heliantheae and the large family phylogeny. These data are important in understanding the diversity, distributions, and evolution of this genus as well as the family. This study will contribute to the overall understanding of patterns of radiation among the Heliantheae genera and within Compositae.

Wulffia baccata and selected closely related taxa were sequenced for psbA-trnH and rbcL. Extractions were done using Qiagen DNeasy Plant Mini Kit. Polymerase chain reaction (PCR) and cycle sequencing was done with primers and methods optimized for Compositae using standard Big Dye Terminator chemistry and run on an ABI 3130 sequencer. Sequences were aligned using Geneious (version 5.0) and verified by eye. Phylogenetic analysis tree visualizations used PAUP*. A species page for Wulffia baccata was created on the Encyclopedia of Life website, and all information was uploaded to this site.

The plastid markers, rbcL and psbA-trnH, showed good resolution at the generic level and helped with the placement of this genus within the Heliantheae. The distribution of Wulffia baccata includes the Guiana Shield, northern and central Andes, and Brazil. We compare the geographic distribution of this species to the most closely related genera in a phylogenetic context. The two plastid markers were phylogenetically informative at the generic level. With our phylogeny we were able to examine the biogeography of Wulffia baccata and hypothesize possible patterns of radiation of this genus.

Future research will include expanding the study to include more species of Wulffia and other genera within Heliantheae. This would yield a more comprehensive data set that would allow us to answer broad questions addressing radiation patterns within the second-largest family of flowering plants. [Funding for this project came from the STEP program of the National Museum of Natural History.]

OA #33
Post-Pleistocene Range Expansion in Sceloporus occidentalis in the Great Basin

Milinda Thompson, California State University Long Beach
James Archie, California State University Long Beach

Pleistocene and post-Pleistocene geological events and climate fluctuations had dramatic and diverse effects on the distribution of the resident flora and fauna throughout the Great Basin (GB). The available habitat for mesic-adapted species, such as the Western Fence Lizard (Sceloporus occidentalis), would have changed considerably during this period. These species are currently found throughout the GB desert at intermediate elevations in isolated and semi-isolated mountain ranges. Phylogenetic analysis of mtDNA sequence variation has identified four major clades of S. occidentalis in the GB with >5% sequence divergence between them. Low levels of sequence variability within clades suggest post-Pleistocene range expansions throughout the GB.

In this study, we focused on the two clades restricted to the central and eastern part of Nevada. We carried out an analysis of mitochondrial and nuclear microsatellite DNA in S. occidentalis to determine how climatic changes affected its distribution. Based on the patterns of mtDNA differentiation, we predicted i) significant nuclear gene differentiation between clades and ii) a loss of allelic diversity from south to north, reflecting range expansion. Clade membership was determined using clade-specific RFLP patterns of mtDNA fragments, while nuclear gene differentiation was determined using five microsatellite loci. Statistical analysis of microsatellite DNA was conducted using ST, IBD Web Service, and Structure. Geographic overlap of mtDNA clades was found in a single population.

Contrary to our hypothesis, we found a lack of genetic differentiation in microsatellite loci between mtDNA clades consistent with a lack of restricted gene flow (ST values between clades were intermediate to within clade values). We found significant genetic variation within the central clade, but not the eastern clade, as follows: i) isolation by distance and ii) loss of allelic diversity from southern to northern populations. These results support the hypothesis of northward range expansion.
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contrast, the eastern clade shows greater differentiation in both nuclear and mitochondrial DNA, suggesting that its range was not restricted during the Pleistocene.

OA #34
The Role of Non-Muscle Myosin II in Early Cleavage: Development of the Cnidarian Nematostella vectensis

William A. Whalen, Calicornia State University (CSU), Fresno
Craig Magie, PhD, CSU Fresno

Interactions between actin filaments and non-muscle myosin II are required for the formation of contractile machinery within the cell, necessary for the cell divisions and shape changes that drive morphogenesis during early development. In this study, we have chosen to investigate the changing role of non-muscle myosin II during development in the cnidarian Nematostella vectensis. Cnidarians are thought to be the sister taxon to bilaterians; therefore, understanding the molecular mechanisms underlying morphogenesis within this branch promises to provide insight into the evolutionary history of this process.

We have utilized fluorescence microscopy to visualize actin and myosin dynamics during early development in Nematostella. During cleavage, actin is found to be located throughout the cortex of the cell, while new filaments are assembled parallel to the cleavage site. Non-muscle myosin II, which becomes activated via phosphorylation of the regulatory light chain by the Rho-activated kinase ROCK, is localized only to the site of cleavage. Once activated, non-muscle myosin II acts as the molecular motor responsible for providing the force necessary to pull the actin filaments past one another, resulting in the formation of the cleavage furrow, and ultimately the complete separation of the daughter cells.

At the blastula stage of development, we found that the activated myosin II was localized to the basal surface of the ectoderm, giving rise to the slightly wedge-shaped cells that make up the hollow sphere. In the later stage of gastrulation, this pattern continued with the additional localization of myosin II to the apical surface of the developing endoderm, where it is likely involved in the apical constriction of endodermal cells and the initiation of gastrulation via invagination. It may be the case that these sites of localization are needed to retain the spherical shape while combating the mechanical forces applied by cell migration during gastrulation.

In the future, we plan to extend our studies to the molecular mechanisms leading up to its activation and localization during different stages of development. [This study was partially supported by the CSU-LSAMP program funded by NSF under grant #HRD-0802628-515291 and the Science Undergraduate/Graduate Research Experience Program (SUGREP) initiative provided by the College of Science and Mathematics at CSU Fresno, Fresno, CA 93740.]

OA #35
A Test of the Different Effects of Drugs on Gamma-Globin Gene Activation Utilizing Dual Luciferase Assay

Donny Williams, Wiley College, TX / University of Texas at Dallas

The focus of this experiment was to determine the ability of certain drugs (Hemin, Sodium Butyrate, FK228 and SAHA) to activate the gamma-globin gene. This research was done due to the link between fetal gamma globin and the prolonged lives of those with sickle cell disease, with the hypothesis that one or more of these drugs (especially sodium butyrate) would induce gamma globin activity. To do so, two stable cell lines were maintained, and a series of drugs were tested on single cell clones, with two lines (Pools) being held as controls. The dual luciferase assay (firefly and renilla reporter enzymes) method was used to determine gene activation. None of these drugs seemed to induce gamma-globin gene activation. Subsequent tests of the baseline cell activity led to the conclusion that the cell clone 3.4 did not respond to drug treatment as well as Pool 3. [We acknowledge LSAMP and Dr. Juan Gonzales for funding and mentorship.]

OA #36
Automated Selection of Protein Data Bank (PDB) Test Sets

Justin Williams, Langston University, OK / Lawrence Berkeley National Lab

X-ray protein crystallography is an experimental technique used to determine the structure of protein molecules. Data files for these models are stored in the Protein Data Bank (PDB). There are more than 66,000 structures within the PDB and it is continually growing. Researchers who want only a small group of PDB files often have to search for files that meet their desired criteria through the entire databank to assemble a suitable subset.

The purpose of this project was to create a program to expedite the assembly of a small subset of files that meet specified criteria for rapid testing of new methods for crystallographic software suites such as PHENIX. The files in the PDB were put through a series of tests that filter user-specified cutoffs for resolution, number of residues, number of chains, MolProbity Clashscore, Ramachandran outlier percentage, and rotamer outlier percentage.

The files that pass through all filters and can be refined successfully are placed in the subset. The seven sample subsets presented here range from more than 800 files to less than 20. Subset generation is beneficial to researchers because it helps to navigate through the PDB for desired files more quickly and easily. If a programmer wanted to test a new method on the PDB, they could use this program to create a subset of
structures that is both smaller and appropriately focused, allowing for rapid and accurate testing.

OA #37
Growth Rate of Colon Cancer Cells in Sera, Collected During Acute Mental Stress Before and After Moderate and Vigorous Physical Activity

Akilah Witherspoon, Howard University

There has been much speculation about the risk factors associated with colon cancer risk, among which includes lifestyle factors such as stress. However, little is known about the influence of mental stress on colon cancer risk.

The purpose of this study was to determine the effects of acute mental stress on measures of cortisol, insulin-like growth factor binding protein 3 (IGFBP-3), and the growth rate of colon cancer cells in vitro, before and after moderate and vigorous exercise.

Study participants consisted of 18 healthy young adults (n=6 males, n=11 females). For seven consecutive days, 7 subjects exercised at a moderate intensity, 6 subjects exercised at a vigorous intensity, and 5 subjects acted as control. Before and after the intervention of physical activity, the subjects performed a 5-minute mental arithmetic test. Measures of saliva cortisol and serum IGFBP-3 were measured using commercially available ELISA assay kits. The growth rate of colon cancer cells were cultured in serum, before and after conditions of mental stress and exercise.

The vigorous control group showed a significant difference between IGFBP-3 levels before and after exercise, while control and moderate showed little significant difference. Across exercise groups, cortisol levels tended to be lower after 7 days of training; however, the difference was not statistically significant. Results indicate that growth rates of colon cancer cells showed a difference before and after exercise. Conclusion: Findings of the current study suggests that the intensity of exercise may have a supportive role in modulating biomarkers in developing cancer. [This study was approved by the Howard University Human Participant Review Board.]

Chemistry & Chemical Sciences

OA #38
Synthesis and Structure Characterization of Ionic Triphenyltin Complexes With Mercaptoacetic and Mercaptopropionic Acids

Andrei Callejas, University of the District of Columbia
Xueqing Song, University of the District of Columbia
Robert Pike, College of William & Mary, VA

Triorganotins have been well established as having various biological activities. However, their low solubilities in water may have limited their effectiveness. On the other hand, ionic triorganotin complexes may have improved solubilities due to their partially ionic characteristics. The reaction of two thiocarboxylic acid (mercaptoacetic acid and mercaptopropionic acid) with triphenyltin hydroxide in the presence of an amine yields two ionic triphenyltin complexes. The structures of the complexes are characterized by infrared and 1H NMR spectroscopy and confirmed by X-ray crystallography. Both ionic complexes consist of an anionic moiety, and a dialkylammonium as the counterion. The anionic moieties of triphenyltin complex with mercaptoacetic acid has a distorted cis-trigonal bipyramidal (TBP) geometry with two carbon and one-sulfur atoms occupying the equatorial positions and an O atom and phenyl group occupying the axial positions; while triphenyltin complex with mercaptopropionic acid shows a tetrahedral geometry around tin atom. Both crystal structures show that the complexes exist as a dimer formed via an extensive hydrogen-bonding network between the carboxylate groups (OCO) from the thiocarboxylatotriphenylstannate anions and the N atoms from the dialkylammonium cations. The coordination difference may be due to the steric hindrance of mercaptopropionate.

The results indicate ionic triphenyltin complexes can be successfully obtained in a condensation reaction of triphenyltin hydroxide with a diproct mercaptoacrylic acid in the presence of an organic amine. Future studies will be focused on the relationship between aqueous solubility and biological activity. [This study was, in part, supported UDC STEM program, University of the District of Columbia, Washington, DC 20008.]

OA #39
Investigating the Role of Common Variants in KCNQ1 for Affecting Fasting Glucose Levels and Predicting Future Type II Diabetes

Rose Cooper, Langston University, OK
L. Been, J. Worsham, and D. K. Sanghera, University of Oklahoma Health Sciences Center

Recently, two independently conducted genome-wide association studies (GWAS) in Japanese populations have identified KCNQ1 as a novel type 2 diabetes (T2D) susceptibility gene. Here we studied whether common variants in KCNQ1 would influence obesity, fasting glucose, homeostasis model assessment (HOMA) of insulin resistance (HOMA IR), â-cell function (HOMA B), and T2D.

We propose to genotype three candidate single nucleotide polymorphisms (SNPs) (rs 2237892, rs 2237895, and rs 231362) in 3,158 individuals (1,201T2D and 1,021 controls), using Applied Biosystems 7900 genetic analyzer, polymerase chain reaction, and restriction digestion techniques. The preliminary data was analyzed using the SPSS for Windows statistical package (version 15.0).
So far, our results have confirmed the association of KCNQ1 (rs231362) with T2D and fasting glucose in this population. The A-allele of KCNQ1 rs 231362 was associated with a protective effect for increased risk of T2D (OR 0.54 [0.35-0.84], p = 0.006). We are still completing the genotyping and analysis of the remaining SNPs.

Our data revealed significant association of rs231362 with fasting glucose levels, which could increase the risk of insulin resistance and future T2D susceptibility in this cohort.

OA #40
Determination of Binding Site and Docking Energies of CDNF Using Computational Studies

Jasmine Corse, Norfolk State University, VA

Parkinson’s disease affects the motor system as a result of the loss of dopamine-producing brain cells, causing tremors in the limbs, difficulty walking, and impaired balance and coordination. The Conserved Dopamine Neurotrophic Factor (CDNF) is a protein that protects and repairs midbrain dopaminergic neurons in vivo.

Previous studies have shown that CDNF is able to protect and even rescue damaged dopamine neurons, therefore slowing the progression of Parkinson’s disease. Hence, the objective of this study was to examine the mechanics of the CDNF protein and why it is able to slow the progression of Parkinson’s disease.

With the use of the Swiss Pro-Viewer software, homology studies were conducted, indicating the classification of the CDNF protein. With the use of the Sybyl-Tripos Surflex Dock Software, the location of the active site for CDNF was determined as well as the energetics associated with ligand docking. The docking equilibrium constant values for the 10 test ligands docked were as follows: dhbt (6.61x10⁻⁷), Thymidine (2.40x10⁻⁷), Ganciclovir (3.31x10⁻³), Penciclovir (4.27x10⁻⁵), mct (5.62x10⁻⁴), hmtt (5.75x10⁻³), Aciclovir (5.89x10⁻³), ahlu (8.32x10⁻³), idu (8.71x10⁻³), and hpt (8.91x10⁻²). Because the dhbt ligand had the lowest docking equilibrium constant value, it was determined that this ligand was the best test ligand for the CDNF active site. Test ligands were used in order to verify that the active site found for CDNF was correct.

In conclusion, the present study provided evidence that the CDNF protein falls into the Armet1 protein family based on its alignment and target sequence. The active site for CDNF was identified using a protomol and a series of test ligands. Further studies will be conducted in order to determine whether the Brain Derived Neurotrophic Factor (188M) or the Heregulin-Alpha Epidermal Growth Factor (1HAF) is the ligand that works with CDNF to slow the progression of Parkinson’s disease, and docking equilibrium constant (Kd), steric hinderance (P), and enthalpy (ΔH) values will be determined. [I would like to gratefully acknowledge the National Science Foundation for their financial support.]

OA #41
Dietary Modulation of Ascorbic Acid Ameliorates Oxidative Stress in Drosophila Melanogaster

Taylor Hood, Alabama A&M University

Studies of Drosophila melanogaster have led to molecular insights concerning biomolecular mechanisms of biology and disease, including development, differentiation, cancer, and aging. Although Drosophila’s antioxidant enzyme systems are well characterized, much less information is available concerning their nutritional micronutrient antioxidant systems, including ascorbate and urate.

This research project allowed us to test the theory of antioxidant benefits and possible extension on lifespan while exposed to oxidative injury. The antioxidant of choice is Vitamin C, ascorbic acid; a fat-soluble vitamin that requires the presence of fat carriers to be absorbed. Unstable oxygen atoms get accumulated when your body doesn’t have enough antioxidants to neutralize them. These free radicals can be removed by proper intake of antioxidants.

Our test subject is the Drosophila melanogaster, which exhibits a simpler version of the human genetic system and is a cost-efficient test subject with a shorter lifespan that allows us to eliminate multiple variables in our results. The current studies have used the Canton S (wild-type) and oxidant-sensitive ry531 (urate-deficient) Drosophila strains to demonstrate that the ascorbate status of this species can be easily modulated via dietary interventions, resulting in significant biological consequences. Dietary supplementation with ascorbate dramatically increased its level, while chemically-defined diets devoid of ascorbate led to rapid depletion of ascorbate in both strains, suggesting that biosynthetic pathways of Drosophila are limited compared to most vertebrate species, excluding primates. Ascorbate-supplemented Drosophila were relatively resistant to paraquat-mediated acute mortality.

Collectively, the present studies illustrate the potential usefulness for studying the oxidative and non-oxidative functions of ascorbate in an easily manipulated model organism that has made major contributions toward unraveling fundamental questions in biology and disease. [This research has been supported by NSF grant #HRD 0928904.]
OA #42
Inhibiting Proliferation in Prostate Cancer Cells Using Benzimidazole-Based Ligands

Donieil Hoy, Jr., Morehouse College, MD

According to the American Cancer Society, approximately 218,000 men will have suffered from prostate cancer by the end of the year 2010, making prostate cancer the most prevalent cancer found in males. The majority of those males will most likely be African American. With such prevalence, it is becoming of increasing necessity that an agent capable of cancer growth inhibition is presented. Many studies have suggested that the PI3K/Akt signaling pathway has a significant role in the cause of prostate cancer, due to the pathway’s up-regulation in men with prostate cancer.

The specific task of this research is to synthesize a compound that can potentially inhibit the PI3K/Akt pathway, preventing cancer cell proliferation. The synthesis and biological activity will be presented. The synthesis will begin with a electrophilic aromatic substitution using aniline as the nucleophile. This will be followed by a reduction of the nitro group to an amine. Next is an amide formation, followed by condensation to form benzimidazole. Finally, installation of the guanidine unit will be accomplished. [We acknowledge the NIH for funding.]

OA #43
Extraction, Isolation, and Purification of Essential Oils From Tropical Medicinal Plant Leaves and Other Plant Components

Kevin Julye, Shaw University, NC
Christopher Njue, Shaw University

Most herbal remedies used in alternative and complementary medicine are prepared by boiling the natural source in water or a water-based media such as chicken soup. During preparations, aromatic compounds have been detected due to their characteristic smell. Most studies in the lab exploit the use of an organic solvent such as methanol to extract phytochemicals from plants, followed by removal of the solvent via rotary evaporation. In both cases, a great number of volatile phytochemicals are missed.

In this study, we proposed to develop quantitative aqueous-based methods for the extraction of essential oils from plants followed by an isolation and purification procedure, to identify individual components present in the essential oil isolate. Solvent extraction with methanol was used as control. Results that demonstrate the superiority of the quantitative aqueous-based method for the extraction of essential oils from plant sources will be presented.

Future work will involve screening of the essential oils as potential antimicrobial agents and for other pharmacological applications. [This work is supported through the NSF HBCU-Up project at Shaw University.]

OA #44
Comparison of Silver Lewis Acid and Silver Nanoparticle-Promoted 1,3 Dipolar Cycloaddition Reactions in Water

Donnovan Moss, Grambling State University / Jackson State University

Currently, the consensus in organic chemistry is that organic reactions are completed in organic solvents. This is based upon a concept called “like dissolves like.” In other words, the solution must be a homogenous to cause the reaction. Even though this thought process is effective and has been accepted for many years, organic-solvent-mediated reactions can be harmful to humans or the environment. Organic solvents have been reported to cause narcosis, depression, and even death in humans. However, there is a solution to this ghastly problem, water.

Water is the most environmentally benign solvent that can be used as a reaction medium, but there is a drawback. Some chemical reagents, as well as organic compounds, are insoluble in water which could prevent organic-based chemical reactions from occurring. Silver nanoparticles (AgNP) were investigated as promoters of the 1,3-dipolar cycloaddition reaction between organic molecules in water which is used as the solvent.

Exclusively, we have examined the use of AgNP promoters to bring about the formation of nitrile oxides from the analogous alpha chlorobenzaldoximes. These nitrile oxides were then reacted with functionalized alkenes to afford the corresponding isoxazoline compounds in good isolated yields.

We will discuss how the AgNP affects yields of the 1,3-dipolar cycloaddition reaction of our substrates in the “healthy solvent,” water. Environmentally benevolent reactions, of primary interest which are foremost targets to be explored by synthetic organic chemists. The 12 principles of green chemistry act as a format in the structure and advancement of the outcomes and methods to diminish and eradicate the application and production of harmful organic waste substances.

The catalyst, plays a prominent role and helps facilitate in the development of alternative pathways by exchanging organic solvents with “green” solvents like water. Even though water was overlooked as a possible solvent for reactions by the majority of organic chemists, it is rapidly gaining approval as a medium for organic reactions. Chemists are frequently presented with complications using water as a solvent as a result of its restricted solubility with reactants or the “hostile” nature of water toward organic compounds. With water being the most prevalent solvent on the earth, it is economical,
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harmless, and environmentally friendly from the green chemistry point of view. So far, the reported use of silver nanoparticles (AgNP) as promoters for 1,3-dipolar cycloaddition reactions has been scarce.

In this, we report the results from our examination of AgNP’s as promoters for the 1,3-dipolar cycloaddition reaction between chlorobenzaldoximes and an alkenes.

All reactions were carried out in new vials with magnetic stirring. One reagent was purchased from a commercial source and used directly without further purification. The other reagent was made in the laboratory prior to this experiment. Reaction products were purified via flash chromatography using silica gel. Reaction was monitored by thin-layer chromatography (TLC) every two hours to check progress of the reaction. Visualization was accomplished using UV light, staining with KMNO4. Chemical shifts were recorded in ppm using a compound from previous research as a reference. The spectra were recorded in CCl4 as a solvent at room temperature.

Water was found to be a good reaction medium for 1,3-dipolar cycloaddition reactions. Silver nitrate and silver carbonate were effective Lewis acid promoters for the 1,3-dipolar cycloaddition reaction in water. Silver nanoparticles react well with non-halogen-containing alkenes to afford the desired isoxazolines. High yields were achieved with the 1,3-dipolar cycloaddition reaction in water. The Lewis acid promoted 1,3-dipolar cycloaddition reaction in water affords relatively non-toxic by-products. Five of the 12 principles of green chemistry were effectively used. [Acknowledgements: We thank the National Science Foundation NSF-REU program (DMR-0755433) and the National Institutes of Health RCMI program (G12RR13459 (NMR CORE laboratory)).]

OA #46
Near-IR Reflectance Properties of Type 3 Ordinary Chondrites

Adonay Sissay, Southern University / University of Arkansas
D. Ostrowski, K. M. Gietzen, and D. W. G. Sears, University of Arkansas

IR Data from the RELAB database which is funded by NASA, was downloaded for type 3 ordinary chondrites in order to graph the data and then determine the percent of CPX and OPX. Also, eight additional samples were obtained from the Johnson Space Center. After graphing by simply using the eye and a ruler, the percentage was determined by comparing this result to already graphed data by other scientists. The previously published work by the Scientists, has reflectance spectra of enstatite (OPX and CPX) end members and their seven mass fraction mixtures with different particle sizes. After obtaining the percent CPX by using a simple technique, a more sophisticated and accurate method was utilized to obtain the percent of CPX. The Modified Gaussian Model (MGM) software which has the capabilities to intensely analyzing an IR data gives a band strength that will lead to the calculation of percentage.

OA #47
TDDFT Study of Furan and Thiophene-Centered Donor-π-Donor and Donor-π-Acceptor Dye Band Gaps

Marcus L. Stephens, Hampton University, VA
Angelique Kater, Hampton University

Recent research efforts have provided enough evidence to support the fact that the organic semiconductor is a suitable
candidate for opto-electronic, nanotechnological, and non-linear optical research and application. Materials with this type of molecular structure have become a chief competitor with silicon-based materials found in electronic materials of the past and present. These molecules can be produced at a lower cost energywise as well as what they can be placed on flexible, yet durable media and substrates, and the speed at which they can be synthesized is high compared to that of silicon-based materials. This research focuses on the theoretical study of a series of donor-π-donor and donor-π-acceptor aromatic heterocyclic derivatives with vinylene and azo- bridges. The band gaps, a key factor in conductivity, were calculated using ab-initio computational methods. We hypothesize that furan derivatives with azo bridges in the donor-π-acceptor format will produce the smallest band gaps.

The band gaps of a combination of furan and thiophene derivatives with the following general structure were studied: Y= O or S / A=A : N=N, C=C, or C=N

These molecules were optimized using the Becke 3-parameter Lee-Yang Parr (B3LYP) method with a basis set of 6-31G. Time Dependent Density Functional Theory (TDDFT) calculations were performed on each optimized molecule with the same level of theory. The band gap energy, maximum absorption, and oscillator strength of each molecule were extracted from the respective TDDFT calculation.

After review of the data collected, furan centers produce lower band gaps; however, the difference between furan and the thiophene band gaps were negligible. The biggest contributing factors to the differences in band gaps for this study were the donor-π-donor vs. donor-π-acceptor configuration and the presence or absence of azo bridges. The two molecules containing the lowest band gaps were of the donor-π-acceptor configuration and contained at least one azo bridge. The band gaps for these two molecules were 2.0840eV and 2.0975eV.

It is clear from the data collected that for these particular systems, furan centers produce lower band gaps; however, the difference between furan and thiophene band gaps negligible. The biggest contributing factors to the differences in band gaps for this study were the donor-π-donor vs. donor-π-acceptor configurations and the presence or absence of azo bridges. The molecules containing the lowest band gaps were of the donor-π-donor type and contained one azo bridge.

Future research efforts will include more detailed theoretical calculations of the non-linear optical properties of the two molecules that produced the lowest theoretical band gaps, such as the linear, quadratic, and cubic polarizabilities. Synthesis of these molecules is also part of our future agenda. [This work at Hampton University was supported by the National Science Foundation (HRD-0734635, HRD-0630372, and ESI-0426328/002).]

OA #48
Diruthenium Complexes as a Potential Anticancer Agent

Destinee Stroud, Texas Southern University

According to the Centers for Disease Control and Prevention (CDC), cancer is one of the leading causes of death in the United States. Scientists have been involved in extensive research to develop a drug that targets cancer cells. Past anticancer drugs have been unsuccessful during Chemotherapy treatments, because they destroy normal body cells and are insoluble in water.

The purpose of this investigation is to test the hypothesis that the organo-metallic compound, which is water-soluble, is an anticancer drug. The importance of this drug study is to find a chemical complex that can target the cancer cells and cause necrosis (cell death). Overall, this study will benefit patients in the future with various types of cancer because mechanisms involved in the interaction of anticancer drugs and targeted malignant cells involve the same scientific concepts. Research efforts involved in the administering of the drug to MCF-7 (Malignant Caucasian Female) breast cancer cells to determine necrosis (cell death).

The concentration of the drug uptake was determined using the Neutral Red Assay. The detection of the neutral red dye found in the lysosomes of the MCF-7 cells was determined at a specific wavelength using the Bio-TEK plate reader. Absorbance values obtained from the Bio-TEK (model number here) plate reader revealed that concentrations above the 100ul sample size indicated that this organo-metallic drug has the potential of being classified as an anti-cancer drug. Laboratory data results from the screening of the drug at lower concentrations was completed.

The fact that the drug in this study is water soluble and the qualitative and quantitative data obtained from the first screening yielded promising results indicates that necrosis has possibly occurred. The organo-metallic drug in this study containing the diruthenium metal is an ideal candidate with great potential to be classified as an anticancer drug. [This research was supported, in part, by a grant from the National Science Foundation awarded to Dr. Bobby L. Wilson, Director of the Science and Technology Enhancement Program, HBCU-UP, Texas Southern University, Houston, TX 77004.]

OA #49
pH Dependence of Metal Phthalocyanine-Human Serum Albumin Interactions

Lana Thomas, Savannah State University, GA

Photodynamic therapy (PDT) is a relative new technique that is used to kill solid tumors. PDT employs a photosensitizer
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(porphyrin-like dye), which binds to Human Serum Albumin (HSA) and localizes in cancerous tissue. The photosensitizer is then activated by light of appropriate energy. Once activated, it reacts with molecular oxygen within the tissue to produce singlet oxygen. Singlet oxygen is a very aggressive chemical species and will very rapidly react with various cell components and kill the cancerous tissue. Chemical thermodynamics is the study of the relationship of energy changes in chemical and physical changes. We measured the thermodynamic parameters governing the interaction between the photosensitizer and HSA to elucidate the key mechanism of drug localization.

Understanding the driving forces behind the protein–drug interaction will enable us to design photosensitizers that may significantly improve the efficacy of PDT. Our experiment was designed to investigate protein–drug interaction over a physiological range of pHs and ionic strengths. Temperature dependent binding affinities were measured by employing a fluorescence spectrophotometer. The photosensitizer, zinc phthalocyanine (ZnPcS4), was held constant at 3.43M and titrated with various concentrations of HSA between 0 and 6.0 M. For the pH studies, samples were prepared in a 30.0 mM phosphate buffer with the pH ranging from 6.2, 7.0. Fluorescence scans were then recorded over the temperature range of 20° to 50°C in increments of 5°C. Binding affinities were calculated based on a Chipman’s analysis. Temperature-dependent trends were observed for the standard enthalpy and entropy changes.

OA #50
Direct and Competitive Binding Assays on Microfluidic Platforms

Amy Wat, California State University, Los Angeles
Frank A. Gomez, California State University, Los Angeles

A simple microfluidic chip setup was used for heterogeneous receptor–ligand studies. The setup has advantages compared to other analytical techniques due to high sensitivity, selectivity, and portability. While other microfluidic-based setups used micro/nano-beads as a solid support for the binding interaction, this technique uses the wall surfaces of the microchannels as an integral aspect of the binding assay. A direct binding technique between the antibiotic teicoplanin from Actinoplanes teicomyceticus, and a fluorescent ligand, 5-carboxyfluorescein-D-Ala-D-Ala-D-Ala (1), is examined. A competitive binding technique is also used to quaniticate the binding of teicoplanin to a nonfluorescent ligand, Nα,Nε-diacetyl-L-Lys-D-Ala-D-Ala (2).

These studies will provide a novel analytical technique in researching interactions between receptors and ligands in biological systems, which are essential for finding vital information on human diseases, including AIDS/HIV, Alzheimer’s, and cancer.

In a typical binding experiment, 3-aminopropyltriethoxysilane is used to modify the surfaces of a series of channels. Each channel is then exposed to a solution of teicoplanin for a few minutes. The antibiotic is retained after washing through electrostatic interactions, and the series of channels are subsequently exposed to bovine serum albumin to avoid nonspecific binding. The channels are exposed to an increasing concentration of 2 and a constant concentration of 1 followed by a wash to clear out any excess ligand. Extent of fluorescence is quantified using a microscope fitted with a CCD camera.

The data is extracted using ImageJ and analyzed using GraphPad Prism. The binding constants for the interactions of teicoplanin with 2 in the standard binding experiment were determined to be in good agreement with data from other analytical techniques. The ease of quantifying the interaction in this microfluidic-based technique may be powerful for exploring many receptor-ligand pairs.

Since this experiment is a study of a procedure, results are being replicated to ensure the stability and reliability of the technique. Furthermore, chemometric studies are being pursued to optimize the experimental parameters. [The authors acknowledge the financial support for this research by grants from the National Science Foundation (DMR-0351848 and CHE-0515363). Partial support to Amy Wat was provided by the CSU-LSAMP program at CSU, Los Angeles which is supported by the National Science Foundation under Grant No. HRD-0802628 and the CSU Office of the Chancellor.]

OA #51
Mechanistic Interpretation of Conventional Michielis-Menten Parameters

Immanuel Williams, University of Maryland Baltimore County
James Polli and Diana Johnson, University of Maryland School of Pharmacy

Drugs often move throughout the body through carrier or transporter systems. The Michielis-Menten model is frequently employed to interpret drug uptake data (e.g. Vmax, Km). However, these kinetic parameters are generally not interpreted with respect to any underpinning mechanistic transporter model.

The objective of this project is to simulate drug uptake via a mechanistic model of a drug transporter and interpret the results in the context of the Michielis-Menten model. This was done by determining Km and Vmax values for each simulation. The analysis showed that within each model that was used to calculate Km, the rate of binding of the drug to the transporter on the outside of the membrane consistently had a negative effect on Km.

In addition, the rate of dissociation from the transporter on the outside had a positive effect (i.e., affinity to the transporter was
lowered). For the analysis of $V_{\text{max}}$, the rate of translocation of the transporter-substrate complex, the rate of dissociation of the substrate from the transporter on the inside of the membrane, and the rate of transporter configuration change from the inside of the membrane to the outside had a positive effect. [This work was support in part by National Institutes of Health grants DK67530.]

**Computer Sciences & Information Management**

**OA #52**  
Creating Avatars for a Collaborative Virtual Reality Environment Project

Carien Anderson, Mississippi Valley State University  
Professor Andrew Strezloff and Lacey Duckworth, University of Southern Mississippi

This project involves creating a collaborative virtual reality environment (CVRE) that allows ERDC staff to discuss buildings currently under development. Most avatars (a representation of a person in a virtual world) tend to be aimed at games. The US Army Corps of Engineers needs avatars that represent professionals (engineers, architects, military staff, etc.).

While there are numerous avatars for gaming purposes, professional avatars are very hard to find. We created professional avatars by using software called DAZ Studio 3D. DAZ Studio 3D is gaming software used by graphic artists/programmers in creating avatars, landscapes, themes, and, so on, for games. We used DAZ 3D to create professional models by downloading professional clothing and model morphs from the World Wide Web. Overall, there were six avatars created from different models (some from the same model). There was one model created for each gender of a specific ethnicity: Caucasians, African Americans, and Hispanics.

The lab was satisfied with the avatars created and are anticipating the finishing touches of the CVRE, which is being created using Google’s 3D coding. [This project is sponsored by the United States Army Corps of Engineers Research Development Center (ERDC) in Vicksburg, Mississippi and by University of Southern Mississippi: AGEM.]

**OA #53**  
Cross-Platform Visualization Display Derived from a Collaboration of Databases

Brittany Brown, Virginia State University

Can scientific visualization have a social and global impact? The main objective of this research is to present a visual representation of a large amount of data to help awaken the public’s attention about, and broaden people’s knowledge about child abduction and runways; “It does take a village to save a child.”

This research is divided into two key components: a literature review, and visual representation and analysis of a large amount of data. The visual representation displays a large amount of data on three-dimensional graphical views from the past decade categorized by nonfamily abductions, family abductions, runaways, and missing children in the United States. Visual displays are implemented in a Qt Creator and an OpenGL widget to render graphics with the OpenGL API in Qt applications.

The hypothesis was that most children are kidnapped by non-family members. The hypothesis was supported, indicating that the majority of children are kidnapped or abducted by family members, and most runaways or missing children locations are known by family members. The research poses questions of concern to the American family households and Justice System. Through this research, further knowledge was also obtained in the areas of Qt Creator and its features, as well as proficiency in design; user interface; hardware-accelerated; high-performance 3D; and graphic display of data.

**OA #54**  
Role of Honeypots in Information Security

Yves Courtois, Grambling State University, LA  
Loni Taylor and Yenumula B. Reddy, Gramblin State University

Honeypots are traps set up to secure sensitive information and divert unauthorized users to an unknown destination. They mislead the hackers/intruders and provide critical information about security threats to system administrators. Honeypots are a relatively new technology and can be used to collect information on attackers and other network threats. We believe that honeypots are useful tools in digital forensics investigation and Web security. In this paper, we provide a brief overview of honeypots and discuss different types of honeypots, the factors that should be considered when implementing honeypots, detection of unauthorized users, the legal issues involved, and the role of honeypots in intruder detection systems.

We designed a luring model for network security. The proposed luring model helps to divert unauthorized users with fake data combined with real data so that the intruder will be tracked into a honeypot. We designed an algorithm to classify the user and identify the suspected user. Once the intruder tracked into the honeypot, the intruder’s intentions are studied for future security measures. Further, we provide the ethical and legal issues involved in implementing honeypots for network security.

We studied the detection of unauthorized users using the luring characteristic of a context honeypot. We separated the
innocent users from intruders using lure message repository (LMR). The initial analysis has more false detections, but as we increased the LMR, the false alarms were reduced. The simulations show that honeypots with more training help to detect the intruders. The ethical and legal issues are provided, and the implementation of honeypots is the responsibility of the organization.

Conclusions and future research questions: The honeypot model in a network is one security tool and it will accomplish goals if used properly. Honeypots can’t completely solve or eliminate the intruder activities, but they provide valuable information. It will be more beneficial if the tool is used with other security tools.

Further research and practical models are required before implementation on a real-world platform. The ethical and legal issues must be studied on a platform basis. [Acknowledgement of funder(s): The research work was supported by Air Force Research Laboratory/Clarkson Minority Leaders Program through contract No: FAB650-05-D-1912. The authors wish to express appreciation to Dr. Connie Walton, Provost & Vice President for Academic Affairs, Grambling State University, for her continuous support.]

OA #55
The Detrimental Effects of High Cholesterol

Brian McClanahan, Norfolk State University

A proposal that involves using numerical analysis to compute the level of cholesterol in humans is studied by Dr. Ravelle Winbush, a professor from the Department of Mathematics at Norfolk State University.

This research will possibly make the process for diagnosing patients with cardiac ischemia much less invasive by reducing the time and quantity of test patients will have to take. This proposal will create visual effects of high cholesterol, which is a major factor in diagnosing someone with cardiac ischemia, and the lack of oxygenation of the heart.

Blender, free software for 3D modeling and animation, was used to create these effects. An animation, which depicted a clog forming in an artery due to excess cholesterol particles (atherosclerosis) and a heart that beating at a faster rate as the clog forms to illustrate stress, was produced.

In the future, another animation will be made that depicts hemoglobin being blocked by a clog in the artery as it attempts to transport oxygen molecules to the heart.

This research was supported by the National Science Foundation Grant #0714930.]

OA #56
The Simulation and Modeling of Delay/Disruption Tolerant Network Routing Protocols Using Public Transportation Systems

Antonio McMichael, Howard University
Howard Sueing and Shawna Carey, Howard University

A Delay-Tolerant Network (DTN) serves as an outlook on the architecture of a sensor network architecture, which focuses on implementing solutions to the technical bottlenecks present in heterogeneous networks that lack continuous network connectivity. DTN routing protocols are often implemented in the networking spaces of urban sensory data collection in environments lacking contemporary infrastructure.

Prior research has been completed titled “The Opportunistic Routing of the Washington Metropolitan Area Bus System as a wireless Vehicular Node Simulated Network,” which resulted in the development of a robust scalable simulation tool enabling research groups to simulate the opportunistic routing protocol as a distributed wireless sensor network (WSN) using buses from the Washington, D.C., Metropolitan Area Transit Authority (WMATA) as vehicular nodes. This research focuses on the development of a simulation tool that implements numerous DTN routing protocols using the same WMATA data while also increasing its scalability, adding custom protocol-upload XML schema and parametrized simulation-run functionality.

OA #57
Artificial Intelligence and Human-Robotic Interaction Applications Using Humanoid Robotics

Jazmine Miller, Spelman College

Robots are mechanical assistants that have the capacity to have a positive impact on society. Already, robots have helped to improve the levels of safety and scientific advancement in the military, search and rescue, and medical fields. As the applications of robotics continues to be a significant driving force towards the betterment of society in all fields, improved human-robotic interaction (HRI) are required to create more advanced artificial intelligence capable of more efficiently carrying out tasks. Using Aldebaran’s Nao Humanoid’s camera, voice recognition, and movements, this research will present the bound of human robotic interactions in recognizing and reacting to human facial and body movements and their connection with commands.

OA #58
Project Expression: A Cloud Computing & Multimedia-Based Java Course

Joseph Shanahan, Auburn University, AL
The explosion of multimedia-based activities has resulted in a widespread dependence on multimedia-driven information; and studies show that people are consuming three times the information per day compared to the year 1960. For this reason, there is a growing demand for computer science and software engineering curricula that accommodates students who thrive on the multimedia experience.

This study, known as Project Expression, was undertaken during Robo Camp, a K-12 computing outreach camp offered at Auburn University. The curriculum brings together modern trends such as Google cloud computing, Alice 3-D programming, Youtube video creation, content management, audio creation, green screening, and much more. With an emphasis on managing cloud computing environments, an essential skill for modern computer engineers, the course attempts to minimize the often confusing aspects of cloud computing through hands-on experience.

Project Expression gives participants access to a working "cloud" environment right from the beginning. The students’ attention is focused on individual cloud elements; realization of connection points between elements gives birth to a practical conception of cloud computing. Methods of project expression have been tested with several different K-12 camps both on-campus and at local elementary schools. All of the participants are in a controlled lab and are surveyed each session. Pre- and post-surveys are given to the participants in order to determine the effectiveness of the course. In conclusion, Project Expression exists as a valuable example and a learning experience for a multimedia-base course, that draws students into the field of computer science and software engineering.

Future work includes extensive data collection, publication, surveys, and the development of a distributable model for the curriculum. Special acknowledgments to Dr. Daniela Marghitu, head supervisor of Project Expression, and administrator of Auburn University’s Robo Camp; further acknowledgments include Overtoun Jenda, Daniela Marghitu, Gerald Chidume, and the Auburn University AASD STEM department. Special thanks to Randy Pausch and Carnegie Mellon, Tim Bell, and the CSUnplugged.org team. [Funding has been provided by NSF AASD-STEM and AccessComputing, Google, and Auburn University’s Computer Science and Software Engineering Department.] (References [1] Ritchel, Matt. 2010. Hooked on Gadgets, and Paying a Mental Price. In The New York Times.)

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OA #59
Efficient Computer Programming for Ligand Fitting in Crystallography

Yasmeen Shumate, Langston University, OK

X-ray crystallography is known to be one of the most content-rich methods available for providing high-resolution information about biological proteins. Ligand structures and conformation can be determined through high-resolution crystallography. Determining protein and ligand structures through crystallography is essential to the pharmaceutical industry.

Crystallography gives scientists exceptional insight into the mechanics of drug action and helps them refine the structures to improve the chances of finding a more effective drug. Python-based Hierarchical ENVironment for Integrated Xtallography (PHENIX) is a program capable of automatically fitting ligands into an electron density and identifying ligands on the basis of the difference density using the LigandFit wizard.

The goal of this project was to design a program that is more resourceful in finding the correct ligand that best fits the density. An equation for determining the volume of a molecule was determined using the calculated electron density. The volume is used to filter the choice of potential ligands to fit the density blobs. Similarities between ligand geometry were used to guide the search. This program makes the process for fitting ligands less time-consuming, more efficient, and easier overall. [Acknowledgements - Department of Energy's Workforce Development of Teachers and Scientists, Lawrence Berkeley National Laboratory, Center for Science and Engineering Education, National Science Foundation, Louis Stokes Alliance for Minority Participation Program, Langston’s Integrated Network College, and Langston University.]

OA #60
Non-Traditional Strategic Form of a Zero-Sum Game Implemented With Software Defined Radio

Michael Terrell, Grambling State University
Y. B. Reddy (Advisor), Grambling State University

The purpose of this project was to create a zero-sum game with a non-traditional strategic form. The players of the game are wireless nodes competing for an open channel. One player will search the bandwidth sequentially while the other player randomly hops to different channels on the bandwidth. There will be a delay for a player during each round of the game. The decision regarding who receives this delay is made at the beginning of each round.

This game is unique because of its strategy space. The strategy space is based upon which channel the game starts on when the round starts and which channel is open during that round. The actual payoffs are assigned probabilities. The game is represented below in strategic form with the sequential player receiving the delay. These are the expected results after the game is simulated multiple times.

A software simulation was created using Python in order to test to see if the above probabilities were correct. Algorithms were designed for each player so that they assured the sequential player moved through the bandwidth one channel at a time and the random player randomly hopped to different channels one
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at a time until a round was over. In order to simulate a round, the players move through their algorithms simultaneously and the first person to reach the random available channel wins the game.

The results obtained from the software simulation were extremely close to the hypothetical probabilities. Below are the results after 999999999 rounds.

In theory, the game should work for hardware simulation as well. The next step is to use multiple Universal Software Radio Peripherals (USRP) as the players of the game and have another USRP set up the available bandwidth for the game. Then, the GNU (GNU not Unix) radio software will be utilized to allow the USRPs to search the bandwidth either sequentially or randomly. It will also allow the USRPs to transmit and receive at the same time. In the future, the game should allow for more cognition on the behalf of players. The players need to be able to change their rate in response to their changing environment. [Acknowledgment of funder(s): The research work was supported by Air Force Research Laboratory/Clarkson Minority Leaders Program through contract No: FA8650-05-D-1912. The authors wish to express appreciation to Dr. Connie Walton, GSU, for her continuous support.]

OA #61
Developing Integrated Reporting Website to Access Best Practices and Results of a Project

Sunil Tyata, J. F. Drake State Technical College, AL
Dennis Turner, J. F. Drake State Technical College
Praveena Kommidi, (Advisor), J.F. Drake State Technical College

A model website developed to present project status for internal and external evaluators is also one of the best ways to present the practices and outcomes of the project. Any other agency that might want to follow the same strategy can use this model as a platform to present their own projects. The end-of-the-year progress report has a formal, web-based structure that facilitates dissemination of the project’s best practices and outcomes. Information technology students do the website work, which gives them real-world experience. Their work can be readily presented to potential employers. Reproduction of web page displays and web links look great on their resumes and portfolios. This work, which can easily be replicated from class to class, gives students real-world project experience.

Students were given the challenge to develop a website model for displaying the college’s NSF project results. They began by researching other websites with similar objectives. None of those websites provided the full complement of project results and best practices requested of these students. The common things found on all the websites were upcoming events and pictures of project activities. They served more to present extended information, rather than explain best practices and outcomes data that could be analyzed by other researchers. The students’ completely developed website will serve as a project report presentable to the funder as well as to be used to develop other funding proposals.

Students understand the advantages of working on a real-time project. They will appreciate the planning process better than will be achieved through lectures and reading. This project works well as a fuel to fire the student’s imagination. The web site will be updated with annual results and any new practices that have been developed. The projects and their presentations will be posted online.

In the future, a website will be developed for the Information Technology Department using this same model. It will serve as a showcase for incoming students, informing them of what to expect. This will also provide current students with additional projects to work on. [This activity was funded in part by a Historically Black Colleges and Universities Undergraduate Programs (HBCU-UP) grant Project #0625155. Dr. John Reutter is the Principal Investigator and Mr. Karl W. Henry is a Co-Investigator.]

OA #62
Producing Publications in Accessible PDFs

Daman Wandke, Western Washington University

People with vision and learning disabilities create, publish, and read PDF documents and require them to be accessible. This means that PDF documents are tagged and in the correct reading order so that screen readers, software applications that read documents aloud can interpret the documents accurately. Reports are generated at the U.S. Department of Agriculture using Adobe PageMaker, which was discontinued in 2004. This research was undertaken to find replacement software that is not only cost-effective and time-efficient but also produces the same quality publications as Adobe PageMaker and makes accessible PDFs.

We hypothesize that Microsoft Publisher with a software add-in will fulfill the criteria. Publisher was selected because it is available with the Microsoft Office Suite and is relatively ubiquitous. Two software add-ins that can convert documents to PDF using Publisher were evaluated: Adobe Acrobat Pro and Microsoft Office PDF add-in. Adobe PageMaker has great layout features, but many of the accessibility features had to be added in manually. Various formatting changes were implemented in Publisher, such as textboxes and tables.

The conversion of these various formats and styles in the final PDFs were evaluated with both software add-ins. The Adobe
add-in could not produce a tagged PDF in the correct reading order from Microsoft Publisher. The free add-in from Microsoft created a better PDF than the Adobe add-in and the PDF could be modified be accessible. Also, the order in which the objects were created in Publisher, and not the location of the objects on the page, was an important variable in the conversion.

Templates were created in Publisher to mirror the USDA reports generated with PageMaker. The USDA and other organizations that are using the now defunct PageMaker should consider switching to Microsoft Publisher with the free Office add-in to fulfill their accessible-document-creation needs.

Future research will evaluate the usability of newer software, Publisher 2010 and Acrobat Professional 10, to create accessible PDFs. [This research was supported by USDA Agricultural Marketing Service.]

ECOLOGY, ENVIRONMENTAL & EARTH SCIENCES

OA #63
Male Genetic Background Influences Female Lifespan and Offspring Production in Red Flour Beetles

Kenya Adams, Spelman College, GA

Populations may vary in their mating behavior traits because of sexual selection, natural selection, or genetic drift, or a combination of the three. We examined the mating behavior and its fitness consequences in three insecticide-resistant populations of the red flour beetle Tribolium castaneum. Studying the behaviors of the insecticide-resistant strains may uncover alternate control methods for the insect. The beetle strains used in this study have some form of resistance to the insecticides malathion (M), pyrethrin (P), or lindane (L) respectively.

In a previous study, we predicted that female mate choice would be adaptive, and therefore females would prefer same-strain males with the resistance to pesticide found in their environment, when given a choice between same-strain and different-strain males. We found no evidence that females preferred same strain males. Further, the genetic background of males and females influenced various aspects of mating behaviors. In the L strain, we found particularly interesting results. The L females avoided the L males frequently in both the mating behavior assay as well as the pheromone assay.

In this study, we predicted that the male ejaculate may have some adverse effect on the female lifespan, which might explain female avoidance of these males. To test this, we monitored the lifespan of the male and female beetles, in all possible mating pair combinations of male and female genetic backgrounds (M, L, and P), noting how many of the beetles died on a weekly basis. We also monitored the offspring count from each pair for a month. This revealed that females that were paired with the L males had a shorter lifespan than the females that were paired with the other males, but they produced the highest number of offspring.

From this, we inferred that there might be a co-evolutionary conflict between the sexes in this particular strain of red flour beetle. We are currently interested in learning more about the mechanism in the male L ejaculate and the inheritability of double pesticide resistance among the three resistant strains.

OA #64
Ionic Liquid Inhibition of Enzymatic Hydrolysis in Microcellulose

Justina Bradley, Langston University, OK
Danielle Nichols and Gilbert John, Oklahoma State University
A. J. Francis and Ashutosh Gupta, Brookhaven National Laboratory, NY

Lignocellulose is a rigid, complex sugar composed of monosaccharide chains linked by β-1, 4 bonds and is a major component of trees, plants, and paper. The degradation of pretreated lignocellulose occurs via enzymatic hydrolysis, resulting in the production of single glucose molecules. Bacterial fermentation of these glucose molecules can be directed toward producing a large amount of ethanol, which serves as an alternative biofuel source to nonrenewable resources (i.e., petroleum).

Currently, the combined pretreatment, hydrolysis, and fermentation processes that are used to produce ethanol are time-consuming and costly. Thus, alternative methods are being investigated. One such method involves pretreating various lignocellulose materials (e.g., paper, grass, etc.) with ionic liquids (ILs), giving an amorphous, less-rigid quality that allows hydrolytic enzymes more access to binding sites. However, some ILs cause a reduction in glucose yield, which is likely due to enzyme inhibition.

This study investigated the effects of three different ILs on two different enzymes in the presence of pretreated microcrystalline cellulose (MCC). The goal of this study was to analyze a combination of different parameters in order to discover the most efficient way to combine the use of IL pretreatment and enzyme hydrolysis into one reaction.

The Dinitrosalicylic (DNS) method was used to analyze the glucose yield for the test samples. The enzymes cellulase and β-glucosidase, and the ILs 1-ethyl-3-methylimidazolium (EMIM-acetate) and 1-ethyl-3-methylimidazolium phosphate (EMIM-phosphate) were used. The reaction mixture was incubated at
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50°C and spectrophotometer readings were taken at time zero, one, four, and twenty-four hours. The IL concentrations tested ranged from 1-40%. Glucose yields for the higher concentrations of IL yielded 5% recovery of the original mass of sample, while lower concentrations of ILs yielded up to 76%.

These results suggest that more glucose is produced when the solution has a low concentration of IL. Therefore, we can assume that cellulose can be hydrolyzed in the presence of small amounts of IL. Further testing would involve the combination of enzymatic hydrolysis in the presence of IL and fermentation. The results of the study support the potential for combining the pretreatment, hydrolysis, and fermentation processes, which would improve the efficiency of biofuel synthesis.

OA #65
Development of Potential Anti-Cancer Agents Targeting Human Estrogen Receptor

Maurice Crawford, Tougaloo College, MS
Bethany Rankin and Dr. Rajnarayanan (no affiliation provided)

There are two types of intracellular estrogen receptors, estrogen receptor alpha (ER α) and estrogen receptor beta (ER β), that belong to the nuclear hormone family and exist in two different conformations, known as, the agonist conformation and the antagonist conformation. Estrogen receptor α (ER α) is found in breast cancer cells, ovarian stroma cells, and the hypothalamus while estrogen receptor β (ER β) is found in prostate and endothelial cells.

Though the estrogen receptor exists in two different conformations, only ER α has proven to be overexpressed in 70% of known breast cancer cases. However, it is believed that this receptor only contributes to breast cancer when it is in the agonist conformation. The conformation adopted by the receptor depends solely on the ability of a portion of the receptor, known as helix twelve, to block co-activator binding. Because ER α is inactive in the antagonist conformation, the purpose of this experiment is to create a set of ligands that force helix twelve into a position that discourages the binding of the co-activator. A ligand that successfully converts ER α into the antagonist conformation could suppress the cancerous effects of the receptor.

In order to create such a ligand, a screening library composed of several ligands was created using a variety of structurally assisted drug design methods. After creation, each ligand’s binding behavior was assessed digitally, using esterdiol as a standard, and their relative binding affinities were recorded. Of the 10 ligands created, 4 proved to have a binding affinity that exceeded that of esterdiol. The four ligands proved to be better suited for binding due to their extensive usage of the histidine (HIS524) and glutamic acid (GLU354) residue, as well as the hydrophobic interactions.

In the future, GCMS and fluorescence polarization will be used as a means of verifying both the chemical composition and the binding affinities of the compounds created. [Funding Provided by: The Jackson Heart Study Undergraduate Training Program.]

OA #66
Assessment of Environmental Estrogens in the Galveston Bay Watershed

Zuri Dale, Texas Southern University

Given the number of pharmaceuticals, steroids, and other organic compounds that make their way into wastewater, there is great concern about how well wastewater treatment plants effluent that is returned to the ecosystem. Thus, the primary goal of this study was to investigate the potential presences of environmental estrogens (EEs) in the lower Galveston Bay Watershed.

The research objectives were to assess the concentration of EEs in the lower Galveston Bay Watershed, specifically San Jacinto River System and the Trinity River System, and to investigate the EE contribution of three wastewater treatment plants (WTPs) with outflow dumping into Buffalo Bayou. This water-quality assessment discovered estrone, ethinyl estradiol, and estriol throughout the Lower Galveston Bay Watershed in concentrations that poses a significant ecological concern to Galveston Bay ecosystems.

The second research objective was to assess the potential impact of the EEs discovered in the watershed through cellular viability studies of the Poeciliopsis lucida hepatocellular carcinoma cell line and the Rainbow trout gonadal cell lines (PLHC-1 and RTG-2 respectively). The viability study showed increased cellular viability for both cell lines exposed to EE concentrations similar to concentrations found in the watershed.

Thus, it was concluded that these potentially harmful compounds in the watershed could adversely affect the environmental health of the Galveston Bay ecosystem. Furthermore, the high levels of ethinyl estradiol and estrone in Lake Houston is of great concern, because Lake Houston is the source of 75% of drinking water for the city of Houston. [This research was supported, in part, by a grant from the National Science Foundation awarded to Dr. Bobby L. Wilson, Director of the Science and Technology Enhancement Program, HBCU-UP, Texas Southern University, Houston, TX 77004.]
OA #67
Beyond Folivory: Three Types of Interactions Between Plants and Insects in the Pine Barrens Community of Long Island, New York
Dorcas Falodun, Southern University at New Orleans
Murty S. Kambhampati, Southern University at New Orleans
Richard Wilkens, Dowling College, Oakdale, NY
Timothy Green, Brookhaven National Laboratory, Upton, NY

In our research, we have focused on three types of plant-insect interactions that have received less attention than folivory: the secondary community of abandoned galls, the galls, and the Allegheny mound ants. Galls are formed in response to eggs laid on scrub oak trees by Cynipid wasps. In the secondary community of abandoned galls, the wasps emerge through an exit hole; the galls then become a refuge for the community of ants and spiders.

In addition to these two plant and insect interactions, we are examining the relationship of Allegheny mound ants with plants. Ants aggressively keep their mounds free of plants to maintain a high temperature for the development of their eggs. Abandoned galls, fresh galls, and oak leaves were collected twice a week from the field. We dissected them under the microscope at 40X. The fresh galls and leaves were taken to the X27A beam line at the National Synchrotron Light Source (NSLS) to analyze their elemental concentrations.

The results showed a high concentration of Mn in both leaf and gall. The mortality study of Petunias was 100% when plants were planted on the ant mounds and death zone. However, we have observed healthy plants (bearberry - Vaccinium macrocarpon and Pennsylvania sedge - Carex pensylvanica) living on the mound. We are interested in this marked pattern of ant-induced plant death and why bearberry and Pennsylvania sedge seem to escape the attack.

In conclusion, the plants and insect interact in the following ways: scrub oak tree has excess Mn from the soil which might be attracting the wasp to lay its egg on the tree to form a gall. Wasps emerge and other insects of the secondary community live in the abandoned gall. Allegheny ant kills the Scrub oak tree in the process of building its mound and feeds on the wasp that lives in the gall. [This study was supported by NSF (grant # HRD-0928797 and DUE-0806894) and DOE awarded to Dorcas Falodun’s SULI internship and for facilities.]

OA #68
The Role of the Genes hsfA1a/1b

Shakeela Jackson, Fort Valley State University, GA
Bala Rathinasabapathi, University of Florida Gainesville

The objective of this study is to find the functions of heat shock factors hsfA1a and hsfA1b in the model plant Arabidopsis thaliana are important for the induction of heat shock protein under high temperature stress. To test whether these genes will have roles in oxidative stress induced by other factors, we evaluated stress tolerance of a mutant that was defective for both hsfA1a and hsfA1b. Sterile seedlings of the mutant hsfA1a/1b plants and its corresponding wild-type (wassi) were grown on vertical agar plates containing Hoagland nutrient medium.

Previous work showed that genes hsfA1a and hsfA1b are heat shock factor genes, if any one of the two are mutated the plant is normal, but if both are mutated in the same plant the mutant shows poor tolerance to heat shock. We created stress by toxic substances such as sodium arsenite (25um), Cadmium chloride (25um, 50um), sodium nitróprusside (SNP, 50um, 100um), and water stress with PEG. The PEG infused plates ranging from 0% to 40% did not seem to affect one or more that the other, but at 10% PEG was where the biggest difference occurred out of the five treatments. Around 30% and 40% PEG the slope of inhibition curve was the same for both wassi and hsfA1a/1b.

The results from using Arsenic, Cd, and SNP: the root growth from arsenic infused plates of 25um was able to withstand the toxicity of arsenic better that hsf, though both were inhibited a great deal comparing to the control. With Cd hsf did a better job at handling the stress than wassi, had an extreme growth rate over wassi at 25um, but at 50um was just too much for either of them to handle. SNP inhibited both the two genotypes at 50um but wassi was inhibited slightly less. At 100um there was little no growth from either of them.

Based on these results, we concluded that the genes that are missing from the mutant are important and needed in helping withstand heat shock and arsenite stress conditions but not stress by Cd, SNP and PEG. Total RNA was extracted from the plants treated in arsenite and control media, but the findings form the basis for further investigation. [This research was supported, in part, by a grant from NSF HBCU-UP (#HRD-0625289) awarded to Sarwan Dhir, PhD, Director for the Center for Biotechnology, Fort Valley State University, Fort Valley, GA 31030.]

OA #69
Plant Regeneration From Explants and Efficient Agrobacterium Tumefaciens-Mediated Transformation of Alfalfa

Keeona Lawrence, Fort Valley State University, GA
Seema Dhir, Fort Valley State University

Medicago sativa L., Alfalfa is a flowering legume of the pea family Fabaceae. It has been grown throughout various regions in South Africa, Australia and the United Kingdom. For centuries alfalfa has served as forage for cattle and as medicine to heal digestive tract disorders and arthritis. Among other constituents, alfalfa has shown to increase milk while lowering manure productions in cattle.
The goal of this study is to transform alfalfa leaf explants using Agrobacterium-tumefaciens. It was projected that by doing so, eventually an entire transformed alfalfa plant could regenerate via somatic embryogenesis. For this purpose, some important parameters, such as sensitivity of explants to kanamycin, age of explants, types of explants, co-cultivation time, Acetosyringone and optical density of agrobacterium culture medium were studied. Agrobacterium strain containing neomycin phosphotransferase (NPTII) gene as selectable marker and β-glucuronidase (GUS) as a reporter gene was used for transformation.

Results were tabulated on the basis of the percentage of GUS expression. Kanamycin at a concentration of 50-150mg/l was used to select transformed cells. Transient and stable GUS expressions were studied in transformed explants and regenerated calli respectively. Using the 0.2 O.D. level as a reference, we were able to standardize the system for the Acetosyringone elution gradients (0mM, 50mM, 100mM, 150mM, 200mM, 300mM). Acetosyringone concentrations were employed on the Alfalfa leaf explants. Highest transient GUS (70%) expression was observed at pH 5.8 after 3 days of co-culturing in 2-days-old explants. Optical density of 0.2 was considered optimal to obtain the highest transformation rate. Agrobacterium culture containing both kanamycin and ampicillin had dramatic effect on transformation efficiency. We found that acetosyringone at 200mM (for GUS expression) and 150mM (for GFP expression) yielded the highest transformation. Future plans will be focused on regenerating the transformed leaf explants. [This research was supported, in part, by a grant from the National Science Foundation (NSF Grant DBI 1004764) awarded to Sarwan Dhir, PhD, Director for the Center for Biotechnology, Fort Valley State University, Fort Valley, GA 31030.]

OA #70
Isolation of Microorganisms From the Pine Barren Soil

Herman Mackey, Jr., Southern University at New Orleans
Murty S. Kambhampati, Southern University at New Orleans
Vishal Shah and Shareya Shah, Dowling College, NY
Tim Green, Brookhaven National Laboratory, NY

There are no studies in the literature describing the microbial flora in the Long Island Pine Barrens (LIPB), which play a central role in balancing its ecosystem. Since the soil of LIPB is normally acidic, sandy, and poor in nutrients, we hypothesized that the microbial flora in the Pine Barren soil has to be widely different from that reported in, for example, agricultural soil.

In this research, we aimed to isolate microorganisms from the soil of Pine Barrens so that we may learn how they impact the vegetation and influence this environment. After collecting soil from the Pine Barren Forest, we thoroughly cleaned the soil by removing root hairs, stones, and other debris. We then cultured the microorganisms using different media. The broth dilution-plating method was used before incubating the plates to obtain pure cultures. The Biolog Ecoplates™, which contain 31 carbon sources, gave us a metabolic footprint based on characteristic reaction patterns.

Thus far, we have isolated 206 cultures from these soil samples by using serial dilutions. The microbial community analysis confirmed the growth of these isolated colonies with the help of Biolog Ecoplates™. The changes observed in the fingerprint patterns have provided us with comparable baseline data that can be used to understand the microbial community changes over time.

Further studies are now in progress to understand how these microorganisms behave collectively in nature by taking the community-level profile and assessing their pattern development, the rate of color change, and the diversity of the abundant species.

In conclusion, later studies will be able to use these baseline observations to track the stability or changes of the LIPB’s microbial community over time. [Work was supported by NSF (grant # HRD-0928797 and DUE-0806894) and DOE for the use of their facilities and accommodations for our team at Brookhaven National Laboratory (BNL). We also thank Noel Blackburn (FaST Program Manager), Jennifer Higbie (GIS), Kathy Gurski (BNL-OEP). Help of Robert Colichio in radiation experiments is also acknowledged. I would like to thank Murty S. Kambhampati and Joe Omojola, Southern University at New Orleans.]

OA #71
Understory Vegetation Analysis in the Proposed Long Island Solar Farm of Pine Barrens Forest, NY

Natasha Robateau, Southern University at New Orleans, LA
Marty Kambhampati, Southern University at New Orleans
Tim Green, Brookhaven National Laboratory, Upton, NY

The conservation of renewable energy is a critical demand for the protection of the environment. In order to encourage energy efficiency through innovation of technologies, British Petroleum has proposed the installation of a solar farm on 200 acres of the Long Island Pine Barrens Forest (LIPBF).

We conducted baseline observations of the pH and distribution of vegetation species within the area. A total of 12 transects of 25m each consisting of 6 quadrats (m²), were laid through the vegetation. In addition, 5 controls were laid in the outer area of the proposed solar farm. The vegetation distribution was identified by taking a tally of each individual species within each plot of a quadrat according to its genus and species. The heights
of the species were also measured. The pH was measured by immersing an electrode pH meter into the soil of the fourth plot of each quadrat. The variations in pH range from 3.2 to 5.9. The areas with a higher acidity of 3.2 to 4.8, composed of sandy soil common for the Pine Barrens Forest, were populated with more vegetation. Moreover, the areas with a lower acidity of 5 to 5.9 were covered with a moist, marshy type of soil populated with minimal vegetation.

Based on the relationship between diversity in soil and vegetation, we have reason to believe that vegetation is driven by acidic soil. Among all sites and dominant species of vegetation in Long Island Solar Farm (LISF) sites, low bush blueberry (LB) and high bush blueberry (HBB) showed the highest and lowest IVI (125.00±50.90 and 70.88±20.95, respectively). Shannon Weiner Index (H) values on plant community diversity ranged from -0.1976 in C1 to -2.0849 in T12 of S14. In conclusion, the pH and the vegetation distribution and diversity gives us the necessary baseline information needed to compare with what may return to the LIPF in the future, after the installation of the solar farm. [This work was supported by NSF (grant # HRD-0928797 and DUE-0806894) for financial support and DOE/BNL for facilities.]

OA #72
Baseline Survey on Biomass Distribution in the Long Island Solar Farm

Dominique Townsend, Southern University at New Orleans
Murty S. Kambhampati, Southern University at New Orleans
Timothy Green, Brookhaven National Laboratory, NY

As electricity and natural gas consumption continues to increase on Long Island, renewable energy sources will play an important role in Long Island’s energy future. To make an efficient and substantial impact on Long Island’s energy crisis, a large-scale commercial solar photovoltaic array of 32 MW will be constructed on approximately 200 acres at Brookhaven National Laboratory (BNL). Because no other utility grade solar installation has been monitored for its environmental impact, and specifically on vegetation biomass, this research has established baseline scientific data for future studies of assessment on the impacts associated with construction and operation of the Long Island Solar Farm (LISF). Plant biomass, plant diversity, chlorophyll concentrations, and other measures were compared after careful quantitative examination within seven major vegetation types.

The seven study sites were selected to represent the variation of plants in the 200-acre proposed solar farm area. Twenty-five meter line-transects and 1m 2 quadrats were used to measure the estimated plant population and percent ground cover. Ground vegetation samples were clipped and brought to the lab for biomass weighing and chlorophyll analysis. Among all sites, S19 has maximum % dry weight (85.5%; 42.75%C). Bracken fern showed highest values of chlorophyll, and black cherry has larger stomata compared to other species. The understory vegetation biomass throughout the LISF area is dominated by Gaylussacia baccata, Vaccinium pallidum, V. corymbosum, and V. angustifolium. [This study was supported by NSF (grant # HRD-0928797 and DUE-0806894) and DOE awarded to Dominique Townsend’s SULI internship and for facilities.]

OA #73
The Analysis and Monitoring of Groundwater in Effort to Maintain a Healthy Environment

Yakia Voltz, Claflin University, SC

Scientifically, groundwater is the water that is found below the ground. Groundwater is produced by normal precipitation due to rain, sleet, and snow. Groundwater is considered to be clean for the most part. However, groundwater is becoming polluted due to other known environmental aspects. Some of these aspects include underground tanks that may store gasoline, pesticides and fertilizers, leaky landfills, etc.

These potential pollutants seep through the soil and contaminate the underground water. It is important to monitor this water because it can potentially cause pollution to the environment and harm the people that drink this water.

The hypothesis of this project is that the water found at the site does contain some contamination due to the high level of potential pollutants utilized on site. There are currently groundwater monitoring wells onsite, that sample the water periodically. For the research, the wells were located and an analysis report was located to find out about each of the wells and the water in the particular area. All of the information was recorded in a database for future reference.

The project resulted in finding some contamination of the groundwater in the S-area of the site. Future research includes developing a better technique of retrieving the information for the groundwater on-site. There were no huge problems associated with the groundwater, but it is important to maintain these levels or eliminate the pollutants completely. Are there any methods of technologically retrieving the information? Is there a system that can be developed in which the information can be sent to a central system periodically? [This research was funded by the NNSA Pipeline program at Allen University and Claflin University. It was also funded by the Savannah River Site, Aiken, SC.]
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MATHEMATICS & STATISTICS

OA #74
Triunitary Perfect Numbers

Leonardo José Bardomero, University of the Virgin Islands
Dr. Douglas Iannucci, University of the Virgin Islands

Given positive integers \( n \) and \( d \), we say that \( d \) is a unitary divisor of \( n \) if \( d \) divides \( n \) but the greatest common divisor of \( d \) and \( n/d \) is 1. On the other hand, we say that \( d \) is a biunitary divisor of \( n \) if \( d \) divides \( n \) and the greatest common divisor of \( d \) and \( n/d \) is 1. We may extend this inductively: we say \( d \) is a k-ary divisor of \( n \), if \( d \) divides \( n \), and the greatest common \((k-1)\)-ary divisor of \( n \) and \( n/d \) is 1. We refer to 3-ary divisors as triunitary divisors, and to 4-ary divisors as tetraunitary divisors, and so on.

Now we say that \( n \) is k-ary perfect if the sum of the k-ary divisors of \( n \) equals 2n. In this talk, we will show why there is no odd triunitary perfect number and why the only triunitary perfect numbers are 6, 60, and 90.

OA #75
Winning Strategy for Chomp Grid with 0, 1, 2, or 3 Pieces in the 3rd Row

Crystal Bennett, North Carolina Agricultural & Technical State University / University of Maryland, College Park

The objective of this summer REU project is to design and implement a winning strategy for chomp grid with up to three pieces in the 3rd row. The take-away game Chomp is played on a rectangular grid with m number of rows and n number of columns. The grid is divided into squares. Two players alternate removing pieces from the grid. The lower-right-hand piece is poison, and the player who removes this piece loses. By expanding the standard version of Chomp of 2 rows and 5 columns to 3 rows and infinitely many columns, we would like to investigate if we can come up with a way to find all the losing positions of a Chomp grid when there are 3 rows and 0, 1, 2, or 3 pieces in the top row. Losing positions are members of the set L. All other positions are considered winning and a member of the set W. If a player can force the game to alternate from a position in W to a position in L and back to a position in W, making the game go W, L, W, L, the other player will lose. We have developed theorems for common conditions in Chomp so that the player can manipulate the game as such.

OA #76
Efficient Catch Share Allocation in Multi-Use Fisheries using LaGrangian Multipliers

Alexander DeLeon, Morehouse College, GA

The presentation outlines the adaptation of LaGrangian multipliers to the efficient allocation of fish catch shares in multiuse fisheries. The investigation chronicles the need for the methods, its limitations, an alternative method, calibration practices, and successful implementation in NOAA Fishery Management Councils. In the future, more rigorous hedonic functions stand to yield better allocation models. Furthermore, additional efforts to recruit greater quantities of relevant data promise better still models.

OA #77
Not-So-Perfect Numbers

Charles Eloie, III, Southern University at New Orleans

A perfect number is a positive integer that is equal to the sum of its proper divisors. In this presentation I will be attempting to prove what form of numbers can’t be perfect numbers; in particular, a number in the form \( p^2 \cdot q \) where \( p,q \) are different prime numbers and \( i,j \geq 1 \) can never be a perfect number.

Since all known perfect numbers are even, I am conducting this study to check if there are certain forms of odd numbers that can also be perfect numbers. In order to prove this, I will be using the sigma function, \( \sigma \), \( \sigma(n) \) = the sum of all divisors of \( n \) for all perfect numbers \( \sigma(n) = 2n \). In order to calculate the sigma values of these numbers, I will be using a partial sum of a geometric series; this number will be set equal to 2n. Then, by using basic algebra I will determine whether a number of the form \( p^2 \cdot q \) can be a perfect number.

I started by proving numbers in the form \( 3^i \cdot 5^j \) where \( i,j \geq 1 \) could not be perfect. Then I moved on to numbers in the form \( 3^i \cdot p^j \), where \( p \) is a prime number and \( i,j \geq 1 \) could not be perfect, and this is the next step in my research.

At this point in my research, I have successfully proven a number of the form \( p^i \cdot q^j \) where \( p,q \) are distinct primes and \( i,j \geq 1 \) cannot be a perfect number. In the future, I intend to prove a number of the form \( 3^i \cdot 5^j \cdot 7^k \) where \( i,j,k \geq 1 \) cannot be a perfect number. [This research was funded by a scholarship from Enhancement, Enrichment, and Excellence in Math and Science (E^2MaS) Program.]

OA #78
Fibonacci’s Numbers in Action

Chasity Fuller, Savannah State University
Robert Kiser and Mulatu Lemma, Savannah State University

An example of the power of math can be found in Fibonacci numbers. The Fibonacci numbers are sequences of numbers of the form: 0, 1, 1, 2, 3, 5, 8, 13, ... These numbers are famous for possessing wonderful and amazing applications. In
mathematical terms, it is defined by the following recurrence revelation: \( F_n = F_{n-1} + F_{n-2} \) with \( F_1 = F_2 = 1 \) and \( F_0 = 0 \).

The first number of the sequence is 0, the second is 1, and each subsequent number is equal to the sum of the previous two numbers of the sequence itself. That is, after two starting values, each number is the sum of the two preceding numbers.

The Fibonacci numbers appear in an amazing array of creations, both natural and human-made. The numbers have very interesting properties and are frequently found in many places in nature and art. The Fibonacci sequence also makes its appearance in many different ways within mathematics. In this paper, we investigate some important applications of the Fibonacci numbers. [We would like to thank our mentor, Dr. Lemma, for his input, guidance, and advice. We are grateful to Dr. Chetty, for his assistance and his unswerving support of research at Savannah State University. We also thank Drs. Mustafa, Jayaraman, Lin, Dolo, Lambright, and Paramasivam, and Ms. Howard for their great encouragement and support. Finally, we thank the PRISM Scholarship Program at SSU for providing us with this golden opportunity of mathematical research, an experience that has been an invaluable part of our higher education.]

**OA #79**
**Multiyear Comparison of Intimate Partner Violence (IPV) among Adolescents Youth Risk Behavioral Survey, Texas and the United States, 2001-2007**

Jamila K. Harris, Langston University, OK / University of North Texas Health Science Center

Intimate partner violence (IPV) has become a serious public health issue in today’s society that has resulted in several harmful and even deadly outcomes in adolescents. IPV is defined as abuse between two people in an intimate relationship who are not married. A relationship does not require sexual intimacy to be classified as IPV.

This descriptive review compares the prevalence rates of IPV among adolescents in Texas and the United States using YRBS data for 2001, 2005 and 2007. The Youth Risk Behavioral Survey (YRBS) is a survey given to various schools to administer to their students. The results are then evaluated and reported to display what health concerns should take priority and what needs to be done to prevent them. The YRBS data was used to collect data prevalence rates of IPV among adolescents for the United States and Texas, 2001, 2005, and 2007, while also comparing prevalence rates among gender, grade, and race within each year.

During this study, there were several interesting findings between males and females, and the grade levels of the adolescents that reported IPV. This research has sparked potential future studies to find out why males are reporting more than females, and also evaluate the trend to which adolescents are reporting more as they get older.

**OA #80**
**A Neuroimaging Investigation Into the Functional Connectivity of Major Depression**

Asya Jones, Spelman College

Depression affects millions of people worldwide. Despite potential gains from anti-depressant treatments, relapse rates remain high and many of the effects of treatment remain unclear. Major depressive disorder (MDD) is the most prevalent of the depressive disorders.

Past research has largely focused on examining biochemical or behavioral characteristics associated with MDD. However, some recent research efforts investigate MDD at a neural processing level to help elucidate the pathophysiology of MDD. Functional magnetic resonance imaging (fMRI) provides information about the functional connectivity between different areas of the brain. We specifically looked at the functional connectivity of 86 brain regions for each of 6 depressed patients who were scanned in a resting state.

In this study, our goal was to characterize the neural activity relationships between each pair of the 86 brain regions and to determine which of these associations were statistically significant. Thus, we analyzed data from 210 serial brain scans in each patient.

From these data, we calculated regional summaries over the 86 regions of six patients and then computed correlations between each pair of regions. We applied a Fisher’s z-transformation to the correlations and conducted a one-tailed t-test to determine whether each correlation was statistically significantly greater than zero. Several statistically significant correlations between brain regions were detected (\( p < 0.01 \)) including the right precentral and left calcarine gyri, left frontal middle gyrus and right frontal superior medial gyrus, and right frontal inferior operculum and right frontal inferior triangularis.

The only significant correlation to satisfy a more stringent testing criterion of \( \alpha = 0.005 \) was between supplementary motor cortex in the right and left hemispheres. Several significant correlations were detected at a lower threshold, suggesting that more relationships may be detectable with a larger sample size.

Our functional connectivity results provide useful information in characterizing the relationships in brain activity between different regions in patients with major depressive disorder. These results may be used to contrast similar functional connectivity results in healthy control subjects. Moreover, our results provide a benchmark for evaluating change in functional connectivity following anti-depressant treatment and insight to how future treatments may target brain activity. [Supported by the National Institute of Mental Health Grants R01 MH-079251 and T34 MH-016573.]
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OA #81
Average Time Until Fixation of a Mutant Allele in a Given Population

Komi Messan, North Carolina A&T State University

The main idea in population genetic is evolution. Evolution is much different from most studies in biology, due to the fact that its insights are theoretical rather than experimental.

Most evolutionary studies concern the frequencies or the fitness of genotype in a given population. Evolution is the change in the frequencies of genotype through time, perhaps due to their differences in fitness (Gillespie 2004). Evolution can also be explained by two forces: forces that introduce variation in phenotypic character such as eye colors, and height, and forces that make some traits to become rare or more common.

The main cause of variation is mutation, which changes the sequence of a gene (Strickberger 2000). Mutation can also be defined as a change in the DNA sequence of Cell's genome. One of the most important problems in population genetics is the time it takes for a gene to go to fixation. A mutant gene in a given population will eventually be lost or established.

The particular interest of this research is to know the mean time for a mutant gene to become fixed in a population, with the exclusion of the case when this gene is lost. A diploid population of N individuals is considered with a forward and backward mutation of u and v respectively per bases. Using a set of nonlinear equations, the genotype frequencies are calculated so that the equilibrium points can be determined for an infinite population. With the diffusion theory, an approximation of the time to fixation is calculated for a finite population.

OA #82
Analyzing the Morphological Structure of a Virtual Polymer Photovoltaic Cell

Kahntinetta Pr’Out, Savannah State University, GA

Currently, no computational model exists for the morphological structure evolution of a polymer photovoltaic cell. The only way to visually capture the morphology of a given photovoltaic cell is to use either atomic force microscopy (AFM) or transmission electron microscopy (TEM).

The overall goal of this project is to develop computational framework that can accurately predict the 3-D morphology a polymer photovoltaic cell as well as correlate the morphological structure to the device’s properties. While in the research program, the objective of the undergraduate student is to analyze at the nano-scale, how the morphological structure of a polymer photovoltaic cell evolves during phase separation.

Using a computational 2-D model of an example morphological structure that has been provided by using the Cahn-Hilliard equation, the characteristics to be analyzed for this research will include betti numbers zero, and one (β0, β1).

By analyzing these characteristics as the morphological structure changes within the device, it can be further related to the manufacturing process, device properties and final efficiency. We hope that findings from this research will contribute to an accelerated development of organic solar cells.

OA #83
Super Central Configurations of the Three-Body Problem With the Inverse Integer Power Law

Kenyaita Taylor-Hodge, Virginia State University
Krystolyn Henderson, Virginia State University

In this paper, we consider the special case of the inverse problem of the central configurations of the three-body problem. Central configurations are special configurations of positions of the masses such that the gravitational forces can be exactly balanced among the bodies. Super central configuration is a configuration that is a central configuration for at least two different arrangements of a given mass vector.

The existence and classifications of super central configurations in the Newtonian inverse square law have been proven by Z.Xie [“Super Central Configurations of the n-body Problem,” Journal of Mathematical Physics 51, 042902 (2010)]. We extended these results to the general inverse integer power law. We have determined the mass $m = (m_1, m_2, m_3)$ such that $S_m(q)=0$ and $S_m(q)=1$ for a given $q = (q_1, q_2, q_3)$ in the collinear three-body problem. For any super central configuration in the collinear three-body problem, we established the relation between mass and the configuration. [This project is partially supported by Mini-grant from the Center of Undergraduate Research in Mathematics (CURM) which is funded by the National Science Foundation grant #DMS 0636648 and by Brigham Young University.]

OA #84
Triangular Numbers Are Everywhere

Shayana Thomas, Savannah State University, GA

Triangular numbers are formed by the partial sum of the sequence “1,2,3,4,5...n”. In other words, triangular numbers are those counting numbers that can be written as “$T_n = 1+2+3+...+n$”. So,

$T_1 = 1$
$T_2 = 1+2 = 3$
In this paper, we investigate how triangular numbers are related to other mathematical concepts. We will also show that triangular numbers are prime examples of how some mathematical concepts are connected to other seemingly unrelated mathematical concepts. [We would like to thank our mentor Dr. Lemma for his input, guidance, and advice. We are grateful to Dr. Chetty, for his assistance and his unwavering support of research at Savannah State University. We also thank Drs. Mustafa, Jayaraman, Lin, Dolo, Lambright, Paramasivam, and Ms. Howard for their great encouragement and support. Finally we thank the PRISM Scholarship Program at SSU for providing us with this golden opportunity of mathematical research, an experience which has been an invaluable part of our higher education.]

**OA #85**

**Student Achievement in Mississippi Middle Schools as a Function of Student Expenditure and Student/Teacher Ratio**

Shonquelsa Thomas, Mississippi Valley State University  
Raymond Williams, Mississippi Valley State University

The focus of this research is to determine the correlation between the student/teacher ratio and money spent per student, with the overall MCT II (Mississippi Curriculum Testing) score and the Math sub score in 50 Mississippi Middle Schools.

The variables included were: student expenditure, student/teacher ratio, MCT II scores, and the math sub scores. Five districts were chosen and 50 middle schools were randomly chosen from these districts. The results were based on test scores listed on the Mississippi Department of Education website. The information found was analyzed using Statistical Program for the Social Sciences (SPSS). The study showed that money was not an issue in education and that smaller classes did not improve scores.

**OA #86**

**Using 3D Graphic Software to Explain Concepts in Multivariable Calculus**

Jasmine Turner, Norfolk State University, VA  
Shahrooz Moosavizadeh, Norfolk State University

College students are generally unfamiliar with multivariable calculus. “The low test scores in Calculus III show the lack of student preparation because they are not exposed to multivariable calculus in high school.” The high school instructors are not expected to teach these topics and therefore are not properly trained to do so.

The objective for this research was to introduce certain concepts of multivariable calculus to high school AP calculus students in the Norfolk Public School system in Virginia. The goals were to examine the three-dimensional capabilities of Microsoft Excel 2007 and Maple 9.5, choose the most reliable software to help teach multivariable calculus to high school instructors and students alike, and create a manuscript to guide the calculus instructors in teaching multivariable calculus. Maple 9.5 software was hypothesized to be the chosen software for the manuscript.

This is a visibility study. Once the three-dimensional capabilities of both software were analyzed and compared, the manuscript was developed. Generating surfaces and solids in addition to testing numerous function and features that the software offers were attempted on both software. Results show Maple 9.5 to be the more reliable software to help teach multivariable calculus to high school AP calculus students. Microsoft Excel 2007 has a Surface Chart feature that is capable of generating three-dimensional surfaces; however, it lacks much more and does not fit the qualifications that the software needs to accomplish the objectives. Maple 9.5, a more robust software, is capable of generating surfaces and as well as solids and displaying multiple graphs. It includes an animation feature, as well as a rotation feature that is very user-friendly. It is highly qualified to help teach concepts of multivariable calculus.

Future research will include testing the three-dimensional capabilities of Mathematica software to see if it is more qualified than Maple 9.5. [This research was funded by the National Science Foundation Grant # 0714930.]

**NANOSCIENCE**

**OA #87**

**Electrostatic Trapping of Au Nanoparticles for the Development of a Chemiresistor Sensor Array**

Brandi M. Adams, Southern University at New Orleans, New Orleans  
Joe Omojola, Southern University at New Orleans (SUNO), New Orleans  
Kim Lewis, Rensselaer Polytechnic Institute (RPI), NY

The ultimate goal of this project is to develop a chemiresistor sensor that detects multiple volatile organic compounds (VOCs) using single gold (Au) nanoparticles on one chip. This, in turn, would reduce the size and increase the sensitivity of these devices. Being able to sense potentially harmful chemicals on a
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molecular level is beneficial for the quality of human life and our living environment.

Chemiresistor sensors can be used to detect “suspicious” chemicals in restricted areas or public places (e.g., airports, government buildings). They may also be used for standardized, air quality testing in work environments (e.g., OSHA testing).

The electrostatic trapping experiment can be represented as different components in a circuit. This yields a good hypothesis for real samples. We suspect that resistance before Au nanoparticle exposure will be many orders of magnitude higher than after Au nanoparticle exposure. Au nanoparticles should fill the nanogap; thus, completing the circuit, electricity should be able to flow more freely through the sample. We hypothesized to see a significant drop in resistance after Au nanoparticle exposure. Also, we hypothesized that resistance of our sample (post-Au nanoparticle exposure) would change with the exposure to the corresponding VOC.

The methods used to achieve our objectives were to (1) to characterize aluminum nitride (AlN) nanogaps by measuring current-voltage characteristics, (2) set up and perform electrostatic trapping experiments to position Au nanoparticles with a diameter of 9 nm in the AlN nanogap, (3) use scanning electron microscopy to image the AlN nanogap, (4) modify the electrostatic trapping experiment to capture a single nanoparticle in the gap, and (5) set up and environmental chamber to expose the nanoparticle to volatile organic compounds (VOCs).

For the sample 16A, the resistance was very large before trapping. After trapping, the resistance reduced to 15 Ω. The resistance measured for sample 16A and 16B before and after exposure to acetone varies approximately by 2 Ω.

Because of sample 16’s surface roughness, a new sample, sample 20, was created using a different etching technique. It is hypothesized that this sample will have less complications, because of a smoother surface profile. Au will be evaporated on sample 20, and electrostatic trapping experiment will be repeated. There is hope that this sample will yield more information to minimize error and create a better sample to trap a single Au nanoparticle. [This project is supported by NSF, the Department of Physics at RPI, and the Department of Natural Sciences at SUNO.]

OA #88
Effects of Catalyst Components on Carbon Nanotubes Grown by Chemical Vapor Deposition

Tasha Adams University, Norfolk State University, VA
Binh Duong and Supapan Seraphin, University of Arizona

In our research, we study the role of each of the four chemical components of a catalyst system used in growing carbon nanotubes (CNTs). Our goal is to be able to grow desirable carbon nanotubes by chemical vapor deposition (CVD), which is believe to be the most practical growth method for CNTs. The catalyst used in our process is known for inducing y-junction CNTs. To our knowledge, there has not been a thorough investigation on the importance of each chemical component used during the CNT growth.

To identify the impact that each component has on CNT growth, we produced nine samples by either omitting or doubling the amount of each component: iron nitrate, aluminum oxide, molybdenum. We used one of three different solvents, including methanol, DI water, or ethanol for the catalyst solutions.

We found that 1) all three catalyst components are needed in effective growth of CNTs; 2) molybdenum has a significant role in CNT growth and y-junctions in our system; 3) the solvent has noteworthy effect on the degree of CNT crystallinity in our system; and 4) the growth of multiple samples at the same time may cause interaction from one sample to the next.

OA #89
Effects of Polymer Crystallization in Single-Walled Carbon Nanotube/Medium-Density Polyethylene Composites

Gabriel Burks, Naidu Seetala, Department of Physics, Grambling State University, LA
Padraig Moloney, Andres Rodela, and Enrique Barrera, Department of Materials Science and Mechanical Engineering, Rice University, TX

Current practices require that electrical power be generated above water, usually on a ship, and sent underwater to the location of need. The fabrication of an electrically conductive polymer, made from polyethylene, would be less expensive, low weight, and usable for underwater electrical applications. Carbon nanotubes (CNTs) are being integrated into polymer matrix to increase electrical properties by several orders of magnitude. The level of crystallization in polyethylene and many other polymers is one of the most important factors that determine its properties after processing.

Here we studied the changes in the physical and intrinsic properties of medium-density polyethylene (MDPE) and MDPE/single-walled carbon nanotube (SWNT) composites by varying the percentage of polymer crystallization and different wt% SWNTs. Different levels of polymer crystallization were obtained by altering the annealing cycles and methods of preparation.

Changes in peak melting temperature (MP) and electrical resistance (R) were observed in MDPE composite systems with crystallization percentages ranging from approximately 40% to 60%. Annealing methods, as well as the incorporation of single-
walled carbon nanotubes, correlated to observable differences in the composites’ MP and R. Composites with 1 wt% SWNTs did not produce any remarkable changes in the electrical resistivity of MDPE. Incorporation of 10 wt% SWNTs caused drastic changes in the electrical resistivity of MDPE samples, showing an increase from non-conducting (>10⁶ Ω) to a resistance of approximately 400 Ω. [Work supported by the Air Force Office of Scientific Research (AFOSR) contract FA8650-05-D-1912, Grambling State University; the Alliance for Graduate Education and the Professorate (AGEP), and the National Science Foundation (NSF) Cooperative Agreement Grant number HRD-0450363, Rice University.]

OA #90
Synthesis of Ni-doped ZnSe@ZnS Quantum dots and Their Cytotoxicity in Human Pancreatic Carcinoma Cells

Melissa Cruz-Acuna, University of Puerto Rico at Mayaguez
Sonja Bailon-Ruiz, Department of Chemistry, University of Puerto Rico at Mayaguez, Puerto Rico
Oscar Perales-Perez, Department of Engineering Science & Materials, University of Puerto Rico at Mayaguez, Puerto Rico

Photodynamic therapy (PDT) is a potential technique for cancer treatment that involves the use of photosensitizing agents to generate cytotoxic species, such as reactive oxygen species, that can destroy cancer cells quickly and in a specific manner. Semiconductor nanocrystals, quantum dots (QDs), are very promising candidates for PDT applications, because they act as efficient energy donors for the photosensitizing agents.

Accordingly, this work is focused on the microwave-assisted synthesis of pure and Ni-doped ZnSe@ZnS QDs in aqueous phase and the evaluation of the corresponding cytotoxicity in PANC-1. Desired nanostructures were produced from starting zinc chloride and selenide aqueous solutions in presence of thiols (mercaptopropanionic acid or thioglycolic acid). The concentration of Ni (II) species varied between 0.00 % w/w and 0.15 % w/w. The QDs formation was monitored as a function of time at reaction temperatures in the 120°C-140°C range under neutral pH condition. The structural, compositional and functional characteristics of these QDs were confirmed via, X-ray diffraction, ICP-MS, UV-Vis and PL spectroscopy techniques.

Human pancreatic carcinoma cells (PANC-1) were cultured in DMEM medium containing 10% (v/v) fetal bovine serum and Gentamicin 50µg/mL at 37°C in air containing 5% CO2. Cells were seeded in 96-well plates and grown to about 80% confluence. Non-doped QDs dispersed in buffer phosphate (PBS) were added to each well at various concentrations (0 ppm, 10 ppm, 50 ppm, 100 ppm, 200 ppm, 300 ppm, 400 ppm, 500 ppm) and incubated during 48h. The cellular metabolic activity was measured by using the CellTiter 96 AQueous Assay at 490 nm and the viability percentage was determined by the trypan blue exclusion assay in a cellometer.

All treatments were realized by triplicate. The viability percentage decreased from 85.6% -12.1% down to 46.7% -0.9% when PANC-1 was contacted with 0 ppm and 300 ppm of QDs respectively. The corresponding cellular metabolic activity decreased from 95.8% -8.6 % to 67.6 % - 1.6 %. Massive cell death was observed at QDs concentrations above 300 ppm after 48 hours of treatment. Our results suggest the possibility of using aqueous QDs as potential platforms for PDT at concentrations below 300 ppm. [Acknowledgements: The National Science Foundation under Grant No. HRD 0833112 (CREST program).]

OA #91
The Comparison of DNA via FRET Spectroscopy

Rochester Gray, Jr., Clark Atlanta University, GA

DNA is known to be the blueprint for life, but recent work with DNA nanostructures and, specifically, DNA origami has shown a broader application for DNA. DNA origami is the process by which a long single-stranded DNA molecule is folded into arbitrary nanostructures with the assistance of many small staple strands. With the ability to functionalize each staple strand independently, it is possible to pattern biomolecules such as proteins and study their interactions. This type of application requires precisely locating the attached molecule and therefore it is necessary to know the spatial stability of DNA origami attachments.

The goal of this project is to understand the constraints that can manipulate the stability by comparing two nearly identical DNA structures formed by the use of different staple strands. Fluorescent resonant energy transfer (FRET) was the primary tool used to study the distance between two points of the DNA. Using FRET, the spacing of fluorescent dyes located along the vertical and horizontal axis of the origami molecule was investigated. The stability was determined by comparing the measured point-to-point distance with the expected distance based on the dimension of DNA and the length of the ligand used to attach the dye. The backbone of the origami is a portion of the M13mp18 single-stranded plasmid and must be produced and purified before it is folded.

I compared two approaches for production of the template: polymerase chain reactions (PCR) and the enzymatic digestion. Overall, the vertical and horizontal lengths were consistent between the two structures fabricated, indicating that the staple orientation had little effect on stability. Specifically, the measured horizontal distance was measured within the expected range of values, but the vertical distance fell outside of the range anticipated. The difference from expected distance indicates that the shape is deviating from its anticipated form, likely bending or stretching. With precise patterning necessary for studying protein interaction, further study is needed to determine how to improve the stability of these structures.
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[This study was supported by a grant from NSF and ONR awarded to Paul Charles, Director of HBCU/MI Summer Intern Program, Naval Research Laboratory, Washington, DC 20375.]

OA #92
The Dosage Dependent Effect of KAuCl4 on Pollen Germination of Crotalaria Retusa

Shandrea Stallworth, Fort Valley State University, GA
Shivendra Sahi, Western Kentucky University, KY

Unique catalytic properties of gold nanoparticles (AuNPs) could be achieved by manipulating their geometries. Recent studies have shown the in planta synthesis of AuNPs and manipulation of their geometries in the roots of plant species. However, due to the lignified cell wall of the plant tissue, isolation of biomatrix-embedded AuNPs have not been met with any success so far. On the contrary, in vitro germinated pollen tubes have been successfully used for the isolation of sperm nuclei by subjecting them to osmotic shock. Several studies have used pollen systems for dosage-dependent effect of various toxic heavy metals. However, the effect of KAuCl4 on the in vitro germination and pollen tube length is not known. Crotalaria retusa pollen shows high percent germination and is amenable to long-term storage. C. retusa pollen was used to decipher the dosage-dependent (0 - 1000 ppm) effects of KAuCl4 on percent pollen germination and tube length. Interestingly, compared with the control (0 ppm) there were significant increases in both percent germination and pollen tube length upon supplementing the germination medium (GM) with 10 ppm of KAuCl4. When GM is supplemented with ≥ 100 ppm of KAuCl4 it induced significant reductions in percent germination and pollen tube length.

This study clearly demonstrates the hormesis effect of gold treatment on pollen germination and tube length. However, supplementation of GM with increasing concentrations of KAuCl4 resulted in a significant decline in the pH values ranging from 6.25 (0 ppm) to 2.56 (1000 ppm). To further determine whether the observed effect was due to KAuCl4 or because of the resultant shift in the pH, KAuCl4-supplemented GM was buffered to pH 6.0 with MES buffer. Interestingly, the dosage-dependent effects of buffered KAuCl4-supplemented GM on pollen germination and tube length was largely comparable with those of the non-buffered KAuCl4-supplemented GM. Efforts are now under way to use the mass pollen culture for the synthesis of AuNPs that would be confirmed by transmission electron microscopy and energy dispersive X-ray spectroscopy. [This research was supported, in part, by a grant from NSF HBCU-UP (#HRD-0625289) awarded to Sarwan Dhir, PhD., Director for the Center for Biotechnology, Fort Valley State University, Fort Valley, GA 31030.]

PHYSICS

OA #93
The Photoluminescence of Etched SiC Nanowires

Polite D. Stewart, Jr., Southern University A & M College, LA

SiC nanowires were produced from carbon nanotubes and nanosize silicon powder in a tube furnace at temperatures between 1100°C and 1350°C. SiC nanowires had average diameter of 30 nm and very narrow size distribution. The surface of the SiC nanowires is covered by an amorphous layer. The composition of that layer is not fully understood, but it is believed that in addition to amorphous SiC it contains various carbon and silicon compounds.

The objective of the research was to modify the surface structure of the SiC nanowires, a step necessary for future surface functionalization. The acid etched nanowires were analyzed using FTIR, TEM, X-ray diffraction, and photoluminescence. TEM images show that after treatment the amorphous layer was removed but the diameter of the core remained unchanged. X-ray line broadening analysis indicates a significant contribution due to stress caused by dislocations and planar faults. After acid etching, line narrowing was observed and attributed to stress reduction and elimination of the smallest wires. High-pressure x-ray study of lattice constant showed that their hardness exceeds hardness of the bulk material by 30%. [This work was funded in part by the Department of Physics and Astronomy at Texas Christian University (TCU), the National Science Foundation (NSF) through the Research Experiences for Undergraduates (REU) Site in Physics and Astronomy (NSF grant PHY-0851558) at TCU, and the Louisiana Space Consortium (LaSPACE).]

OA #94
Microwave Testing of Ferromagnetic Composites

Quincy L. Williams, Norfolk State University, VA

For theory purposes and applications, it is important to know the relations that constrain both microwave permeability and bandwidth of electromagnetic absorbers. Conventional mixing rules cannot give accurate estimates of constitutive properties when polymers contain inclusions with high static permeability; therefore these limits need to be determined experimentally.

Two polymer composites of Moly-Permalloy (Ni80Mo4.5Fe) and polystyrene were fabricated in house both with approximately 8% concentration of Moly-Permalloy. Sample 1 was formed under 1.5T magnetic field producing a composite with magnetic inclusions oriented in the direction of field lines, while sample 2 was formed with magnetic inclusions randomly dispersed.
Microwave ferromagnetic resonance testing shows a high absorption of energy in the randomly dispersed composite and high tunability of magnetization with respect to the direction of the microwave field magnetic vector in the oriented composite. Maximum deviation of real permeability from unity (\(\mu_r = 0.58\)) was obtained in the random composite with saturation magnetization of 202.09 Oe.

**SOCIAL & BEHAVIORAL SCIENCES**

**OA #95**  
Patient Education and Informed Decision Making in Prostate Cancer Treatment  
Zainab Afzal, University of the District of Columbia

Prostate cancer is the second-most-common cause of cancer death in American men. Approximately every two minutes a man is diagnosed with prostate cancer. Also, about every sixteen minutes a man dies from prostate cancer. The purpose of the study was to observe how patients reacted to their diagnosis, and whether patient education affected how they coped with the subsequent steps in its management. The Center for Prostate Disease Research (CPDR) at Walter Reed Army Medical Center offered a wide array of educational opportunities across the entire clinical spectrum of prostate cancer. Shadowing patients through the various stages of prostate cancer diagnosis, treatment and recovery, as well as being mentored by many clinical staff members, afforded a rich educational opportunity to understand this disease from both the clinician’s and the patient’s perspective. A personal perspective towards how patient education impacted the various processes patients went through is addressed. Men are screened for prostate cancer by a prostate specific antigen (PSA) blood test and the digital rectal exam (DRE). If the PSA value is elevated or the DRE is abnormal, the physician usually recommends that the patient undergo a prostate biopsy.

Patients whose biopsy results are positive are advised to attend a Multi-Disciplinary Prostate Cancer Clinic at CPDR. In this all-day clinic, patients and their family members are provided with a comprehensive educational and consultative experience to help them make an informed decision about the optimal treatment for them. The standard treatment decisions for prostate cancer patients are surgery, radiation, or active surveillance. Factors that affected which type of surgery or radiation treatment patients would choose were noted.

Also, for the surgery patients who attend a comprehensive preoperative counseling class given by Dr. Jane Hudak, RN, observations on how they reacted to the surgery and after were done. The physical side effects and psychological adjustments that patients go through after their treatments were taken into account. For patients with advanced prostate cancer and for those whose disease has recurred, they are advised to attend the CPDR Recurrence Clinic. Observations on how they react when they are provided the opportunity to consult with physician specialists in medical oncology and urologic oncology to develop the next treatment strategy were done.

Each patient copes differently to their diagnosis of prostate cancer, but patient education affects how they react to it. Other factors such as family support, age, and previous medical conditions, also affect how patient cope with their diagnosis and subsequently decide on their treatment option.

**OA #96**  
Gender Differences and Attitudes Toward Intimate Partner Violence: Does Context Matter?  
Thomas Benjamin, Morehouse College / University of Rochester, NY
Mandi L. Burnette, University of Rochester, NY

Studies of public attitudes toward emotional abuse, within the context of intimate partner violence (IPV), are deficient. Much of the relevant intimate partner violence literature that investigates culpability focuses on understanding gender differences in attributions of blame towards victims or perpetrators. Based on existing literature, we hypothesized that attitudes about culpability differ depending on, not only roles (e.g., perpetrator and victim), but also the gender of the perpetrator and respondent and if the IPV perpetrator is a victim of emotional abuse. A sample of n = 97 participants were recruited to complete an online survey. Vignettes depicted a physically abusive husband or wife and emotionally abusive spouse. We tested pre-post differences, using a paired-samples t-test, in attitudes toward actors of intimate partner violence, given physical and emotional abuse.

Results indicated that emotional abuse mitigates and intensifies attitudes toward both perpetrator and victim. We also tested for changes in attitudes based on gender of the respondent and perpetrator, using a repeated-measures ANOVA. Gender of the respondent and perpetrator influenced the respondent’s likelihood of calling the police, victim self-defense justification, and average recommended jail sentence. These results can advance awareness of the effects of gender bias and acknowledgement of complete context in judiciary decisions. [This research was performed under the Ronald E. McNair Post-Baccalaureate Achievement Program at the University of Rochester.]
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OA #97
A Comparison of the Societal Impacts and Warning Operations for the 1989 and 2010 Huntsville, Alabama, Tornadoes

Angelica Betancourt-Negron, University of Puerto Rico-Rio Piedras
Mike Coyne, Kristin Scotten, and Jennifer Lee, NOAA Educational Partnership Program and NOAA National Weather Service, Huntsville, AL

The city of Huntsville, Alabama, lies within a region of the United States known as the Tennessee Valley, which is not traditionally associated with “Tornado Alley.” However, latest research indicates that most tornado fatalities occur in the lower Arkansas, Tennessee, and Mississippi River Valleys.

Huntsville has had its share of tornadic events, including the two tornadoes in this study. On 15 November 1989, a large F4 tornado tracked through south Huntsville with little to no advance warning at the start of the evening rush hour. There were a total of 21 fatalities and 463 injuries.

On 21 January 2010, an EF2 tornado moved through downtown Huntsville during peak evening rush hour, but this time there were no fatalities and only three injuries. The choices made by both the National Weather Service and core partners of the agency during these two tornadic events will be discussed, as well as how these choices either mitigated or amplified the environmental effects registered by the general populace of Huntsville.

While the decision-support services, such as warning decisions and communications provided by NWS Huntsville are important, the resulting action taken by the public is just as crucial; an investigation into the societal impacts pertaining to these two tornadoes will be shared.

Future NWS Huntsville decision-support services and choices will be shaped by the present research in an effort to mitigate the impacts of another tornado striking Huntsville. [This research was possible thanks to the opportunity for the internship of NOAA Educational Partnership Program and NOAA National Weather Service in Huntsville, AL office staff.]

OA #98
Differences in the Predictors of Self-Rated Health in the Exploring Health Disparities in Integrated Communities Study

Natieka Green, Shaw University, NC
Caryn Bell, BS, Ruth G. Fesahazion, BSHS, Thomas A. LaVeist, PhD, and Roland J. Thorpe, Jr., PhD, Hopkins Center for Health Disparities Solutions / Johns Hopkins Bloomberg School of Public Health

Self-rated health is a strong predictor of mortality as well as health status. African Americans frequently report a lower self-rated health than non-Hispanic whites even after controlling for demographics, socioeconomic status, disease status, and health behaviors. This leads us to believe that other factors may influence self-rated health and that different races assess their health using different factors.

We examined the predictors of self-rated health among African Americans and non-Hispanic whites from the Exploring Health Disparities in Integrated Communities-Southwest Baltimore (EHDIC-SWB). By selecting participants from the EHDIC-SWB dataset, which consists of 1,408 participants residing in an integrated community, we are given the opportunity to overcome for the confounding of race and socioeconomic status.

Among African Americans, there was a negative association between diabetes, heart disease, former drinking status, obesity, and age and self-rated health. Among non-Hispanic whites, there is a negative association between depression, stress, current smoking status, respiratory, obesity, less than weekly religious service attendance, and age and self-rated health. There are similarities in the factors associated with self-rated health; there are also numerous factors that both races do not report, which may influence differences in the interpretation of self-rated health, and result in race differences in ratings of self-rated health.

OA #99
Using a Network Approach to Search for Trends in Undergraduate Students’ Epistemologies of Science

Elais Jackson, Tennessee State University

Standards-based science education at the K-12 level, focuses on the constructivist view of the epistemology of science as the most desirable (Ryan & Aikenhead 1992; Tsai 1998; Liu & Tsai 2008, among others). Although the majority of undergraduate students who choose science majors align more closely with an empiricist viewpoint of science knowledge (Liu & Tsai, 2008). A sample of the scientific epistemological views (SEVs) of STEM majors at an Historically Black University (HBCU) has been collected and analyzed to determine the extent to which student SEV is a factor in undergraduate students’ science experiences.

This survey data was collected with an instrument that contained five subscales related to a student’s SEV, and research study helps to illuminate the trends of college student SEVs, according to various demographic indicators, in order to properly assess the role epistemology may play in HBCU undergraduate STEM majors. Various approaches from network science are being used to explore the data to design future research questions.
This presentation will discuss these explorations. It is possible that current undergraduate science curricula have mischaracterized the epistemology of science in a way that drives diverse groups of students away from their chosen science major and subsequent careers, making exploratory research of this type is highly important for diversifying the future science workforce. [This project was made possible by funding from the National Science Foundation under the HBCU-UP program, award #1036330.]

OA #100
Progressive Ration Choice Procedures for Assessing Effort-Related Decision Making

Simone Janniere, Bennett College, NC / University of Connecticut

Considerable evidence indicates that motivated behavior is characterized by cost/benefit analyses. Animals weigh the benefits or value of rewarding stimuli vs. the amount of time or effort that is required to obtain them. Recent research indicates that brain dopamine (DA) systems are involved in effort-related decision making.

Drugs that interfere with DA transmission bias animals towards low-effort alternatives, even if it generates a lower value or magnitude of reinforcement. This has been studied with T-maze procedures as well as operant conditioning tasks that allow the animal to choose between lever pressing for a more valued reward ( Bioserve high carbohydrate pellets) vs. approaching and consuming a less-valued laboratory chow.

The present experiment involved the development of a novel behavioral procedure for assessing effort-related decision making. Rats were given a choice between lever pressing on a progressive ratio (PR) schedule vs. consuming lab chow. In the progressive ratio schedule, the amount of work required (i.e., the number of lever presses) gradually increases as the session progresses. At some point, as too much work is required, the rat shifts from lever pressing on the progressive ratio schedule to eating the lab chow.

In this study, the effects of the DA D2 family antagonist halodol were assessed in rats trained on the PR schedule. Halodol reduced the number of lever presses, but did not affect the amount of chow consumption. This indicates that halodol can reduce the effort involved in working for food, but does not decrease appetite. [This study was supported, in part, by a grant from The National Institute of Mental Health awarded to John Salamone PhD, Board of Trustees Distinguished Professor, Department of Psychology, University of Connecticut, Storrs, CT 06268.]

TECHNOLOGY & ENGINEERING

OA #101
Building and Calibrating the NASA Radio JOVE Radio Telescope

Amanda Clopton, Howard University, Washington, DC

The purpose of the Radio JOVE Project is to research, build, and calibrate a radio telescope to be used by high school student and students majoring in astronomy at Howard University. The radio telescope will be used to observe and analyze natural radio emissions of Jupiter and the sun.

The radio signals given off by Jupiter are very weak, therefore, in order to be heard by the human ear, the radio frequency signals must be amplified by a receiver and then converted to audio signals.

In order to build the radio telescope, a receiver that is tuned to a specific frequency to hear the signals emitted by Jupiter must first be constructed. Once the receiver is built, the antenna, which serves as the connection between an intercepted radio frequency and the radio receiver, is then assembled. The antenna must be assembled outside in an open space that is clear of power lines, away from buildings, and is at least 30 ft by 4 ft.

The components needed to build the receiver include wires, resistors, capacitors, inductors, diodes, transistors, and integrated circuits. Antenna components include copper wire, a coaxial cable, connectors, insulators, toroid cores, a power combiner, rope, support masts, and hardware.

The method for building the receiver is as follows: Wire the PC board (mount the components), prepare the enclosure panels, wire the rear panel, mount the PC board to the front panel, assemble the enclosure, and finally test and align the receiver.

To assemble the antenna: Cut the wire and coax to the appropriate lengths, wrap the insulators and attach to the appropriate wires, prepare and solder the coax lines, install the toroids and connectors, and finally conduct the antenna mast assembly.

The construction of the radio telescope has just begun; therefore, no conclusions have yet been drawn. However, it is expected that a functioning radio telescope will be built that can receive radio waves from space. It is hoped that the radio telescope will be of use to students and aspiring astronomers who are want to gain more knowledge about radio emissions from Jupiter and the sun. [The Radio JOVE project is sponsored and funded by NASA. The materials were bought by Marcus Alfred, PhD, physics professor at Howard University.]
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**OA #102**  
Water Droplet Impingement and Evaporation Analysis on Artificially Microstructured Superhydrophobic Surfaces

Mercy Dicuangco, Norfolk State University / Purdue University

Superhydrophobic surfaces are non-wettable surfaces characterized by high water contact angles (WCAs), a low sliding angle, and low contact angle hysteresis (the difference between the advancing and the receding contact angles) [4-6]. Surfaces with such properties offer a wide range of promising applications, including their use in microfluidic-based technologies such as lab on chip devices, microelectromechanical systems (MEMS), and microarray biochips. Hence, the study and fabrication of superhydrophobic surfaces has become a growing worldwide research interest in the science community.

This investigation experimentally demonstrates the influences of superhydrophobicity on droplet impingement dynamics and evaporation, giving rise to the characterization of the artificially fabricated superhydrophobic surfaces tested in this work. There are primarily two types of surfaces considered; one with a single layer of roughness microstructured with SU-8 pillars and the second type with dual layers of roughness induced by an array of silicon pillars coated with photoresist. Both single and double roughened surfaces were utilized in the droplet impingement experiments. By varying the height from which the droplet was released, thus modifying the impact velocity, the relationship between the wettability properties of the surfaces and the dynamic impact behavior of the droplet is observed. Secondly, free droplet evaporation on the double roughened surfaces was carried out to analyze droplet stability on the surfaces corresponding to time dependent measurements of the droplet’s contact angle, contact radius, height, and volume. All experimental data for analysis in this study were visually obtained through image processing of snapshots taken with a high-speed camera.

**OA #104**  
The Recipe for Learning Math Starting From SCRATCH

Sharrod Hines, Norfolk State University, VA

Playing computer games and using computer software in the classroom is not a negative way of learning or teaching. This type of learning is actually positive in many different ways. Studies have shown that since the introduction of computers and games as a study tool, pass rates in standard math classes have significantly increased. For example, in 1990 when computers were first introduced, Algebra I pass rates increased from 47% to 75%.

The objective of this study is to bridge the gap between those students in elementary school that were not performing well in math on the Virginia Standards of Learning test with those students that were performing well, by using computer-based learning, with a co-objective of expressing why computers and computer games are needed in the classroom as a learning mechanism.

This study is important because minority students statistically have been shown to do worse than other students taking the same exams; therefore, there is a need for higher achievement and an increase in the number of minorities in STEM fields.

A math-based computer game called “The Math Adventure” will be used to test students’ knowledge of materials and standards learned in grades 1-5. The game was developed using Scratch software and was designed for elementary school students,
OA #105
Design and Analysis of a New Leak-Free Connector

William George Humbert, IV, Bowie State University, MD

It is important to have a device capable of connecting pipes securely, reliably, and purely mechanically, with no application of welding, gluing, or threads that reduce the life of pipelines. Analysis of the swaging process allowed the design a new mechanism distributing evenly compressive loads required to seal connection between two pipes hermetically. During the course of design it became necessary to create a backlash-free rack-pinion gear of high precision and strength.

The first stage of the project consisted of principal design of a swaging tool with a mathematically analyzed and optimized new type of rack-pinion gear incorporation into it followed by derivation of parametric equations of the rack-pinion profile.

The second stage of the project included three dimensional Pro/Engineer modeling of leak-free connector components used for fast prototype building on Z- and V-Flash 3D printers. In order to estimate the new tool efficiency the combination of the backlash-free rack-pinion gear and the swaging tool can be implemented and tested for effectiveness compared to a normal rack-pinion system. Achieved results can also be used in the automotive, railroad, chemical, oil, and gas production industries, as well as many others.

OA #106
Quartz Crystal Microbalance Investigation of Enzymatic Hydrolysis of Cellulose

Stefan Jenkins, Florida A&M University
Subramanian Ramakrishnan, Florida A&M University

Quartz crystal microgravimetry (QCM) was used to investigate the interactions between cellulase enzymes and model cellulose substrates. The substrates consisted of thin films of cellulose that were spin-coated onto polyvinylalmine (PVAm) precoated quartz crystal sensors carrying conductive gold surfaces. In QCM the quartz crystals are piezoelectrically driven and the frequency and dissipation shifts allow monitoring of substrate hydrolysis at various temperatures and enzyme concentrations in situ and in real time. The changes in frequency of cellulose-coated quartz resonators during their incubation in cellulase solutions were related to contributions from the liquid phase properties, the adsorptions of cellulase enzymes, and the hydrolysis of the substrate.

OA #107
Smart Rod

Jeff Kesling, Savannah State University, GA

The application of scientific and mathematical principles to the method of differential leveling as applies to the Civil Engineer in the planning and design of the construction of buildings, highways, and bridges were investigated. Such planning and designing requires the surveying of locations to determine what changes may need to be made prior to any construction or alteration. Differential leveling is the independent measurement of an unknown elevation relative to a known elevation (Kavanagh). One of the key elements to perform accurate differential leveling is the ability to keep the rod and the instrument plumbed to the earth. Current state of the art is to use a scope and graduated rod, both of which employ bubble-levels to determine plumb.

The purpose of this project is to replace the graduated rod with a smart rod. The smart rod consists of graduated rod that employs a tilt sensor, transmitter, and Parallax Discovery board. The tilt sensor is used to measure the rods angle with respect to the earth, and the transmitter wirelessly transmits the angle data to an automatic level that is also equipped with a Parallax Discovery board. The Parallax Discovery boards are used to bridge the components together and run a program to interpret the angle data. In order to achieve this communication a program using Basic Stamp Editor was developed. The program reads the Smart Rod’s angle data and transmits the leveling condition through an LED that is equipped to the automatic level. When the rod is plumbed with the earth, an LED that is equipped to the automatic level is activated. Once the LED is activated the surveyor will read the rod reading. To test the effectiveness of the Smart Rod we measured the elevation of 8 locations using the industry standard method and compared the results to our Smart Rod method.

The results show a trend toward a higher accuracy in the measurements and a slight decrease in the time required at each station.

giving them a series of questions to answer based on their grade level. Students must reach a certain score within the given time limit by answering enough questions correctly. The game is still undergoing development, but a demo has been obtained.

Future studies will include development of the “Math Adventure” game and analysis of the data to determine if the game helped students achieve better SOL scores. If the game is successful, it will be distributed to various schools to be incorporated into classroom lectures. Another “Math Adventure” game could be created using the Game Maker software, which uses 3D animations as opposed to the 2D animations used in Scratch. Ultimately, a higher minority turnout rate for STEM majors in higher education and to increase the Virginia math SOL scores. [I would like to gratefully acknowledge the National Science Foundation for their financial support.]
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OA #108
Piezoelectric Energy Harvesting for Naval Applications

Andrew Powell, Howard University

Energy harvesting is the method of retrieving energy from external sources in the environment. By utilizing the energy that is a byproduct of vibrations and heat in the environment, what was once wasted energy can be converted and stored to power other devices. This process is especially advantageous in military applications where massive aerial and terrestrial vehicles emit large vibrations and temperatures into the environment. For example, the Navy is interested in harvesting the heat and vibrational energy that vertical takeoff and landing aircraft exert on launch pads and also has a general interest in harvesting energy from the environment to power wireless sensor systems.

This work will explore the performance of piezoelectric materials over a range of operating conditions reflective of the environment of Naval applications. In addition, estimates of energy availability will be made for various naval systems. As part of the final deliverable, a proof of concept demonstration, emulating energy harvested from piezoelectric materials in a launch pad, will be developed.

OA #109
Phase Equilibria Analysis of Biodiesel Fuels Using Thermophysical Property-Based Models

C. Davis Powell, North Carolina A&T State University

This project will utilize fundamental phase equilibria and solution thermodynamics to predict the composition and properties of biodiesel (BD) fuels. Model parameters to be investigated will include the effects of biodiesel composition, solution temperature, and solid precipitates.

This project will examine Regular Solution Theory (RST), Flory Huggins (F-H) Theory, and other common activity coefficient models to predict liquid phase behavior for multiple component systems. Estimates of primary and secondary phase transition enthalpies will be predicted using the literature relationships and compared with experimental data. The results of the BD property models will be compared with literature and experimental data.

OA #110
The “Lift Me” Project: Investigating “Embedded System” Technology and “Mechatronics” to Create a Lifting Device for the Mobility-Impaired


This activity involves using FPGAs and Microcontrollers or “embedded technology” to control a chairlike lifting device that would allow a caretaker to assist a person with little to no mobility or a person with limited mobility to assist themselves and be lifted from a prone position at floor level to a seated position at chair, table, or toileting height. Lifting devices are usually completely mechanical, quite large, and require multiple personnel to control and use them to lift a single individual. We are challenged to investigate the conversion a mechanical system to an “embedded mechatronic” device that will reduce the size, provide for a single assistant or patient control singularly, and provide for safe and predictable use.

“Finite State Machine” analysis was used to design the data exchange and control system. Multiple scenarios for the safety and efficiency of the unit were considered. The operational characteristic of the device was also described in this fashion. The “State Machine” was then downloaded through a JTAG port on the FPGA, where it self-configured to behave as a complex hardware device that emulates a PWM controller that drives a DC motor senses the environment for tilt, speed, safety interlocks and turns emergency power off.

The results are as follows. The FPGA was successfully configured using “Finite State Machine” analysis. PWM speed control was accomplished using FPGA devices to control the “H-Bridge” amplifiers. This provides ease of the up/down motion and varies the speed smoothly over the course of the lifting process. The mechanical lifting components were proven and tested in a 1/10 scale model to provide “proof of concept.” Minimum and maximum height safety interlocks have been prototyped as well.

So far, “embedded technology” is proving to be cost-effective and practical in creating the “mechatronic” lifting device. As the project continues, the microcontroller will be integrated into the system and used as a safety watchdog device that stores “real-time” state data from the FPGA’s environmental sensors. It will also control the RF communication devices that send commands to the motors and three axis accelerometers. Together with the FPGA, the microcontroller will communicate over a “serial peripheral interface” where the data will be full duplex. [This activity was funded in part by a Historically Black Colleges and Universities Undergraduate Programs (HBCU-UP) grant. Project #0625155. Dr. John Reutter is the Principal Investigator and Mr. Karl W. Henry is a Co-Investigator.]

OA #111
Characterization and Adsorption Studies of Nano-TiO2 on Porous Medium

Canisha Seymore, Howard University

The growing applications of manufactured nanomaterials in consumer products raises questions, such as how much products are disposed after use and transported into natural resources, as well as their implications for the environment. As a result, it is
imperative for engineers to acquire an adequate understanding to foresee the effects of such particles in natural environments by means of investigating the mobility and bioavailability of nanoparticles. It is evident from chemistry that iron-oxide can adsorb metallic compounds. Soil rich in iron-oxide is found in certain regions of the country. Hence, this research is geared toward understanding and predicting how nano-TiO2 deposits and adsorbs onto iron-oxide-coated silica beads (model soil) as a function of pH, nature of adsorbent (beads), and the concentration of adsorbate (TiO2).

Analyzing such adsorption can be achieved by investigating the relationship between the pH and the zeta potential of the nano-TiO2 in relation to the three categories of silica glass beads: Unetched-Uncoated Beads (obtained from Potters Industries), Unetched-Coated Beads (Iron Oxide Coated Beads), and Etched-Coated Beads (iron-oxide-coated beads etched using NaOH). This observation is necessary as Zeta potential gives insight into the charge and adsorption properties of various surfaces. Zeta potential of the beads were measured using an electronic kinetic analyzer (EKA), which is used to investigate the electrokinetic effects of solid and liquid interfaces of almost all shapes and sizes. 1mM of NaNO3 was used as the background electrolyte, and the pH was varied to 4.0, 5.5, and 8.3.

It was discovered that the isoelectric points (IEP), pH at which the surface charge is zero, of the etched-coated, unetched-coated, and the unetched-uncoated beads were 3.4, 2.7, and 3.0, respectively.

These IEPs were expected as etched beads have a rougher surface than unetched-beads, which allows for more coating of iron oxide that has an IEP of 4.9. The IEP of the nTiO2 was measured to be 5.5. Results of the experiment proved that most adsorption of the nTiO2 onto all categories of the beads would occur in the pH range of 4.0 to 5.0, as between these values all categories of glass beads and the nTiO2 are oppositely charged. At pH values 3.4 and below, the beads and nTiO2 are both positively charged and will produce little to no adsorption, as like charges will repel each other. Similarly, at pH values 6 and above the beads and nTiO2 are both negatively charged and would result in little to no adsorption. [Acknowledgements: National Science Foundation (NSF); Center of Environmental Implications of Nanotechnology (CEINT); Karel Morgan-Evans; Molaisamy Ramamoorthy, PhD, and Kimberly Jones, PhD.]

Undergraduate Abstracts for Poster Presentation

**BIOLOGICAL SCIENCES**

1  
**Do Chimpanzee Priority Conservation Areas Correspond to Reservoirs of Chimpanzee Genetic Diversity in Cameroon and Nigeria?**

Emmanuel Adomfeh, SUNY University at Albany  
Matthew Mitchell and Katy Gonder, SUNY University at Albany

Wild chimpanzee (Pan troglodytes) populations across western Africa have experienced a 75% decline in the last few decades. Throughout Africa, chimpanzees are continuously being threatened by destructive human activities such as poaching, hunting, deforestation, and habitat alteration. Traditional methods meant to conserve chimpanzees, have so far had little impact at stopping current trends of population decline. Many
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populations are expected to become extinct in the next few decades unless a more comprehensive approach is applied.

Of the four recognized chimpanzee subspecies residing across tropical Africa, two occupy Cameroon and Nigeria, P. t. ellioti and P. t. troglodytes. The ranges of these subspecies converge at the Sanaga River in central Cameroon. Despite this ancient break, there appears to be a genetic “transition zone” between these subspecies around the confluence of the Sanaga and its main tributary, the Mbam River. Consequently, this region of Africa is of particular conservation concern because the area functions as an engine of active diversification in chimpanzees. An IUCN-endorsed conservation action plan is being developed for chimpanzees spanning this region.

Here, we compared the conservation management units (CMUs) that will appear in this conservation action plan against phylogenetic and population genetic data gathered from >250 chimpanzees spanning this region. The goal of this study was to evaluate how well these CMUs correspond to reservoirs of chimpanzee genetic diversity across Cameroon and Nigeria. Ideally, this conservation action plan will ensure future populations of chimpanzees are healthy by focusing conservation actions on protecting populations that will: 1) maintain pockets of genetic diversity across this region and 2) preserve a high degree of connectivity between individual chimpanzee communities.

Our findings suggest that patterns of genetic diversity across this region are complex. These observations suggest that substantial coordination between the Governments of Nigeria and Cameroon, as well as coordination between provincial governments within each country will be very important in maintaining reservoirs of genetic diversity and connectivity between chimpanzee communities across the region. [This research was supported by an NSF Physical Anthropology Senior Research Award to MKG (Award Number 0755823) and funding provided by the University at Albany State University of New York to MKG.]

2 Role of Arabidopsis RACK1 Proteins on the Environmental Stress-Signaling Pathways

Beatrice Akers, Howard University, Washington, DC

RACK1 Protein Family in Arabidopsis is known to regulate protein-protein interaction mediated diverse stress signaling mechanism. However, little is known about the precise cellular mechanism they use to mediate diverse environmental stress-signaling pathways. Earlier, the loss of function RACK1A knockout plants indicated a role in the environmental drought stress signaling pathways.

To expand the scope of the project, new knockout mutants of RACK-1b and RACK-1c, and double mutant plants are used in this project. By introducing different stresses to mutant alleles from Arabidopsis, we show that mutant RACK-1 plants are more resilient plants under various conditions. In this study, the mutants are exposed to UV-B radiation, temperature shock, and to several metabolic stresses that inhibit WT plant’s growth and development. We have found that all three mutant alleles show, compared to the WT plants, hypersensitive response to sugar.

In addition, we also show that the mutants maintain increased capacity to minimize the production of oxidative stress indicator -Hydrogen peroxide. This is evident from the lack of polymerization of 3,3-diaminobenzidine (DAB) that forms a brown coloration at the site of hydrogen peroxide formation. In order to expand upon our understanding, assays are being done in the presence of NaCl. Western blots will also be done to assay protein levels in mutant plants. By implicating the RACK1 proteins in the oxidative stress, signaling pathway, we hope to understand and present a complete scenario of RACK1-mediated cellular stress signaling pathway.

3 A Cell Culture Approach to Studying Fatty Acid Modulation of Porcine Lung Macrophage-like Cell Function

Frazly K. Alexander, University of the Virgin Islands / University of Missouri
Kevin Fritsche, Clark Merle, and Jimmy Browning, Jr., University of Missouri

Omega-3 (n-3) fatty acids improve cardiovascular health and may have beneficial effects on the immune system. In these experiments, we sought to investigate the anti-inflammatory actions of these fatty acids using a porcine lung macrophages cell line, 3D4/31. First, we characterized how we could modify the fatty acid profile of these cells by adding different combinations and concentrations of different fatty acids to the cell culture medium. Following this, we determined how such changes in cellular fatty acid composition affected the production of the pro-inflammatory cytokine, tumor necrosis factor-alpha (TNF-a).

Our results show that, under normal culture conditions, this cell line displayed a fatty acid profile unlike that of lung macrophages isolated directly from pig lungs. We were able to normalize the fatty acid profiles by co-culturing the 3D4/31 cells with linoleic acid (LA) and arachidonic acids (AA) for 24 hr. When a mixture of n-3 fatty acids, EPA and DHA (3:2 @ 50 uM), were added to the culture medium along with LA and AA, the overall fatty acid profile in the 3D4/31 cells was similar to lung macrophages isolated from pigs fed a diet containing fish oil. Culturing the 3D4/31 cells with LA and AA reduced their ability to produce TNF-a. Enriching these cells with EPA and DHA
diminished TNF-a production even further. We also investigated the impact of EPA and DHA treatments separately.

Our data suggest that both of these n-3 fatty acids reduced porcine macrophage TNF-a production to a similar extent and in a dose-dependent manner. Additional studies are needed to determine the specificity of this effect as well as the underlying mechanism(s) for n-3 fatty acids on immune cell function. In conclusion, the porcine macrophage cell line 3D4/31 appears to be a useful in vitro system to study the immune modulating effects of omega-3 fatty acids.

4 Molecular Phylogeny of a Rare New Zealand Species of Lepidium (Brassicaceae)

Nadya Ali, University of Washington

Endemic to New Zealand, Lepidium sisymbrioides, L. tenuicaule, and L. naufragorum are the three species used in this study. The goal of this project was to understand the phylogenetic placement of these relatives of the model plant Arabidopsis thaliana, including the only dioecious member of the Brassicaceae (L. sisymbrioides), and its close hermaphroditic relatives, L. tenuicaule and L naufragorum. An additional goal was to test whether these endangered New Zealand species belong to a monophyletic group.

For that purpose, we sequenced an intron of the floral transcription factor PISTILLATA (PI), a gene responsible for making petals and stamens. We used the intron to build a molecular phylogeny that places the three species studied within the larger Lepidium phylogeny as a first step towards understanding the evolution of dioecy in this flowering plant. Sequences were aligned and a phylogenetic tree was obtained using other published Lepidium species as an out-group. These results will advance the study of the evolution of separate sexes from hermaphroditism in plants, while making use of the tools available in the related model system.

5 SPF/TAP: A Novel Target for Hypolipidemic Drug Development

Myrissa Alston, Winston-Salem State University, NC
Angel Watson and Morris J. Clarke, Winston-Salem State University

Accumulation of squalene in mammalian cells is a hallmark of squalene (Sq) epoxidase (SqEp) inhibition by the allylamine anti-fungal, terbinafine, and novel hypolipidemic drugs, NB 598 and FR194738. The post-mevalonate pathway of cholesterol biosynthesis is an attractive target for the development of novel hypolipidemic interventions in the treatment of atherosclerotic disease and recent studies in SPF^{-1} knockout mice support this notion. We postulate that Sq accumulation in mammalian cells may result from disruption substrate transfer mediated by the cytosolic protein, supernatant protein factor (SPF), which shares amino acid sequence identity with tocopherol-associated protein (TAP). However, a specific ligand for SPF/TAP other than tocopherols has not been identified. Thus, our hypothesis is that the chemical series purported to be SqEp inhibitors (Musso et. al. 2003) in a crude mevalonate (MVL) and ATP Fortified rat liver homogenate-base assay system cause Sq accumulation by antagonizing SPF/TAP translocation of Sq to catalytically active SqEp.

We have investigated the effects of phenylpropargylamines (Ppa) on Sq accumulation in SPF/TAP expressing non-adherent P815 cell cultures utilizing APCI interfaced to LCMS for analyte detection. Accumulation of Sq was evaluated in the presence and absence of Ppa and exogenous mevalonate (MVL) in exponentially growing and confluent P815 cultures. Previous in vitro studies in Triton-X100 solubilized rat microsomal SqEp assay ruled out SqEp inhibition by Ppa while NB 598 exhibited sub-micromolar IC_{50} values. Likewise, HepG2 cells, lacking SPF/TAP, showed no Sq accumulation when culture was in the presence of Ppa.

Our results show that chloro-disubstituted Ppa caused Sq levels to increase 100-fold and 160-fold in confluent P815 cells in the absence and presence of MVL. Taken together, these findings provide compelling evidence for SPF/TAP as a new hypolipidemic target.

Future investigations will consider direct ligand-protein interactions between SPF/TAP and halogenated ligands by isothermal titration calorimetry. To further study the potential therapeutic benefit of Ppa ligands as novel hypolipidemic, a human cell line expressing SPF/TAP will be investigated. [This research was partially supported by the NSF HBCU UP award to Project Director, Dr. Abdul Mohammed and Winston-Salem State University.]

6 Characterization of Small Molecules Inhibitors of NF-kB That Sensitize Cells to Apoptosis

Priscilla Amara, Benedict College & University of Virginia
Marty Mayo, Benedict College, SC

A major focus in cancer research is to understand how carcinomas overcome cell death pathways. It is recognized that the ability of a cancer cell to overcome programmed death signals is one of the rate-limiting events in metastasis. Poor clinical prognosis for all carcinomas is directly associated with late-stage diagnosis and high propensity for metastasis to liver and bone. The transcription factor called nuclear factor-kappa B (NF-kB) is responsible for controlling life and death decisions in
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cancer cells. We know that BH3 proteins are bim, bid, and pulma.

There are two types of pathways in the cell: intrinsic and extrinsic. Intrinsic pathways are mediated by bim. These proteins, bim and bid, block survival protein and promote activation of death proteins, which are bak and bak. Recently, the Mayo laboratory has discovered a novel cell survival role for NF-kB. The p65 component of NF-kB specifically binds to a pro-death protein called Bim. Bim is a master regulator of intracellular death pathways and is proposed to act as a “guardian” against cancer metastasis.

Therefore, NF-kB facilitates metastasis by sequestering and inhibiting the pro-apoptotic function of Bim. Relying on structural studies that examine the characteristics of NF-kB: Bim interaction, Jason Chruma’s laboratory created small molecule inhibitors to p65.

The overall goal of my SRIP project was to examine whether small molecule inhibitors of p65 induced cell death. Using a model of cell viability, small molecule inhibitors of p65 were found to induce cell death. However, two of the selective p65 inhibitors tested were not as effective at inducing cell death as the parental scaffold compound. Additional experiments are needed to identify the effective concentration required to kill cells and to determine whether compounds are killing through apoptotic mechanisms. The most effective compounds anticipated from our studies are expected to facilitate clinical trials on new adjunct therapies for treating metastatic carcinomas (supported by GM068627 and HRD 0411486).

7 Generation of GFP Targeted to Trypanosoma Brucei Mitochondrion

Misghana Andemichael, University of Washington

African Trypanosomiasis is a disease caused by Trypanosoma brucei (T. brucei) species of parasites and transmitted to human individuals by the bite of the tsetse fly vector. Once the tsetse fly becomes infected, the parasite undergoes biochemical and structural transformations into procyclic forms in the midgut. These reach the salivary glands over time and are transmitted into the host as the tsetse fly bites its host. Procyclic forms transform into bloodstream forms upon entry in the blood of human hosts. Various metabolic processes are important for the parasite to survive in both the stages of its life cycle.

In order to study the contribution of mitochondrion in bloodstream forms towards pathogenesis, we wanted to generate a T. brucei-cell-line expressing green fluorescent protein (GFP) targeted to mitochondrion. This was achieved by cloning the GFP gene in an expression vector specific for T. brucei. The GFP gene was inserted in pT7-3V5-PAC vector using two restriction enzyme sites. One of the hallmarks of an eukaryotic cell is the presence of organelles. These organelles are membranous bodies, encompassing specific proteins with distinct functions and usually possessing a targeting sequence for efficient localization. In order to localize GFP to mitochondrion, its gene sequence was cloned in frame with a partial and complete gene sequence of a mitochondrially targeted protein Ndhk. GFP was linked to a Ndhk localization signal because Ndhk is a known protein in the complex I of organism’s mitochondria. In order to target the mitochondrion, vectors and inserts of interest were digested.

We processed the digested plasmids through gel electrophoresis, isolated inserts through gel purification, and ligated the vectors with particular inserts. Finally, the plasmids of interest were transformed into bacterial cells and screened for successful integration. Cloned pT7-mito-GFP plasmids were transfected into T. brucei cells with the aid of an electroporator. The transfected cells were observed for the mitochondrial localization of GFP through fluorescent microscopy. By observing T. brucei mitochondrion within the parasite, we would determine the role of T. brucei mitochondria in African Trypanosomiasis disease transmission. [This research was funded by the UW GenOM Project (NIH HG023601).]

8 The Role of the MicroRNA Endonuclease Dicer in Sea Urchin Embryology

Odinaka Anyanwu, Lincoln University, University of Delaware Deborah H. Powell, Jia L. Song, and Kirk J. Czymmek, University of Delaware

Dicer is an RNase III-type endonuclease and is responsible for the regulation of microRNA. MicroRNAs are non-coding RNAs about 22 nucleotides in length. Specifically, in adenocarcinoma, a form of prostate cancer, several miRNAs including those generated by Dicer, are found to be up-regulated and directly proportional to the severity of the cancer. Conversely, it has also been shown that down regulation of Dicer expression in mice showed an enhanced tumorgenesis phenotype.

Considering this strong link of Dicer to cancer as well, as microRNAs implicated in other cancers such as lymphomas, breast cancer, lung cancer and more, a thorough evaluation of how it is regulated and how alterations in its expression affect cells is needed.

For this research, sea urchins were used as a model system to evaluate the role of Dicer during embryonic development. Due to its optical transparency, the sea urchin embryo is very well-suited for microscopy experiments, allowing delineation of cell types expressing Dicer in the entire embryo. Furthermore, its full genome recently has been sequenced and found to have
significant homology to many important proteins in vertebrate biology.

The aims of this project were to develop a method for localization of Dicer and 3D Rendering of intact embryos with the subsequent identification of specific cell types.

Preliminary data suggested that Dicer may have a specific asymmetrical localization pattern during early gastrula development, while later stages lacked asymmetrical distribution.

9  
**Offactory Circuit Activation Induces Neurotransmitter Respecification, Affecting Behavior**

Geetika Arora, University of California San Diego

According to Dale’s principle, neurons that are already specified to express a specific neurotransmitter cannot respecify to express a different transmitter. Previous studies in the Spitzer lab have shown that activity can affect the type of neurotransmitter neurons expressed in the brain and spinal cord long after their endogenous transmitter has been specified. We are currently studying the effect of activity on the level of dopamine and GABA expression in the olfactory neurocircuitry involved in the kin recognition behavior in Xenopus laevis.

Specifically, we found that tadpoles exposed in kin-conditioned water during development display a higher number of dopaminergic cells in the olfactory bulb as compared to tadpoles raised in nonkin-conditioned water. We now want to know whether changes in dopamine expression affect the way tadpoles recognize their siblings. Detection of dopaminergic neurons in the olfactory bulb was done by immunoctyochemistry. To determine whether dopamine is the key player in kinship recognition, the dopamine receptor antagonist, sulpride, and the ablator, MPTP, were applied via agarose beads that were preloaded with the drugs and surgically implanted in the olfactory bulbs of 2-day-old embryos. The embryos were then tested for kinship recognition behavior.

10  
**Evolutionary Genetics of Aedes Aegypti**

Laura Barrera-Martinez, University of Washington  
Julia Brown, Yale University

Aedes aegypti is the major vector of yellow fever and dengue fever viruses across the world. As of today, there is no vaccine for dengue. Therefore, investigating the biology of the vector, Aedes aegypti, is crucial for disease control. To determine genetic variation across the geographic distribution of Aedes aegypti, we tested different MgCl2 concentrations and annealing temperatures when using a polymerase chain reaction to amplify DNA fragments. In addition, we used a cloning method to separate the heterozygote alleles. Here we report the genetic variation between different geographic populations of Aedes aegypti.

We conclude that African populations are very different than worldwide populations. These results may play a role in the approaches to control Dengue. [Thanks to the National Human Genome Research Institute and the Howard Hughes Medical Institute to the Goizueta Foundation for making this project possible.]

11  
**Parasitic Burden of the American Eel, Anguilla Rostrata by Anguillicolaoides Crassus in Two Estuaries of South Carolina**

Jan-Alexis Barry, University of the Virgin Islands  
Steve Arnott and Bill Roumillat, College of Charleston, SC

In Winyah Bay, and the Cooper River, SC, the American eel Anguilla rostrata, was collected to determine the age, length, weight, health assays, and sex ratios, as well as to determine the prevalence of the invasive parasitic swimbladder nematode Anguillicolaoides crassus. The invasive parasite A. crassus occurs in both Winyah Bay and Cooper River and could possibly cause deleterious effects on the populations of these two estuaries by lowering the reproductive output of the eels when the spawning season occurs.

I hypothesized that the aforementioned parameters would be statistically significantly different, when comparing these two estuaries during the months of June and July. For this research, eels were electro-fished from the Winyah and Cooper River (SCDNS’s highest recording of eel capture areas), weighed and measured, otoliths were removed for aging, liver and spleens were removed and weighed for health assays, gonads were removed for histological work in determining gender, and swimbladder nematodes were removed, counted, and weighed if present. No controls were used for this research. Prevalence was slightly higher in Cooper than in Winyah, but only in June. The length frequency of eels significantly differed between the two estuaries, with larger eels in Winyah Bay. Parasitic prevalence declined from June to July in both estuaries. Small/young eels were more likely to be infected than large/old eels, but this was found only during June. Infected eels had enlarged spleens, and were slightly heavier than uninfected eels. Liver weight was not affected by infection, but declined from June to July. Eel total mass was also heavier in infected eels vs. uninfected eels, and a sex ratio could not be determined due to paucity in the number of males.

Future studies might include looking at the aforementioned factors in different estuaries of South Carolina; continuing this research over a period longer than two months; and observing the sex ratio differences among populations. [Acknow-
Abstracts

12 Unidentified Gram-Positive Soil Bacteria Transported by Shoes from Madagascar and South Africa May Be Airborne

Letitia Beckett, Shaw University, NC
Alshae Logan, Shaw University

It is a concern that Gram-positive soil bacteria transported on international traveler’s shoes, non-regulated by Homeland Security, get free entry to the soils of the United States. Such is a concern because Gram-positive bacteria can survive for long periods in the atmosphere and can be widely dispersed by air currents unlike Gram-negative bacteria that enter the atmosphere and die from desiccation and solar radiation. Some airborne bacteria suspended in the air were proven to be hazardous to the environment and to human health, such as pathogenic bacteria Staphylococcus aureus and Bacillus cereus.

The scope of this work was to investigate the airborne characteristics of three unidentified Gram-positive soil bacteria with high CFUs (>100) which were transported by shoes from Madagascar and South Africa by plane. Passive monitoring was conducted to test the hypothesis that the Gram-positive bacteria (A1, B2, C3) are airborne. The control consisted of sampling the air of the boxes 1 and 2 (411 x 24W x 38.5H; 24W x 15.75H) prior to infection. The air in the two sterile plastic boxes 1 and 2 were sampled using the passive monitoring method to trap any airborne bacteria left suspended in the air.

A sterile petri-dish with AB Minimal Medium (ABMM) containing glucose was placed in the boxes for 7 days at 23°C. The plate was then incubated overnight at 37°C. The CFUs were determined using plating on (Luria-Bertani) LB medium containing 1.5% agar, with stock concentration at around 109CFU/ml. For monitoring bacterial air suspension after infection, three gram positive unidentified bacteria (A1, B2, C3) plated on similar medium was placed in the box 1 and 2 to infect the air then trapped using the same method.

The results showed that bacteria A1 (>155 CFU’s) and B2 (>160CFU’s) were trapped above 150cm high in Box 1. In box 2, C3 bacteria was trapped (CFU’s >110) at 120cm horizontal distance from the contaminants. The result was consistent with our hypothesis; bacteria A1, B2, C3 are all airborne; A1 and B2 tend to suspend vertically; C3 tend to suspend in a straightforward direction. For future research, the results presented in this experiment may be of importance to see the extent of dispersion and suspension of bacteria A1, B2, C3 in a larger room. Other modes of dispersal besides air, such as water could also be investigated. All of the manipulations were performed under sterile conditions. [This study was funded, in part, by NSF, AAAS, Shaw University, Dr. Greenfield’s South Africa Team and HBCU-Up].

13 Effect of Novel Small Molecule Inhibitors of Id Proteins (AGX-8 and AGX-51) on Cell Survival

Danaya Bethea, Clark Atlanta University

The Id proteins (Id1, Id2, Id3, and Id4) are negative regulators of differentiation that act by sequestering basic helix loop helix (bHLH) transcription factors like E47. Ids are highly expressed during embryonic development but in adult tissues their expression is rare to absent. However, Id proteins are required for tumor angiogenesis and are also highly expressed in many cancers. This expression profile suggests that Inhibiting Id function may be a viable approach to treat cancers at multiple levels, i.e., by blocking angiogenesis and limiting cancer cell survival.

Recently, we discovered small molecule inhibitors of Id protein activity based on the interaction of Id proteins with their bHLH partner E47. Two of these molecules, AGX51 and AGX8 blocked Id1–E47 interaction in a protein-binding assay and induced cancer cell apoptosis. However, the molecular mechanism of AGX8 and AGX51 is not well understood. In vitro and in vivo remains to be elucidated. The present study was designed to investigate the effect of AGX8 and AGX51 on genes involved in the cell cycle control and apoptosis such as p27, p16, BAX, Bcl-2, and known Id1 target genes, such as cyclin dependent kinase inhibitor (CDKNI) p21, in prostate cancer cells.

The objective was to understand if the small molecules blocked Id-regulated genes that influence cell cycle and apoptosis. The prostate cancer cells DU145, LNCap, and PC3 were treated with AGX8 or AGX51 (in DMSO) or DMSO (control) for 24 hrs. The cells were fixed and processed for FACS analysis (PI and AnnexinV) and/or RNA extraction for gene expression studies. The RT-PCR results indicated that AGX-8 (1um) significantly increased p21 expression that was associated with decreased cell proliferation as measured by CyQuant NF cell proliferation assay. That treatment with AGX8 was able to up-regulate p21 expression is the first and most direct evidence that this small molecule interferes with Id1 and allows E47 to induce p21 expression. Surprisingly, AGX8 also up-regulated the expression of p53, a tumor suppressor, but down-regulated the expression of HDM2, a tumor promoter.

Collectively, these results demonstrated that AGX8 is an effective antitumor drug. We are currently performing FACS analysis to demonstrate the effect of AGX8 and AGX51 on cell cycle and apoptosis.

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14
Dopamine Regulates Cortical Glutamate Homeostasis Through Astrocytes

Leighann Black, Claflin University, Washington, DC
Ariel Y. Deutch, Claflin University

Schizophrenia has a number of symptoms, including cognitive deficits. Among the latter are changes in certain types of memory and difficulties in planning that are thought to occur in the prefrontal cortex (PFC). Imaging and postmortem studies have revealed a decreased volume of the PFC and decreased density of PFC dopamine-containing axons in schizophrenia. Animal studies indicate that dopamine loss causes a loss of dendritic spines on PFC neurons, and postmortem studies report a similar decrease in PFC dendritic spines in schizophrenia. Dendritic spines are the major target of excitatory inputs onto neurons, which mainly are glutamate-containing axons.

One hypothesis of the cause of spine loss in schizophrenia is that dopamine depletion changes extracellular glutamate levels, which are known to modulate dendritic spine survival and maintenance. However, it is unknown if the source of the extracellular glutamate is altered neuronal glutamate release or a change in glutamate modulation by astrocytes, a type of non-neuronal cell. In the dopamine-depleted PFC of rats we determined levels of several glutamate-related neuronal and astrocytic proteins by immunoblots. PSD-95, the major protein present in the part of the spine specialized for receiving excitatory inputs, was not changed in the dopamine-denervated PFC, nor did we see a change in the dendritic protein actin. In contrast, levels of astrocytic proteins that regulate extracellular glutamate are changed in the dopamine-denervated PFC.

These data suggest that altered extracellular glutamate levels responsible for spine loss in PFC cells may be due to changes in astrocytes rather than neurons. [This project was funded by the Leadership Alliance and the Vanderbilt Brain Institute.]

15
A Comparative Study of Herbs vs Cipro Against Escherichia Coli and Staphylococcus Aureus

Alexandria Broadnax, Dillard University, LA
Jasmine Hardman, J. Bernard Singleton, Lewins Walter, and Gabrielle High, Dillard University

Western medicine is widely considered the sole treatment for illnesses. It is defined by the National Cancer Society as, “A system in which medical doctors and other healthcare professionals treat symptoms and diseases using drugs, radiation, or surgery.” The problems with western medicine such as the use of antibiotics is the side effects and the growing resistance of microbes. Herbal remedies, on the other hand, have been used effectively for a far greater period of time with little to no side effects.

The purpose of this study was to compare the antimicrobial effects of herbs and an antibiotic on Escherichia coli and Staphylococcus aureus. Those that were included in the study were mint, onion, ginger, garlic, thyme, and the antibiotic Ciprofloxacin 500mg. 10g of each herb and the antibiotic, Cipro, were measured and pulverized. Once pulverized, some of the herbs were mixed together two at a time, while the others were tested separately. The herbs and the antibiotic were diluted with 5 ml 0.9% saline solution. Filter paper discs were then saturated with the solutions along with a control of saline solution. These were plated on nutrient agar plates inoculated with E. coli or S. aureus. The plates were then incubated for 48 hours.

The final experiment was done to compare garlic, the most effective herb, with the antibiotic Cipro for the most activity on nutrient agar plates against the bacteria. The results indicated that garlic (allicin) had the greatest ability to fight the bacteria compared to Cipro and all the other herbs in the study. Future studies will include comparing other herbs with different antibiotics against some other bacteria. [This Study was supported, in part, by a grant from NSF/LAMP awarded to Dr. Abdalla Darwish, DU-Director, Dillard University, New Orleans, LA, 70122.]

16
The Role of Brassica rapa FLC Genes in Flowering Time

India Brown, Fort Valley State University, GA
Amy Litt, Fordham University, NY

The goal of this project was to find out what genes were responsible for the evolutionary change in flowering time. My first question was: Is there allelic variation in the genes, and, if so are alleles correlated with flowering time? I hypothesized that there would be allelic variation correlated with flowering time. I also hypothesized that gene expression would first increase and then decrease.

We examined the relationship between flowering time and genetic variation in B. rapa Flowering Locus C (FLC) genes, which suppress flowering. I looked at the 1st intron, because it is responsible for gene expression. A total of 30 samples, 15 from the 1997 Backbay (BB) population and 15 from the 2004 (BB) population, were used for amplification of the 1st intron using PCR and sent off for sequencing to look for allelic variation in three of the FLC genes. Sequence data of the 1st intron revealed no allelic variation, which did not support my hypothesis. In addition, for future experiments there is a need to have an established method for studying gene expression through the course of development within an individual. No one has looked at variation within a single individual or natural population.
My second question was: How does expression change over the course of development of an individual? I hypothesized that gene expression would start off high and then decrease over time. One FLC gene was used to view gene expression using quantitative real-time PCR (qRT PCR) to determine how gene expression changes over the course of development within a single individual. qRT-PCR showed an increase in expression from the first to the second sampling time point, followed by a decrease. The initial increase did not occur in all of the samples, so more analyses will have to be done.

There was little to no allelic variation shown with my sequence data, which resulted in my hypothesis not being supported. This could be because random samples were used with little difference in flowering time. I hypothesized that gene expression would first increase and then decrease, but my results showed an initial decrease and then an increase. Based on these results, there is a need to have more tests and analyses in the future. [This research was supported, in part, by a grant from NSF HBCU-UP (IHRD-0625289) awarded to Sarwan Dhir, PhD, Director for the Center for Biotechnology, Fort Valley State University, Fort Valley, GA 31030.]

17
The Effect of Curcumin on Lipopolysaccharide-Induced Lesions in the Liver and Pancreas of 129 SvEv mice.

Rashawnda Brown, Langston University, OK / Tuskegee University

The aim of our research is to understand the role that curcumin will have on diabetes mellitus. Diabetes mellitus is a disease in a group of metabolic diseases characterized by high blood glucose levels that result from defects in insulin secretion, or action, or both. Lipopolysaccharide (LPS), a gram-negative bacterium, increases the number of glycogen deposits in the liver and may cause hyperglycemia, which is a cause of diabetes.

We hypothesized that curcumin, an effective antioxidant, would prevent LPS from causing hyperglycemia because curcumin has been shown to inhibit the growth of salmonella and E. coli. Curcumin has also been proven to prevent LPS toxicity. To test the hypothesis, 25 male and 25 female 129 SvEv mice were induced with different treatments of curcumin, LPS, or both over a period of 48hrs. Curcumin reduced the number of glycogen deposits in the mice treated with curcumin first. In the mice treated with LPS first, the number of glycogen deposits were the same as the mice treated with LPS alone. The results proved that curcumin could serve as a preventative but not an actual treatment. [I would like to acknowledge the IBS-REU program at Tuskegee University as well as the national science foundation.]

18
A Comparison of Study Time for High School Students, First Time Freshmen, and Upperclassmen Enrolled in a College Introductory Biology Course

Tierra N. Butler, North Carolina Central University
Wendy Heck Grillo and Gail P. Hollowell, Department of Biology, North Carolina Central University

The academic success of undergraduate students in introductory science courses can be influenced by numerous factors, including class attendance, class participation, completion of assignments, time spent studying, and seeking help or advice (Brophy, 2004). In the introductory biology course at our university, the course instructors explain to the students during the first week of class that there is an expectation in higher education that students should study 1-2 hours each day for each hour in class.

This introductory biology course is the first core course for biology majors, science majors, and other majors who will be taking upper-level courses in biology. This course consists of 3 lecture hours and 2 laboratory hours each week. All of the students enrolled in this course had a minimum SAT score of 1000, and the laboratory component was independent of the lecture material presented in class. Three distinct student population groups were enrolled in this class: high school students, first-time freshmen, and upperclassmen (which included one student enrolled in the course pursuing a second degree).

It was hypothesized that all students would study the course material at least 6-8 hours each week, with the upperclassmen studying the most time and and the high school students studying the least. To measure this hypothesis, all students were asked to complete weekly study logs that described their study activity and indicate how much time they spent studying the course material each day of the week. Data from the beginning of the semester to midsemester indicated that the upperclassmen studied the course material the most (3.66 hrs per week) and first-time freshman studied the course material the least (2.60 hrs per week). Results from this study will help course instructors in higher education determine how study time and study activities influence academic success of undergraduate students in an introductory science courses.

19
Cellular Processes Supporting Intracellular Pathogen Spread From Cell to Cell

Klondy Canales, University of Washington / Yale University
Ana-Maria Dragoi and Herve Agaisse, Yale School of Medicine

Listeria monocytogenes is a bacterial pathogen that proliferates in the cytosol of mammalian epithelial cells and spreads
intercellularly using actin-based motility mediated by the bacterial protein ActA. Listeria propagates from one cell to another by forming protrusions that extend and are engulfed by the neighboring cell. Our preliminary results suggest that Rab22 and Rab35 of the GTPases family may contribute to Listeria spreading by facilitating the formation and uptake of the membrane protrusion produced during infection. We hypothesize that Rab 22 and Rab35 are required for Listeria monocytogenes propagation. In order to confirm the differential localization of Rabs within the cell, adherent HeLa 229 cells were co-transfected with RFP fusion Rab22 or Rab35 and GFP fusion plasma membrane marker.

To analyze the loss-of-function effect of Rabs on the listeria spreading, we also created dominant-negative mutants by site-directed mutagenesis. We found that Rab35 localizes at the plasma membrane surrounding the Listeria protrusions from the primary infected cells. Rab22 is localized in the cytosol most likely in the early endosomal compartments and around the Listeria vacuole in the receiving cell. The dominant negative GDP-bound forms of the Rabs have a different cellular localization and are not confined in the Listeria protrusions.

Our results confirmed previous findings and suggest that loss-of-function mutations in Rab22 and Rab35 might affect the Listeria protrusion formation and propagation. Our findings offer a new level of regulation by Listeria of the cellular trafficking machinery in order to promote an efficient infection and may help discover new therapeutic strategies.

20
Expression and Regulation of Survivin in Prostate Cancer

Maygen K. Cardona, Boise State University, ID

Survivin is an Inhibitor of Apoptosis Protein (IAP), which makes it responsible for cell proliferation and survival by inhibiting regulated cell death and promoting mitosis.

The exact role that it plays in prostate cancer is not yet fully understood; expression and regulation of Survivin is the primary focus of my project. The way Survivin was studied was through fractionating various cancer cell lines (LaPC-4, PC-3 E+, VCAP, C4-2 and DU145-Spindle, Round and Tight) and isolating the nuclear and cytosolic components. These fractionated samples were then treated and analyzed using Western Blot analysis being probed for nuclear and cytoplasmic Survivin, respectively.

The two main goals of my project were to see if there is a difference in expression between nuclear and cytosolic Survivin, as shown in previous immunohistochemical staining, and also to test if movement of the Androgen Receptor from the nucleus to the cytoplasm occurs, when the cell components are treated with charcoal-stripped media.

The found results were that there is in fact a difference between nuclear and cytoplasmic Survivin as indicated by band definition in Western Blot analysis for all lines used. There was also movement seen in the Androgen Receptor of two cells lines (LaPC-4 and C4-2) with charcoal-stripped media. Since little is known about Survivin, other than the fact that it is most readily seen in cancerous cells in humans, the hope is that through my results we will be able to inhibit expression of the protein by understanding what functions the two forms have.

21
Use of Diagnostic Tools in the Detection of Spiroplasma spp. from Experimentally Infected Goats

Paige Chandler, Louisiana State University
Charles Boudreaux, Christie Landry, Hilari French, and Philip Elzer, Louisiana State University

Transmissible Spongiform Encephalopathies (TSEs) are persistent brain infections characterized by lesions in the CNS with a buildup of protease resistant prions in brain tissues (Doherr et al. 2007). Examples of TSEs include BSE in cattle and CJD in humans (Bastian et al. 2007). Suckling Mouse Cataract Agent (SMCA) is a laboratory strain of Spiroplasma mirum, first discovered in a rabbit tick (Tully et al. 1982). Previous studies have shown that ruminants experimentally infected with SMCA intra-cranially exhibit similar neuropathologic changes as those described in animals infected with TSEs. The recently identified adhesin protein, present in SMCA, is theorized to play a role in the attachment of the bacteria to its host. We hypothesized that Spiroplasma mirum SMCA could be isolated from tissues in animals infected with S. mirum SMCA.

We further hypothesized that we could create a diagnostic assay for the detection of Spiroplasma in infected animals. If this research were to continue and more conclusions found supporting the theory that this bacteria is a contributing factor to TSEs, we could eradicate it from our domestic farm animals and also potentially develop therapies for people with CJD.

Samples from a goat previously injected with SMCA were collected. All samples were placed in a 1 mL vial of M1D broth and allowed to incubate at 30°C. Color change media was used to indicate if samples from goat tissues contained any growth. Once color change was observed in media, 5 µL of culture were sealed with clear nail polish on a slide and observed by dark field microscopy to identify S. mirum in the broth. If a positive dark field image was observed, then a standard PCR test was run. (New England Biolabs). PCR reactions were designed to amplify the adhesin gene for use in a TA cloning vector for expression in E. coli. Western blots using anti-HIS primary antibody and serum from infected goats were performed to show that the adhesin is recognized as an antigenic protein from SMCA.
It was concluded that SMCA can be isolated and detected by dark field microscopy and confirmed by PCR. SMCA adhesin antibodies were observed and the SMCA adhesin protein was expressed in E. coli. [This study was supported in part by LSAMP -REU, NSF/USDA, and LSU AgCenter State Project #LAB03774 research monies. We would like to acknowledge the contributions of: Dr. Frank Bastian, Tony Bridges, and Sue Hagius, Department of Veterinary Sciences, LSU AgCenter and Dr. Ron Thune, Russ Freeland, and Christine Darnall, LSU School of Veterinary Medicine.]

22
Efficacy of Anti-Inflammatory Synthetic Peptide in a Murine Model of Ulcerative Colitis-linked Colon Cancer: IL-10 Deficient Mice

Frank Chestnut, III, Tuskegee University, AL

Interleukin 10 (IL-10) is a cytokine with anti-inflammatory properties that is produced by monocytes and lymphocytes. IL-10 down regulates the expression T helper cells (Th 1), and prevents the binding of the major histocompatibility complex (MHC) class II antigens. IL-10 homozygous deficient 129SvEv mice develop ulcerative colitis in response to their commensal flora, which can progress to adenocarcinomas in 6 months.

Our goal was to better understand the relevance of IL-10 in ulcerative colitis and the possible benefits of the synthetic peptide 2A21-10 (10N). The 10N peptide is an IL-10 homolog that has been shown to have anti-angiogenic and anti-inflammatory properties. We hypothesized that the 10N peptide would abrogate inflammation and prevent ulcerative colitis, and ultimately, colon cancer, in an experimental disease model.

To test this hypothesis, we purchased 129SvEv Knockout (KO) and Wildtype (WT) breeding pairs and used their progeny for the experiment. All mice were between the ages of 4-6 weeks and weighed 30-40 grams. 54 mice were reared under SPF husbandry conditions and with a diet of autoclaved chow and water, ad libidum. Another 54 mice were reared under conventional husbandry conditions with standard chow and water, ad libidum. IL-10 Knockout mice and Wildtype mice were split into 6 experimental groups: Untreated (Control), Sham (0.9% saline solution), 0.5mg/kg body weight dosage Prophylactic Treatment group, 5mg/kg body weight dosage Prophylactic Treatment, 0.5mg/kg body weight dosage Frank group, and 5mg/kg body weight dosage Frank group. The injections were administered once a week for 10 weeks. At the conclusion of the experiment, the mice were euthanized with carbon dioxide, dissected, the organs were fixed in 10% Neutral Buffered Formalin, embedded in paraffin, and stained with hematoxylin and eosin.

The preliminary results reveal that disease may be dependent on husbandry conditions, and the treatments used. Animals had varying stages of disease with adenocarcinomas frequently occurring in IL-10 KO mice that were reared under conventional husbandry conditions. Also, these initial results seem to indicate a role for 10N in the treatment of colitis and colitis-induced cancers. It is our greater hope that the results will lead to new treatment avenues for individuals with inflammatory diseases and neoplasms.

23
Effect of Combining Body Weight Supported Treadmill Training and Functional Electrical Stimulation (FES) in Spinally Contused Rats

Lauren Conn, California State University, Los Angeles

Body weight supported treadmill training (BWSTT) and functional electrical stimulation (FES) are two therapies that have been used to improve the recovery of walking after spinal cord injury. During BWSTT, the person is suspended over a treadmill while leg movements are assisted by therapists. FES is the electrical stimulation of nerves that produce functional muscle contractions.

The objective of the present study was to examine the effects of combining FES and BWSTT in a rodent model of spinal cord injury. We hypothesized that the ability of neural circuits in the spinal cord to generate walking will be enhanced by combining FES and BWSTT.

Twelve rats received a spinal cord contusion injury at the mid-thoracic level. One week later, half of the rats were trained to perform BWSTT using a robotic system to assist hindlimb movements. FES was delivered through electrodes placed in the tibialis anterior muscle. Stimulation of the tibialis anterior was timed with forward swing of the hindlimb and resulted in an enhanced flexion of the ankle. The other half of the rats received the same amount of muscle stimulation, but the FES was delivered without BWSTT.

Qualitative analyses of video footage showed that after 4 weeks of training, stepping performance was better in the rats that received the BWSTT + FES than in the rats that received FES only. Further analysis will be conducted to determine the differences between the two groups in number of weight bearing steps. To determine if the therapy affected neural circuits involved in walking, we will examine the local expression of the brain derived neurotrophic factor and synaptophysin in motor neurons of the spinal cord. These are biochemical markers believed to play a role in the recovery of walking following spinal cord injury.

The findings of this study will have implications for current rehabilitation and physical therapies that address spinal cord injured individuals. If our hypothesis is supported, future studies will be performed to investigate the physiological and
biochemical mechanisms by which FES and BWSTT enhances neuron function and stepping recovery. [This project was funded by a NIH grant, NS 42951-01S and an administrative supplement via AARA awarded to Dr. Ray De Leon Ph.D., Associate Professor in the Department of Kinesiology and Nutritional Science, California State University, Los Angeles 2010. Partial support to, Lauren Conn, was provided by the LSAMP program at CSU, Los Angeles which is supported by the National Science Foundation under Grant No. HRD-0802628 and the CSU Office of the Chancellor.] Other authors: Pamela See,Tekang Chao, Sina Askari, Dr. Debora Won, Teresa Lazzaretto, Cheryl Chow, Elizabeth Partida, Marvin Hamlin, and Dr. Ray De Leon, California State University, Los Angeles.

24 Mesenchymal Stem Cell Viability and Imaging with Fluorescent Nanoparticles
Jarrett L. David, Morehouse College, GA
Kevin Townsend, Morehouse College

A challenge with stem cell therapy is identifying where the injected cells will travel; one potential solution is the use of fluorescent biomarkers. In vivo they would give their target a fluorescent color which can be identified using a microscope equipped with a fluorescent filter, this would allow researchers to see if the cells have reached the targeted area and from there they will be able to modify the procedure, making it more effective.

Fluorescein isothiocyanate or (FITC) has proven to be a potential biomarker because of its low toxicity. When FITC is combined with mesoporous silica nanoparticles and capped with a contrast agent such as Bismuth, it produces a very effective tag.

We have tested these fluorescent nanoparticles at various doses with mesenchymal stem cells. These stem cells can not only give rise to bone marrow, cartilage, and fat cells, but they also support hematopoietic stem cells. First the cells were tripansized then seeded onto a 24 well plate; this allowed us to see if there was an uptake of the fluorescent nanoparticles by the cells and if they were still viable at the various doses. Images of the tagged stem cells were taken at 20x magnification with a microscope equipped with a fluorescent filter. The pictures were analyzed using both Cellprofiler and Image computer software.

The goal of this experiment is to see the highest dosage of fluorescent nanoparticles we can expose the stem cells to without killing them. [Special thanks to: Dean Wolff and Dr. Peeples as well as the SROP/McNair Program at the University of Iowa, without them this would not be possible.] References: [1] Martinus H.V. Werts (2005). “Making Sense of Lanthanide Luminescence” Science Progress 88(2):101-131 [2] Suzanne Kaderetre, P.h.D. (2005, March 31). “Adult Stem Cells” Week International Society for Stem Cell Research, p. 1. July 13, 2010.]

25 Regulation of the Innate Immune System through PIAS3 mediated SUMOylation of IRF-3
Sergio J. Davila, University of California, Los Angeles (UCLA)
David Jesse Sanchez and Genhong Cheng, UCLA

When the innate immune system recognizes that a cell is being infected by a virus, a key transcription factor, Interferon regulatory factor-3 (IRF-3), becomes activated and induces expression of the antiviral cytokine Type I Interferon (IFN). This conserved pathway is crucial in the immune defense against viruses. However, prolonged induction of IFN may lead to autoimmune diseases such as arthritis and systemic lupus erythematosus or cause excessive tissue damage at virus infected sites. Because of this, deactivation mechanisms of the IRF-3 pathway are required to maintain organismal homeostasis. Covalent attachment of small proteins like the small ubiquitin-like protein modifier (SUMO) to a larger active protein has been found to be important in disruption of protein function.

We hypothesized that SUMO played a repressive role in the innate immune system by covalently binding and repressing IRF-3 activity. We used co-Immunoprecipitation (co-IP) to characterize IRF-3 and SUMO interactions using a wildtype and a mutant IRF-3 construct lacking the conserved SUMOylation motif. To further understand how IRF-3 is SUMOylated after activation, we also looked at what protein functions as a SUMO ligase to induce IRF-3 to be modified by SUMO. A luciferase reporter gene assay was utilized to examine how SUMO and members of the Protein Inhibitor of Activated STAT (PIAS)-SUMO ligase family affected IRF-3 modulation of IFN expression. Our results demonstrate that IRF-3’s induction of IFN is negatively affected when SUMOylated and that Pias3 is the SUMO ligase responsible for IRF-3 SUMOylation. Our findings elucidate the negative regulatory role of Pias3 and SUMOylation on the mammalian innate immune system.

This work sets the stage for future explorations into how cells control the production of IFN leading to better antiviral therapy as well as control of autoimmune diseases that come from overproduced IFN. [This study was supported, in part, by the grant NIH IMSD GM 55052.]

26 Genome Size in the Genus Thalictrum
Rebecca de Frates, University of Washington

Polyplody events in plants and animals can lead to change and variation in a genus. This study was designed to discover the polyplody events in the genus Thalictrum and the evolutionary implications of these events. The genus Thalictrum varies in ploidy level tenfold ranging from 2°C to 10°C. The ploidy level was estimated using flow cytometry to find genome size based on peaks and number of mega base pairs from the data. The
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Genome size lead to the calculation of ploidy levels in the specific species of the genus.

The data was combined with previous research in the phylogeny done by the Di Stilio lab. Using the ploidy levels in the phylogeny, the occurrences of genome duplication were located, showing the importance of polyplody and its implications in evolutionary development. Further research finding ploidy levels for the full phylogeny will be conducted by the Di Stilio lab. [Acknowledgements: UW GenOM Project: ALVA 2010 (NIH HG02360-10) and the National Science Foundation (IOS-RIG 0818836).]

27 Domain Analysis of the GRB7/FHL2 Protein-Protein Interaction
Olivia DeLeon, Dine College, NM

GRB7 is a protein involved in cell migration related to cancer progression. GRB7 (growth factor receptor-bound protein 7) has been found to be over-expressed in nearly 30 percent of breast cancer cases. We have recently shown that FHL2 (four and a half LIM domains isoform 2) and GRB7 interact in the mammalian cell environment. Our hypothesis is that the binding of GRB7 and FHL2 is specific to individual domain interactions of each protein.

Our research will determine which individual domains of FHL2 and GRB7 bind to each other. By sub-cloning and direct protein-domain binding screens, we will characterize the interactions between GRB7 and FHL2. Preliminarily, we have determined the FHL2-LIM-1 domain successfully binds to the GRB7-RA-PH domains. Additionally, the interaction appears to be strongest between the FHL2-LIM1 and GRB7-RA domains. The individual domain interaction of FHL2-LIM-1 and GRB7-RA shows the interaction in the mammalian cell environment may be isolated to the GRB7-RA domain or the FHL2-LIM-1 domain. Further studies are underway to screen other FHL2-LIM domains for binding to the GRB7-RA-PA domains.

We hypothesized that the Ece1 protein levels differ in the two recombinant congenic strains. These strains were chosen because they harbor different alleles of the chromosome 4 QTL. The proteins’ samples were obtained from mouse hearts. The samples were prepared in a homogenate buffer at a pH of 7.2. They were centrifuged at 500 rpm for 10 mins. The protein samples were separated through gel electrophoresis. The gels were run at 100V and 0.01A for 1-2 hrs. The primary and secondary antibodies used were rabbit anti-mouse (1:400) and goat anti-rabbit (1:1000), respectively. The membrane was prepared on transparent film in Amershams ECL reagent. The detection was done using a Kodak Film Developer. The protein concentration was measured via Bio-Rad Bradford Assay. Protein standards were prepared with concentrations of 0.2, 0.4, 0.6, 0.8, and 1 mg/mL using 5 mL of dye in each tube along with 100 μL of each corresponding standard solution. They were vortexed and incubated at room temperature for 5 mins. The absorbance was measured at 595 nm. When the resulting Films were compared, the gene Ece1 was found to be more abundant in the mouse strain HcB-23.

Previous studies have found that the gene Ece1 present on chromosome 4 catalyzes the cleavage of big endothelins to endothelins. We compared the expression of this gene in the strains by comparing the protein level. In the case of Ece1 protein, the sizes of the different isoforms were too similar to allow them to be distinguished. Western blot was used to determine the extent to which Ece1 protein levels differ between HcB-8 and HcB-23 mice. It was confirmed that HcB-23 tissues contained more Ece1 protein. Future experiments like immunohistochemistry can be conducted to see which cells express the protein. Another way is to study the expression of eNOS in the same congenic strains. [This research was supported, in part, by a grant from NSF HBCU-UP (#HRD-0625289) awarded to Sarwan Dhir, PhD, Director for the Center for Biotechnology, Fort Valley State University, Fort Valley, GA 31030.]

29 The Regulation of Fatty Acid Synthase in Prostate Cancer by Dietary Folate and Alcohol
Laura Dewberry, Tuskegee University / University of Pittsburgh
Dr. Denise O’Keefe (Summer Mentor), Kathryn M. Sobek, and Jessica Cummings, Tuskegee University and University of Pittsburgh

Prostate Cancer is a form of cancer that develops in the prostate gland and is classified as an adenocarcinoma, a glandular cancer. According to the American Cancer Society in 2010 there will be approximately 200,000 new cases of prostate cancer and almost 30,000 deaths from this cancerous disease. Although there are many diagnostic tools, testing, and screenings developed to detect prostate cancer, almost every male will get prostate cancer within his lifetime.
While there are many undiagnosed cases of prostate cancer, the incident rates among African-American males are twice the rates for White males. The majority of these men will die from Androgen Independent Prostate cancer (AIPC), which currently has no cure. Our objective in the O’Keefe lab is to identify the mechanisms of gene regulation that induce prostate cancer. We study this in the context of varying concentrations of folate. Folate is a B vitamin required for cellular proliferation, DNA repair, and methylation reactions.

Previous data from our lab has shown that many prostate cancer patients have overly sufficient levels of circulating folate and that high levels of folic acid intake correlate with increased prostate cancer growth. Data in the literature suggest that in mice, dietary folate regulates FASN expression. Fatty Acid Synthase (FASN) is an enzyme that synthesizes long chain fatty acids and is highly expressed in prostate cancer tumors.

The aim of our study was to determine if folate regulates FASN expression in human prostate cancer cells. Furthermore, because alcohol is known to interfere with folate metabolism, we will assess if the combination of folate and alcohol will affect FASN expression. In doing so, we will test these hypotheses by analyzing FASN mRNA expression by quantitative real time PCR after treatment with varying concentrations of folate and alcohol in prostate cell lines. Protein expression of FASN will be examined by western blot. Consequently, if we find that folate regulates FASN expression, we will be able to limit the growth of this cancerous tumor as well as lower death rates of these men by recommending a diet with specific safe levels of folate.

After conducting numerous experiments our preliminary data shows that FASN is down, regulated in response to low folate, higher levels of Folate lead to higher levels of FASN expression, high alcohol consumption decreases cell growth and little to no alcohol increases cell growth. Future Plans: We will continue to research FASN and its role in gene regulation, study the effects of folate & alcohol on FASN expression, and examine FASN expression in human tumor xenographs grown in mice with different folate diets.

30 Evaluating the Effects of Community-Dependent Multiple Antibiotic Resistance in Polymicrobial Biofilms

Silvia Dimitrova, Georgia State University
Bianca Islam, Kristen Howery, Bryan Stubblefield, and Eric S. Gilbert, Georgia State University

Synergistic interactions among bacteria living in multispecies biofilms contribute to diverse processes including antibiotic detoxification. We hypothesized that the number of each cell type present at the initiation of biofilm formation would influence the development of synergistic interactions, in turn affecting the mature biofilm structure.

To test this hypothesis, we worked with two strains of antibiotic resistant Escherichia coli, one with resistance to ampicillin and the other with resistance to spectinomycin. Bacteria were initially placed on the surface of a flow cell (a device for cultivating biofilms) by recirculating them in phosphate buffer for up to 4 hours. Subsequently, a growth medium containing ampicillin and spectinomycin at twice the minimum biofilm inhibitory concentration was introduced to the flow cell. The concentrations of antibiotics that were selected were shown to be sufficient to inhibit the growth of each strain when growing alone.

After 48 hours, it was observed that under some conditions, microcolony development occurred, suggesting that the two strains of bacteria worked together to cooperatively detoxify the two antibiotics. To better understand the necessary conditions that permitted this growth, we investigated the effect of ratios of the two types of bacteria on the ability of the biofilm to form.

To accomplish this, we seeded the surface of the flow cell with ratios of the two types of bacteria, E. coli ATCC 33456 pUCSpec and E. coli ATCC 33456 pEGFP ranging from 5:1 to 1:5. Controls were performed to determine biofilm growth for each strain alone at the respective ratio cell numbers in the presence of both antibiotics. The two types of bacteria could be distinguished from one another by fluorescent labeling, and their presence in the flow cell was determined by confocal laser scanning microscopy.

Preliminary results indicated that microcolonies could form at a 5:1 ratio of strain pUCSpec to strain pEGFP, but not at ratios of 1:1 or 1:5. Further experiments with adjusted concentrations for the spectinomycin and ampicillin antibiotics indicated that the ratio which resulted in the most biofilm biomass was the 1:5 pUCSpec strain to pEGFP strain ratio.

Our current efforts are directed towards characterizing these results in a definitive way. Future research efforts will be geared toward examining the intracellular distance between cells in each ratio. Also, the experiments will be repeated using other model systems. This research is medically relevant because if the optimal ratio for biofilm formation in different model systems is known, treatments for biofilm-based diseases can be aimed at disrupting this optimal ratio and preventing severe infections. [The authors acknowledge the Howard Hughes Biotechnology Scholars Program, the Georgia State University Honors Assistantship, and the Louis Stokes Alliance for Minority Participation (LSAMP) program for their funding and support.]
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Cues used by Habrobracon hebetor (Hymenoptera: Braconidae) to Locate Hosts

Julius Eason, Fort Valley State University, GA
Robercy Matute, Melinda Davis, and George Mbata, Fort Valley State University

Among all stored-product moth pests the Indianmeal moth, Plodia interpunctella (Hübner) (Lepidoptera: Pyralidae), is especially important in the US and worldwide. P. interpunctella is a pest in milling machinery and other food processing plants, warehouses, bakeries. It contributes significantly to losses caused by insects of stored commodities, particularly stored peanuts, stored cereals and processed food. The parasitoid, Habrobracon hebetor (Say), is well known as a useful natural enemy of Pyralid moths of stored grains and grain products, and a useful tool in environmental compatible procedures for managing moth pest populations in stored grains. Many parasitoids are known to use semiochemicals emanating from their hosts, or host’s habitat as cues to locate hosts. It is hypothesized that semiochemical cues used by the parasitoid to locate the larval host emanate from the host, hosts-food or habitat.

The role of semiochemicals, in host location by the parasitoid, was investigated in Y-tube and four-way olfactometers, by assaying responses to stimuli associated with the Indianmeal Moth, Plodia interpunctella. Orientation of mated parasitoid females was measured in response to the following stimuli: Indianmeal moth sex pheromones, hexane extracts of residue of the rearing medium, female adults or larvae of Indianmeal moth. All stimuli elicited significantly better responses than those to blank controls. Female parasitoids that had not been previously exposed to Indianmeal moth larvae (naive) had a shorter latency period and response time than those that had been previously exposed to moth larvae (experienced). Odors emanating from life moth larvae elicited the strongest responses.

Comparison of responses in a four-way olfactometer, when completed, will determine which of the stimuli or combinations thereof will offer the greatest attraction to both naive and experienced parasitoid. [Acknowledgements: This study was partially funded by NSF-HBCU-UP program.]

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The Effect of Gravitational Changes on Transposons in Eukaryotes

Theophilus Edovia, Southern University at New Orleans
Illya Tietzel, Southern University at New Orleans

Transposons are genetic elements that move from one location to another on a chromosome. In eukaryotic organisms, transposable elements function in regulating gene activity, cause mutations and diseases, as well as contribute to species differentiation. Space flight involves changes in gravity which can be experienced by eukaryotic organisms. Eukaryotic organism from former space flights exhibited mutations. Meanwhile, the question whether changes in gravity influence transposons in eukaryotes has not been emphasized at all, although it is relevant to the health of living organisms experiencing space flight.

We hypothesize that changes in gravity relative to the earths might influence activity of transposons. To test this hypothesis, the eukaryotic fruit fly Drosophila melanogaster will be cultivated and subjugated to different centrifugal forces to monitor activities of transposable elements using molecular biology technologies. Control groups will be retained at 1 gravity (g). Flies were euthanized with chloroform. Molecular biology technologies are used to measure the transcript levels and frequency of the hobo transposons.

The methods used are (1) RNA and DNA isolation, (2) (PCR) and (3) RT (Reverse Transcription)-PCR. In regard to results available, fruit flies were grown successfully in Formula 4-24 instant Drosophila medium. Furthermore, DNA and RNA were extracted using Trizol according to manufacturer’s instructions. Currently RT-PCR and analysis of the transposon expression and frequency is undertaken using the published primers for hobo transposon. It is concluded that cultivation with Formula 4-24 is feasible and requires 2 weeks to grow a sufficient amount of flies. Euthansia with 0.1 ml was successful. Moreover, the TRIZOL method accomplished lysis of cell and isolation of DNA. (RT-PCR remains to be conducted. [This research was funded by the NASA/LEQSF(2005-2010)-LaSPACE Subcontract 43709.]

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The Role of PI3K/AKT/PTEN in Human Embryonic Stem Cells

Erika Escobar, University of California Los Angeles

Human embryonic stem cells (hESCs) have enormous potential for regenerative medicine. hESCs are derived from the inner cell mass of human blastocysts, which contain pluripotent cells. These cells can differentiate into cells from all three embryonic germ layers. In addition to their pluripotency, hESCs can safely contribute to regenerative medicine; pathways regulating their self-renewal and differentiation must be elucidated. A number of cellular pathways have been shown to play a role in hESC fate decisions, including the PI3K/Akt/PTEN pathway. However, the mechanism by which the PI3K/Akt/PTEN pathway influences hESC pluripotency and differentiation remains unknown.

We hypothesize the PI3K/Akt/PTEN pathway plays a role in maintaining hESC pluripotency in part by regulating the expression of pluripotency genes. To test this, we generated a
knockdown of PTEN in hESCs (PTEN KD hESCs), in which we see activation of the PI3K/Akt pathway, as expected. Through real time PCR and western blot assays, we compare the gene and protein expression profiles of PTEN KD and control nontarget (NT hESCs).

Our preliminary results demonstrate that the PI3K/Akt/PTEN pathway regulates pluripotency by maintaining increased expression of pluripotency genes, including Oct4 and Nanog. Furthermore, we studied the ability of PTEN KD hESCs to differentiate into mesoderm and endoderm using real-time PCR and immunocytochemistry assays.

The results confirmed that endodermal differentiation was impaired in the PTEN KD hESCs. In conclusion, this work demonstrates that the PI3K/Akt/PTEN pathway has an essential role in maintaining the balance between pluripotency and differentiation in hESCs.

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**β-Adrenergic Receptors and Catecholamines Modulate Pregnancy-Specific Catecholestradiol-Mediated Proliferation of Uterine Artery Endothelial Cells**

Sean Fling, Spelman College, GA  
Sheikh O Jobe, Jill M Koch, and Jing Zheng, Department of Ob/Gyn. Perinatal Research Labs, Madison, Wisconsin  
Ronald R. Magness, Department of Ob/Gyn. Perinatal Research Labs, Pediatrics and Animal Sciences, University of Wisconsin-Madison

Recently, E2β’s role in pregnancy-induced angiogenesis via the proliferation of uterine artery endothelial cells extracted from pregnant ewes (P-UAEC) was evaluated through the action of its classical receptors, ER-α and ER-β. It was found that ER-β modulates E2β-mediated proliferative responses in P-UAECs. Further studies suggested that E2β and two of its metabolites, the catecholestradiols 2-hydroxyestradiol (2-OHE) and 4-hydroxyestradiol (4-OHE), also induce a significantly increased proliferative response in P-UAECs. However, unlike E2β, catecholestradiols mediate proliferation through mechanisms other than estrogen receptors, which are currently unknown. It is known that catecholestradiols and catecholestradiol metabolites have an affinity for adrenergic receptors (AR).

Therefore, we hypothesized that 2-OHE and 4-OHE stimulate proliferation of UAECs via ARs and that catecholestradiol can also modulate these mitogenic effects. Identification of AR subtypes (α1, α2, β1, β2 and β3) in P-UAECs was performed by Western Blotting. Validated P-UAECs were pretreated in the absence or presence of nonselective α-AR or nonselective β-AR blocker followed by endothelial basal medium, 2-OHE2, or 4-OHE2 treatment. Catecholestradiol’s effects were evaluated by combining treatments of epinephrine or norepinephrine together with 2-OHE2 or 4-OHE2. Western Blotting revealed the presence of α2, β2, and β3 AR in P-UAECs; however, α1 and β1 were not detectable. Both 2-OHE2 and 4-OHE2 treatment significantly increased (P<0.01) P-UAEC mitogenesis.

Pretreatment with the α-AR antagonist did not alter (P>0.05) P-UAEC proliferation responses to catecholestradiols, but β-AR blocker completely abrogated (P<0.01) those effects. Treatments of P-UAECs with combinations of catecholestradiols and catecholestradiol significantly enhanced P-UAEC proliferation compared to either alone.

These data demonstrate that catecholestradiols stimulate proliferation of P-UAECs via β2 and β3 AR. Moreover, catecholestradiols that directly activate β-ARs can mimic these mitogenic actions. However, combination treatments provide significantly greater stimulation than either catecholestradiol or catecholestradiol alone, suggesting the potential relevance of the convergence of the sympathomimetic system and catecholestradiols in the regulation of pregnancy-induced angiogenesis. [Research supported by NIH R25 GM083252, HL49210, HD38843, HL87144 & HL64703.]

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**MRP7 as a Drug Resistance Factor for Breast Cancer**

Katherine Foster, Lincoln University, PA / Fox Chase Cancer Center  
Elizabeth Hopper-Borge, Fox Chase Cancer Center  
Derrick Swinton, Lincoln University

A major difficulty in cancer treatment is that cancer cells ultimately develop resistance to chemotherapeutic agents. The ATP-Binding Cassette (ABC) transporters promote drug resistance to many cancers by directly effluxing drugs from cancer cells. The ABC transporters consist of three classes of membrane-associated transporter proteins which efflux drugs.

The first and most widely studied efflux pump is the P-glycoprotein (P-gp) pump. P-gp confers resistance to a wide-range of natural product drugs, and nucleoside analogs. Later the Multidrug Resistance Protein (MRP) group of ABC efflux pumps was identified. The MRP subfamily of pumps consists of 9 distinct family members (MRP 1-9), each conferring resistance to natural product drugs and/or nucleoside-based agents.

MRP7 is the only family member that confers resistance to both natural product drugs and nucleoside-based agents. Preliminary studies were conducted with Mrs7-/- and wild-type mice. Increased drug sensitivity was observed for the Mrp7 null mice compared to the wild-type mice after paclitaxel treatment.

This is a significant, clinically relevant finding, suggesting that inhibition of MRP7 may have clinical benefits in cancer treatment. Currently little is known about the physiological functions of MRP7 in the growth and development of normal
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and tumor cells or MRP7’s resistance phenotype in breast cancer.

As part of the ongoing process to understand MRP7’s role in resistance and MRP7’s potential as a target to enhance current breast cancer treatment regimens, the Lincoln summer intern participated in the following research related activities: (1) Establishment of a baseline characterization of proliferation, invasiveness and migration and (2) Determination of the sensitivity of mammary tumor cell lines derived from Mrp7 knockout and wild type mice to two microtubule stabilizing drugs, paclitaxel and docetaxel.

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*Bioluminescence: Inducing the Imposex Condition in an Hermaphrodite*

**Kahil Gilliard, University of the District of Columbia**

The release of triorganotins into aquatic habitats has been a major problem for gastropod mollusks. These chemicals can cause a condition known as imposex which is the masculinization of females, thereby affecting their ability to produce progeny. It was of interest to us to determine if the snail, *Biomphalaria glabrata*, the hermaphroditic intermediate host for *Schistosoma mansoni* that causes schistosomiasis, would undergo imposex when treated with the Triorganotin, triphenyltin chloride. Transformation to the imposex condition has not been reported in *Biomphalaria* species; however, it is felt that producing only male offspring would discontinue the lifecycle and be of particular value to the elimination of schistosomiasis.

The objective of this study was to induce the imposex condition in *Biomphalaria glabrata* snails. The fecundity rates of individual susceptible *Biomphalaria glabrata* snails of the NMRI strain were recorded daily for 2 weeks to ascertain the egg-laying frequency of selected snails. These rates were then recorded daily for 40 days which included the time period during and after the snails had undergone treatment of 0.5 ppm triphenyltin chloride for 7 days, as well as for snails that had been placed in 0.1 ppm Triphenyltin chloride continuously for a period of one month. Light and electron microscopy was done on the major sex organs of each group of snails (ovastes and the albumen gland) before and after treatment.

Our preliminary results revealed that untreated snails produce approximately 6 egg-clutches per week as compared to a one-time dosage that produced no egg-clutches during the 7 day treatment. The egg production resumed to approximately 2 egg clutches per week, one week after the treatment ended. By week-four the egg production was tantamount to the production of the untreated snails. Snails undergoing continuous dosage produced no egg-clutches in a 7-day period. Light and electron microscopy showed minor disruptions in the albumen gland and the ovastes morphology, but the initiation of an increase in the male structures of the ovastes was not observed. Future studies will include examination of the DNA variability between the treated and the controlled snails. [Supported by NIH Grant 1R25CA129035.]

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*Identification of Phenotypically Distinct Cortical Macrophage/Microglia After Stroke*

**Marlesa Godoy, University of California, Los Angeles (UCLA)**

Ischemic stroke is the leading cause of adult disability due to the brain’s limited capacity for repair. In mouse models of stroke, however, the peri-infarct tissue that surrounds the stroke has been shown to comprise a unique niche environment that supports multiple mechanisms of functionally-relevant post-stroke neuroplasticity. This niche is composed of diverse cell types, including in-migrating neuroblasts, endothelial cells of angiogenic blood vessels, and pericytes. However, work in spinal cord injury (SCI) has highlighted two phenotypically distinct populations of macrophage/microglia, termed M1 and M2 type cells, which mediate distinct injury-associated processes. In SCI, M1-polarized macrophages support a pro-inflammatory response, whereas M2-polarized macrophages promote an anti-inflammatory response.

The experiments in this study investigated the macrophage/microglia response in peri-infarct cortex, from early 3 days (3d) to intermediate 7 days (7d) time points after mouse cortical stroke. Using immunohistochemistry, confocal microscopy, and stereological techniques, Iba1+ macrophage/microglia were phenotyped based on their expression of polarization-specific antigens: CD16/32 (M1), CD86 (M1), Arginase 1 (M2), and CD206 (M2). A representation of total M1-polarized and M2-polarized macrophage/microglial populations was attained by mapping macrophage/microglia expressing each antigen in 3d and 7d brain sections through the stroke.

A gradual increase in peri-infarct infiltration of macrophage/microglia was observed from 3d to 7d after stroke, with further infiltration of the infarct core at 7d after stroke. M1/M2 phenotyping of these cells demonstrated an M2-polarized response that peaked 3d post-stroke and was concurrent with an M1-polarized response that steadily increased from 3d to 7d after stroke and peaked at 7d after stroke.

Of note, M2-polarized macrophage/microglia were primarily associated with blood vessels. In conclusion, distinct macrophage/microglia populations are clearly recruited to both peri-infarct cortex and the infarct core. This suggests that the early immune response differs from the later immune response in stroke, and may be associated with a tissue repair phenotype. More work is needed to clearly discern M1/M2 phenotypic responses and their functional role after stroke.
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The Influence of Hurricanes on Mycobacteria in Killifish  

Ciara Green, Southern University at New Orleans  
Illya Tietzel, Southern University at New Orleans  

The Gulf coast is an area frequently threatened by hurricanes. In addition to extreme damage, hurricanes increase detectable amounts of microbial pathogens that affect fish and humans. Mycobacteria are rod-shaped bacteria that cause diseases such as fish tuberculosis in fish and tuberculosis and leprosy in humans. The goal of this research is to determine if hurricanes cause higher levels of Mycobacterium marinum infections in fish.

The hypothesis of this study is that the fish tissue will have higher levels of Mycobacterium marinum infections following hurricanes. To test this hypothesis, an acid-fast procedure (Kinyoun method) was used to detect the Mycobacteria. Fish from the height of the hurricane season (late Summer/Fall) will be compared to samples from later time points (Winter/Spring). Mycobacterium marinum served as a positive control, Escherichia coli served as a negative control, and any isolated microbe of the fish was the unknown. Conditions that were controlled were: the preparation of a broth that requires refrigeration until use, the inoculation of agar plates at 37 degrees Celsius or 98 degrees Fahrenheit, the use of carbol fuchsin to stain the bacteria for five minutes, and the use of methylene blue to counter stain for thirty seconds.

The preliminary results were that a test run for the acid-fast stain was performed successfully in which a bacterium (Mycobacterium phlei) was used in order to ensure positive identification applying the method. Microbes of Killifish from the height of the hurricane season were successfully grown on nutrient agar plates. Fish from outside the hurricane season remain to be caught and analyzed.

Future research will include PCR (polymerase chain reaction) analysis to independently confirm the presence of Mycobacteria. It is concluded that acid-fast stain is an effective procedure to positively identify Mycobacteria. Furthermore, after five days of cultivation, bacterial colonies were visible. This confirms microbe colonization in the experiment fish. [I would like to thank Dr. Illya Tietzl who mentored this research. I would also like to thank Dr. Kambhampati, principal investigator of the Scholarship for Excellence in Natural Sciences (SENS) who sponsored me with a stipend of the NSF DUE 0806894 grant.]

Shakhawat Bhuiyan, Jarvis Christian College  

Signal recognition particle (SRP) is an important cytosolic ribonucleoprotein complex which directs secretory proteins to and across biological membranes in all organisms. The SRP initiates the targeting to the proper cellular compartments by first interacting with the nascent signal sequence as it emerges from the ribosome to cause a translation arrest, and then with the SRP receptor in the membrane. This step is a prerequisite for the subsequent sequestering of many proteins including those which play a vital role in many human diseases, e.g. cardiovascular disease, stroke, and diabetes. The recognition of the signal peptide is carried out by the large domain of the SRP protein SRP54M, and SRP RNA helix 8b. The specific aim of this study is to enrich scientific understanding of the molecular mechanism of signal peptide interactions within the signal recognition particle.

Signal peptide vary considerably in their size and are characterized by N-terminal region with a net positive charge, a hydrophobic (h) region of approximately 12 residues, followed by 5 to 7 residues with higher average polarity. Working with isolated signal sequences has been exceedingly difficult due to their hydrophobic character. To circumvent the problems associated with the handling of hydrophobic signal sequences we cloned, expressed and purified a soluble fusion protein (Trx-Af54Msig) composed of Thioeductin, LamB signal sequence and the SRP54M domain of Archaeoglobus fulgidus SRP4 (Af54M). The purification of the fusion polypeptide is eased by presence of 6X-Histag and thrombin cleavage site (LVPR GS) for removal of the tag. To investigate if the TEV-cleaved signal peptide remained associated with SRP54M or bound to SRP RNA, Af54Msig was digested to completion with TEV protease and incubated with full-length A. fulgidus SRP RNA. The results showed that the signal peptide always bound, either directly to the RNA or indirectly through its association with SRP54M.

We expressed and purified a soluble fusion protein (Trx-Af54Msig) composed of SRP54M and signal sequence. After breaking the covalent bond between the signal sequence and the SRP54M portion of the fusion protein, the signal peptide appeared to interact with SRP54M and SRP RNA. Our future research plan is to characterize these interactions and identify the specific region of signal peptide involved in interacting SRP54M by site-directed mutagenesis. [Acknowledgement: SmA RT grant from the National Science Foundation (HBCU-UP program).]

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Study of Signal Peptide Interaction within the Archaeal Signal Recognition Particle  

Cory Hamilton, Jarvis Christian College, TX  
Christian Zwieb, Department of Molecular Biology, UT Health Center at Tyler, TX  

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Assessing the Health Risk Due to The Contamination of Food Products by Microbes  

Jasmine Hardman, Dillard University, New Orleans, LA  
Charne Thomas, Samantha M. Diggs, Delano Patterson, William Taylor, Curvelle Lewis, and Bernard Singleton, M.S., D.V.M., Dillard University
Contamination of food products can come from handling, production, storage, and the ingredients used during the processing. It was found that plastic is porous and allows for micro-organisms to seep through (1). Microorganisms may also get into food products through the lack of clean working and storage areas. During storage at the warehouse, grocery store, or even in the pantry at home, there are loads of bacteria and viruses that can be spread through rodents and rodents’ droppings and urine. Even if you do not consume the droppings, the bacteria and viruses that are in them are on whatever the droppings touched (2). Breathing in dust contaminated with rodent urine or droppings and touching the product contaminated are some of the means of getting infected.

Where there is food and water, mice are present. Be aware of the signs which are rodent fecal matter and urine containing bacteria, viruses, and other microbes that can cause illnesses, diseases, and even death. Some of the microbes that cause diseases maybe present include E. coli, Hantavirus, Salmonella, and Leptospira.

The purpose of this study is to assess the health risk and presence of microbes on selected canned foods and fresh produce. In this study, 30 cans and produce were collected from a variety of local grocery and produce stores. Then they were swabbed to determine the presence of microbes on the top of the cans and on the surface of the produce after rinsing them off with tap water. The Cotton swabs were used to inoculate EMB and nutrient agar plates, which were incubated for 48 hours at 37°C. There were a number of varieties of colonies grown. On the EMB agar plates there were bacterial colonies that appeared metallic green, which is an indication of the presence of E. coli and other colonies were different colors.

There was also fungal growth. Selective colonies were transferred to carbohydrate broth to check for fermentation after 48hrs at 37°C to further identify them. Some of the microbes fermented the lactose broth which is also a trait of E. coli while others fermented sucrose. However, some microbes did not ferment either sugar. For future consideration genetic analysis would be the next step.

41
Regulation of Gene Expression by Lipid Peroxidation / Product 4-Hydroxynonenal

Adrienne Hatchett, University of Arkansas at Pine Bluff
Pankaj Chaudhary, Rit Vatsyayan, Rajendra Sharma, and Yogesh C. Awasth, University of North Texas Health Science Center

4-Hydroxynonenal (4-HNE) has been suggested to be involved in stress-induced signaling for apoptosis. In present studies, we have examined the effects of 4-HNE on the intrinsic apoptotic pathway associated with p53 in HepG2 cells. Our results showed that HNE caused apoptosis in HepG2 cells. Upon HNE treatment, a dose dependent induction and phosphorylation of p53 was observed that was accompanied with the activation of the pro-apoptotic p53 target genes viz.p21 and Bax, JNK, cytochrome-c, caspase3.

The anti-apoptotic Bcl-xl was down, regulated in HNE treated HepG2 cells. The effects of HNE on the expression and functions of p53 was blocked in GSTA4-4 overexpressing cells indicating that HNE-induced, p53-mediated signaling for apoptosis regulated by GSTA4-4. [Funding Source: NIEHS and NEI]

42
The Phylogenetic Characterization of the Crenarchaeal amoA from Lake Magadi

Kiara Henderson, Southern University and A&M College, Baton Rouge, LA
Jackie Denson and Mack Ivey, University of Arkansas
Department of Biological Sciences Fayetteville, AR

Lake Magadi, Kenya, is an alkaline, ”saline pan” lake system. Approximately 100 sq km in size, it is geographically the southernmost lake within the Rift Valley of Kenya. The lake contains concentrated brines of sodium carbonate as well as large precipitates of the mineral trona, hydrated sodium bicarbonate carbonate (Na3HCO3CO3H2O). Before actually analyzing the data collected from the cloned and sequenced 16 rDNA amplicons, it was strongly believed that we would discover some of the same halophilic Euryarchaeota that are dominant Archaea pertaining to this specific basin. However, after utilizing 16 rDNA amplicons obtained from bacterial, archaeal, and nanoarchaeal universal primers, we report the discovery of marine-related Crenarchaeota within a thermal feature and the initial phylogenetic placement of the archaeal monoammonium oxygenase (subunit amoA) from this location.

These initial results lend support to the concept that Lake Magadi contains a number of both bacteria and archaea known to be chemolithotrophs. Phylogenetic characterization of the amoA subunit of the Archaeal monoammonium oxidase from this site shows that it is most closely related to the marine subgroup, but forms a unique cluster. In addition these sequences contain seven amino acids that are unique to this location, which is the most alkaline environment site reported to date in terms of ammonia oxidizing archaea (AOA) discovery. Recently it was discovered that the Crenarcheota possess the capacity for aerobic ammonia oxidation, and recent studies suggest they are the dominate nitrifying organisms on the planet (NH3 → NO2/N03). This could potentially provide structural and functional insight into this ubiquitous enzyme.
43
Disruption of Sleep Impacts Hippocampal Memory Performance

Vicky Herrera, University of Washington

The suprachiasmatic nucleus (SCN) is the master circadian clock in the brain that controls the timing of our wake and sleep cycle. The SCN is composed of two anatomically distinct sub regions, dorsomedial (dm) and ventrolateral (vl) SCN. The vl sub-region receives direct input from the retina, and in turn projects to the dmSCN. Utilizing an experimental model known as forced desynchronization, rats are exposed to a 22 hour light-dark (11D: 11L) cycle leading to desynchronization of the vl and the dmSCN; this in turn leads to desynchronization of the sleep stages known as Rapid Eye Movement (REM) and nonREM (NREM).

During the forced desynchrony protocol, the SCN sub-regions cycle between phases of alignment, or misalignment, during which the two subregions oscillate abnormally out of phase. In days when the SCN sub-regions are aligned, rats exhibit relatively normal sleep patterns; in contrast, during days of misalignment, rats show highly disrupted sleep architecture. The normal sequence that REM and NREM typically have is lost in misaligned days. Sleep is necessary for learning and contributes to memory consolidation. The hippocampus is a brain region that is necessary for proper long term memory, and is influenced by circadian regulation. Our laboratory has previously shown that hippocampus-dependent learning is impaired in misaligned phases, but not aligned phases. We are working on establishing how desynchronization of SCN neurons and the associated disruption of sleep stages affect hippocampal signal transduction pathways that are key for memory consolidation.

We hypothesize that desynchronization of the SCN interferes with increases in hippocampal pERK (phosphorylated extracellular signal regulated kinase). Increases in pERK are associated with synaptic plasticity in the hippocampus and are necessary for proper long-term memory consolidation. Our hypothesis predicts lower pERK levels in misaligned rats compared to aligned rats. We used locomotor activity to determine synchronization in male Wistar rats, and analyzed the hippocampus pERK levels in animals sacrificed during aligned and misaligned phases by western blot analysis of pERK levels, normalized to the total ERK protein levels.

This study would indicate that alignment of circadian rhythms, particularly the sleep-wake cycle, is critical for normal hippocampus-dependent memory. [This Research has been supported by the University of Washington Bridge Fund.]

44
NOSI, NOSII and NOSIII are expressed as Splice Variants in Selected Cells

Melanie Hill, Tougaloo College, Tougaloo, MS

Andy Perkins and Erdogan Memili, Mississippi State University
Bettye Sue Hennington, Tougaloo College

Full term babies with a low birth weight are at a higher risk of developing hypertension as adults. The link between low birth weight babies and adult hypertension is not well understood. Our lab works with a low birth weight rat model called the intrauterine growth restricted model (IUGR) using Sprague Dawley laboratory rat kidneys. It has been found that the male hypertensive IUGR rats have different levels of endothelial nitric oxide synthase protein (eNOS) and mRNA in whole kidney lysates. The differences in the NOS system may have a distinct role in the development of high blood pressure. Studies have shown that eNOS mRNA levels are abnormal in diseases of the cardiovascular system. Splice variants are the results of alternative splicing of primary mRNA. Various studies have discovered that splice variants can play a role in the regulation of NOS.

The objectives of this study were to search all documentation for splice variants of NO isoforms and to combine all information into one source. Our hypothesis is that we will find documented splice variants for all nitric oxide isoforms. To accomplish our objectives, we searched through the National Center for Biotechnology Information (NCBI) databases of Pub Med, Nucleotide, Gene, Protein and Genome. The databases show splice variants for rat kidney neuronal NOS, human endothelial cell eNOS, and rat kidney and human fibroblast inducible NOS. PCR was used to search for splice variants in the male control rat kidney cDNA and the male IUGR rat kidney cDNA with primers to the 5’ end of each of the NOS genes.

These primer sets show a single band for the 5’ end of eNOS, iNOS, and nNOS. Primer sets to the 3’ end of eNOS also show single bands. We would have expected multiple bands if splice variants existed. The bands will be sequenced to determine where the products are located in the cDNA.

The results are expected to shed light on molecular mechanisms regulating hypertension in adults born at full term but low birth weight and, therefore, to improve human health. [This study was supported by NIH-RMI 5P20MD002725-04, Tougaloo College, NSF-HBCU-UP HRD 0811638, NSF-URM Grant NSF-DBI 0957421.]

45
Nano-Enzyme Systems: Development of an Artificial Liver for Modeling Protein-Protein Interactions

RaQuetta Howard, Alabama A&M University

Cytochrome P450 enzymes are important for drug metabolism, accounting for 75% metabolism of drugs, and are the major enzyme in first pass drug metabolism. Studies have shown that these enzymes are susceptible to protein-protein interactions,
and this can affect drug metabolism. There is also interest in the electron transfer processes that occur simultaneously with metabolism.

In this research, a method is being developed to immobilize two different P450 enzymes to binary arrays of gold and platinum “dots” to study protein-protein interactions. This approach requires the attachment linkers (hydrocarbon chains) attached to one metal (e.g. platinum) be masked during the attachment of the first enzyme to a second metal (e.g., gold) bearing a different linker. Then, the masked linker will be unmasked for the purpose of attaching the second enzyme.

The work described here addresses the problem of unmasking. In the experiment, Au-SAM chips were prepared from a long chain carboxylester. The resulting Au-SAM was treated with carboxyesterase, an enzyme that converts esters to carboxylic acids. Then, the P450 was coupled to the SAM which now contained the required carboxyl group. The conversion of the SAM from being carboxyester terminated to carboxylic acid terminated was monitored by surface Plasmon resonance. Enzymatic activity was then determined by monitoring the conversion of diclofenac to 47-OH diclofenac using high performance liquid chromatograph (HPLC) with ultra-violet (UV) absorbance detection as previously described.

The results demonstrated that the ester terminated SAM was hydrolyzed, the enzyme was immobilized to the SAM, and enzyme activity was retained. [This research was funded by NSF grants #DMR 0647763 and #HRD 0928904.]

47 Characterization of Gene Expression Patterns in Breast Cancer Subtypes

Lishann Ingram, Clark Atlanta University, GA  
Christina Swoope, Meagan Grant, Lori Neves, and Melissa Davis, University of Georgia

Breast cancers are among the most common human neoplasms in women worldwide. The relative survival rate for women with triple-negative breast cancer (defined as Estrogen Receptor negative, Progesterone Receptor negative, and Her-2 negative) is lower than for women with other types of breast cancer, with 77% of women surviving five years after diagnosis, compared with 93% survival for other breast cancers.

This investigation probes whether there are differences in gene expression for two different breast cancer cell lines (subtypes), namely, Estrogen receptor positive (HCC70) and Triple-negative (HCC1806), with reference to normal cell-lines (CCD-986Sk and CCD-1065Sk). The genes of interest were Transforming Growth Factor β Receptor 1 (TGFBR1), Transforming Growth Factor β Receptor 3 (TGFBR3), and Epidermal Growth Factor Receptor (EGFR). Reverse Transcriptase- Polymerase Chain Reaction (RT-PCR) shows that TGFBR1, TGFBR3 and EGFR gene transcripts are expressed in both cancer lines but not in the normal line. Quantitative-PCR (q-PCR) analysis shows that TGFBR1 is overexpressed (12 fold) in the triple negative cell line. Also, EGFR expression in the triple negative line suggests that this line is also a representation of a basal-like tumor. Immunostaining assay further confirmed that EGFR protein is expressed and intriguingly, we find is localized to the cell surface of the triple negative subtype and is localized to the cytoplasm in Estrogen Receptor Positive and normal cell lines. This suggests EGFR has a distinct function in triple negative subtypes, relative to ER positive subtypes.

In addition, upon bioinformatic investigation, we have identified a single nucleotide polymorphism (SNP) which represents an
amino acid substitution. This particular allele appears to be an Ancestral Informative Marker (AIM) and therefore might be implicated in ancestrally distinct functions of EGFR. As we move forward to identify biological mechanisms of ethnic disparities in breast cancer, this work has laid the foundation for ongoing investigations. [I would like to thank SUNFIG/REU Fungal Genomics and Computational Biology, HBCU UP, LSAMP and NSF for this opportunity.]

48
The Effect of 4'-Bis-Thiosemicarbazide, a New Ribonucleotide Reductase Inhibitor, on Prostate Cancer Cell Proliferation

Nechelle Jack, Clark Atlanta University, GA

Although several approaches, including surgery and radiation therapy, provide physicians with options for treating patients with early stages of prostate cancer, no effective therapeutic treatment option for the advanced castration-resistant cancer is currently available. The development of new highly potent with low toxic chemotherapeutic agents as an effective treatment for prostate cancer with the castration-resistant phenotype is immediately needed. In this project, a new ribonucleotide reductase (RR) inhibitor, 4'-Bis-Thiosemicarbazide, was synthesized and tested to examine its effect on prostate cancer cell proliferation using the US Patent-awarded LNCaP cell model system.

Our hypothesis is that Ribonucleotide Reductase Inhibitor is Involved in Cell Proliferation of Prostate Cancer.

The effect of 4'-Bis-Thiosemicarbazide on the proliferation of androgen-sensitive LNCaP C-33 and androgen-independent LNCaP C-81 prostate cancer cells was examined. C-81 cells exhibit many biochemical properties of prostate cancer cells at the castration-resistant stage. Cells were cultured in regular medium and also steroid-reduced condition, mimicking androgen-ability therapy in clinics. The effect of 4'-Bis-Thiosemicarbazide at 1 and 10 μM concentrations on cell growth was analyzed by cell number counting, and the solvent DMSO was used as a control. The expression of cell proliferation markers including cellular prostatic acid phosphatase (cPACP), an authentic protein tyrosine phosphatase functioning as a negative growth regulator, was also analyzed by western blot analyses.

Upon 4'-Bis-Thiosemicarbazide treatment, the growth of LNCaP C-81 cells significantly diminished, followed a dose-dependent phenomenon under both regular and steroid-reduced conditions. In 4'-Bis-Thiosemicarbazide-treated LNCaP C-81 cells, cPACP protein levels were elevated, inversely correlating with growth suppression. Interestingly, 4'-Bis-Thiosemicarbazide also reduced LNCaP C-33 cell growth in regular medium, while the expression level of cPACP protein was not significantly altered.

Our results clearly show that 4'-Bis-Thiosemicarbazide exhibits an inhibitory effect on the proliferation of LNCaP C-81 prostate cancer cells, following a dose-dependent fashion. In those treated C-81 cells, cPACP expression level is up-regulated. Further studies shall be continued to clarify the molecular mechanism of growth suppression and the potential of 4'-Bis-Thiosemicarbazide as a therapeutic agent on advanced castration-resistant prostate cancer.

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49
Antimicrobial Triclosan Pollution Effect on Aquatic Environments and Rana Catesbeiana

Arshaqui T. Johnson, Norfolk State University
Maureen Scott, Norfolk State University

Pharmaceutical pollution residues of personal care products, birth control pills, soaps, antidepressants, pain killers, has a devastating effect on marine organisms in our nation’s waterways. This study examines the effects of the antimicrobial agent Triclosan on Rana catesbeiana and aquatic environments.

The antimicrobial agent Triclosan is found in several personal care products. Triclosan prevents the growth of fungus, mildew, bacteria, and deodorizes a surface or area by blocking the active site of enoyl-acyl protein reductase enzyme (ENR), which is an essential enzyme in fatty acids synthesis of bacteria which is important for building cell membranes.

This study examines the development of Rana catesbeiana in a Triclosan polluted environment. Rana catesbeiana premetamorphic tadpoles were placed in a triclosan polluted aquatic environment containing pure triclosan in the amounts of .005mg/L, 572 mg/L and 0.5 mL of Dial® Hand Soap containing 0.00054 mg/L of triclosan and 0.5 mL of Clean and Clear® Acne Face Wash containing 0.00014 mg/L of triclosan. Other tadpoles were placed in an unpolluted aquatic environment on April 12, 2010.

The aquatic environments were evaluated daily and the developmental stages of the frogs were recorded. The tadpoles were examined for bacteria in all triclosan polluted tanks and control tanks. This study determined that triclosan pollution had a dependent effect on Rana catesbeiana rate of survival during metaphosis when internal and external gills are absorbed and lungs formation occurs. Aeromonas was detected in all triclosan polluted tanks. Aeromonas is naturally resistant to triclosan due to the presence of enoyl-acyl carrier protein reductase isozymes.
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enzymes (Massengo-Tiasse and Cronan, 2007). Triclosan was a dependent factor of the antimicrobial resistant bacterial growth of Aeromonas. Studies have shown Aeromonas hydrophila is not inhibited by the antimicrobial peptides produced by the frogs skin (Rollins- Smith, 2002). Bacteria growth was an independent variable that leads to the frog’s inability to sustain life.

This study established that triclosan aquatic pollution produced by personal care products is detrimental to amphibian’s development and 0.005 mg/L pure triclosan acting independently had no observable differences from the control tadpoles. Independently pure triclosan of 572 mg/L has the same effect as personal care product Dial® Gold Antibacterial Hand Soap containing 0.00054 mg/L and 0.00014 mg/L Clean and Clear® Acne Face Wash of triclosan. Future studies will include effects of triclosan and personal care products on other marine organisms and use of sterilized water. The research illustrates that personal care products containing antimicrobial agent triclosan is detrimental to marine organisms and may alter the aquatic microflora. [National Science Foundation Grant #0714930. Acknowledgements: Maureen Scott, Mentor Ms. Zenora Spellman, STARS Mrs. Valencia Ingram, STARS NSU Biology Department Hunt Club Farm (Virginia Beach).]

50 The Antimicrobial Activity of Biosynthetic Silver Nano-particles (AgNPs) on Pond Water Microorganisms

Candis Johnson, Alabama A&M University
Ibukun Kusimo and Dr. Florence Okafor, Alabama A&M University

The synthesis of metal and semiconductor nanoparticles has attracted significant attention from physicists, chemists, materials scientists, and engineers due to their potential applications in catalysis, biosensing, recording media, and optoelectronics. Although numerous chemical and physical methods are offered for metal nanoparticles synthesis, the materials used in these reactions are toxic and potentially hazardous. Furthermore, the physical methods are energy consuming. Increasing environmental concerns over chemical synthesis routes have resulted in attempts to use biological objects in nanoparticles production.

Previous studies have shown that silver nanoparticles are effective antibacterial, antifungal, anti-viral and also anti-inflammatory agents. Recent research studies suggest a distinct increase in the effectiveness of silver nanoparticles in combination with plant extracts such as Actaea racemosa (Black Cohosh) and Chrysophyllum albium (African Udala). Black Cohosh is known and was commonly used, by Native Americans, amongst many others as an analgesia and anti-inflammatory medication.

The purpose of this research is to produce silver nanoparticles from the reaction of silver nitrate and Actaea racemosa and Chrysophyllum albium extracts and compare their antimicrobial effectiveness. The herbal extracts (Actaea racemosa) were produced using the standard Soxhlet and evaporation method. A solution of Actaea racemosa extract was heated to 800°C and was then induced with 10-3 M of AgNO3. An immediate reaction took place.

The results showed that substantial amounts of silver nanoparticles (AgNP) were produced. This was verified using UV -Visible Spectroscopy, Infrared (FTIR) spectroscopy, and Atom Force Microscopy. We observed appearance of Surface Plasmon Resonance (SPR) peak, which corresponds to the silver nanoparticles - 417 nm in 1 minute. Pond water samples were treated with varying amounts of the nano-silver colloids and the microbial counts were determined. We found that 20ul of the Udala-based AgNP was enough to inhibit the growth of both Gram positive and Gram negative microorganisms resident in pond water. However, further investigation is needed to quantify the antimicrobial effectiveness of the AgNPs. In addition, we are planning to investigate biocompatibility and cytotoxicity grade of silver nanoparticles prepared using plant extract. [This research is supported by NSF HBCU-UP Grant #HRD0928904 and the AAMU Title III program.]

51 Therapeutic Potential of Curcumin: Inhibition of MIC-1/GDF-15 Expression in Prostate Cancer Cells Exposed to Heavy Metal Carcinogen

Brittany Jones, Clark Atlanta University
Poomy Pandey, Studishdar Das, and Surinder K. Batra, University of Nebraska Medical Center

There is emerging evidence that prostate inflammation is a contributing factor to prostatic carcinogenesis. Various proinflammatory cytokines, chemokines and other immune molecules are observed near the tumor microenvironment and help in tumor proliferation. Macrophage inhibitory cytokine 1 (MIC-1) is a member of Transforming Growth Factor-β (TGF-β) family of cytokines and has been shown to inhibit secretion of TNF-α by activated macrophages to thereby reduce cell death.

MIC-1 has been shown to be overexpressed in prostate cancer and has been proposed to be used as a prognostic and diagnostic marker of prostate cancer along with Prostate Specific Antigen (PSA). It has also been shown that MIC-1 is upregulated in response to hypoxia and anoxia. Promoter analysis of MIC-1 indicated the presence of putative consensus sequences for transcription factor binding elements such as NFkB. NFkB plays a role in hypoxic stress. Additionally, Curcumin has been shown to inhibit the NFkB pathway in various cancer models.

Therefore, we hypothesized that Curcumin can be used as a potential therapeutic agent in prostate cancer where it can
downregulate MIC-1 production. We observed the MIC-1 mRNA expression in various prostate cancer cells (PC3, PC3M, LnCap35 and LnCap126) and treatment with NiCl₂ and CoCl₂. RWPE1, a benign immortalized prostatic epithelial cell, was also used, but had least MIC-1 mRNA in comparison to the cancer cells. mRNA expression was verified by both RT-PCR as well as quantitative real-time PCR. MIC-1 is a secretory cytokine, therefore culture supernatants were checked for the secretory MIC-1 in two cell models (PC3M and LnCap126 cells), and a similar induction was observed upon treatment with NiCl₂ and CoCl₂.

When treated with Curcumin, we observed a decrease in the MIC-1 expression compared to controls and cells treated with heavy metals. In addition, CoCl₂-induced motility of PC3 cells was inhibited by Curcumin. NiCl₂ had no effect on motility of PC3 cells. In conclusion, we demonstrate the potential of Curcumin in downregulating MIC-1 expression induced by hypoxic condition and thereby can be a potential agent for prostate cancer therapy.

52 Building A Better Tomato: Olfaction and the Future of Genetically Modified Fruits and Vegetables

Dajia King, Fort Valley State University, GA
Seth Currlin, Wendy Yoder, and David W. Smith, University of Florida

Olfaction plays an important role in our quality of life. Transgenic tomatoes lack certain chemicals that are essential for great taste. Guaiacol and Methyl Salicylate are chemically similar. The two chemicals are naturally present in tomatoes. These odorants were used to detect thresholds in a number of participants. Thresholds are the minimum concentration of an odorant that someone can acknowledge and distinguish.

Once the threshold was established for each odorant, a proportional mixture was made with those results. The threshold of the mixture was then obtained and analyzed. Adaptation occurs when a sensory receptor stops responding to a stimulus due to continuous exposure, and then becomes unnoticeable. Adapting odorants were then utilized to see if the odorant could inhibit the smell while using the opposing background odorant at twice its threshold. By setting a masking odorant against the adapting odorant, we were able to detect how sensitive they are to adaptation. [This research was supported, in part, by a grant from NSF HBCU-UP (#HRD-0625289) awarded to Sarwan Dhir, PhD, Director for the Center for Biotechnology, Fort Valley State University, Fort Valley, GA 31030.]

53 Morphological, Anatomical, Physiological, and Genetic Diversity in Lagerstroemia spp (Crape Myrtle)

Courtney LeBlanc, Southern University at New Orleans

Lagerstroemia spp, commonly known as Crape Myrtle, is a native of China and Korea that is heat tolerant, has a wide range of inflorescence colors, long flowering periods, growth habits ranging from shrubs to tall trees, exfoliating bark, and survives under extreme weather conditions, such as hurricane Katrina. This study will ascertain the overall heterogeneity of five Lagerstroemia species based on flower color: Lagerstroemia natchez (White Flowers), L. tuscarora (Coral Pink Flowers), L. muskogee (Lavender Flowers), L. indica purpurea (Purple Flowers), and L. indica dynamite (Red Flowers).

It was hypothesized that Lagerstroemia (Crape Myrtle) is a diverse angiosperm. Samples were analyzed by taking cross sections of stems and ovaries, and epidermal peels to examine the histology; extracted chlorophyll from the leaves and measured the percent transmittance using a Spectronic 20D+ to examine the physiological component of the leaf, and attempted to extract the DNA by gel electrophoresis. The histology of the five species of Lagerstroemia histology appeared to have similar number of stomata on the epidermal surfaces of the leaves and stems, and pollen had similar structure.

The ovary finding showed that the number of sepals varied from having four, five, six, and seven ovules in a flower. Future studies will focus on Lagerstroemia and its association with pests (aphids and caterpillars), the diversity in chromatophores, phytochemistry, and DNA structure. [This study was supported by NSF (grant # HRD-092879) awarded to Courtney LaBlanc’s Research internship.]

54 Can Methanogens Survive on Mars using Insoluble Carbonates as their Energy Source?

Brittnee Leonard, Southern University and A&M College

From the different missions to Mars it is believed by some scientists that the planet was at one time the home to a living organism. This experiment is a continuation of a past experiment that dealt with Methanogens and their growth patterns on insoluble carbonates. The previous research was done in order to see if Methanogens could live on insoluble carbonates, magnesium or calcium carbonate, if the carbon dioxide wasn’t able to reach them down beneath the soil. In the previous experiment a mutant form of the species Methanothermobacter wolfeii was discovered while running an experiment on the parent strand of the species. The purpose of this research project is to determine if the mutant discovered is able to grow.
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The Effect of Clb-2 Deletion in Yeast Quiescence

Edwin Llamas, University of Washington

Saccharomyces cerevisiae is a common form of yeast that is known for baking, as well as making wine and other alcoholic beverages. This form of yeast is specifically known for its ability to create daughter cells, or in other terms 'bud.' Clb-2 is a gene that encodes a B-type cyclin that activates Cdc28p to promote the transition from the S, G2, and M phases. Through this activation, the Clb-2 gene moves the cell cycle into mitosis. I have explored the role of Clb-2 in cells that exit the cell cycle and enter the quiescent state. We tested the hypothesis that 'When the Clb-2 gene is deleted, the cell cycle will grow into a stationary phase at a much faster rate, as well as move into mitosis at a faster rate. It is in this stationary phase in which the yeast cells will go into quiescence. Genes of this cell function efficiently in the cell cycle; it is unclear how. The quiescent state can be applied to cells for longevity depending on positive results.

The hypothesis for this project is that the cell will grow in the stationary phase at a much faster rate and transition into mitosis more quickly when the Clb-2 gene is deleted. The Clb-2 encodes for the b-type cyclin, which activates the cdc28p protein and promotes the transition to the s,g2,n, and m phases. The cyclins allow for specific intervals of time to be taken through the cell cycle, which eventually leads to the budding of yeast. The Breeden lab has established 4 goals in order to analyze the potential results in the cell cycle in the case of Clb-2 deletion.

The goals consist of quiescent state; recording their thermo-tolerance, their life span, recording how they transitioned out of their quiescent state, and how efficiently the Clb-2 deleted strains were able to grow according to their original state of being a wild type. To perform these tests, the cells were required to have a Clb-2 gene delete in order to be compared to the wild type yeast cells. Once the Clb-2 gene was deleted, the cells were required to be placed into the quiescent state in order to perform tests on both the wild type and Clb-2 deleted cells.

This led to the results that the Clb-2 gene had very little effect on any of the tests, except for the thermo-tolerance that was illustrated positive. The Clb-2 deletion had very little impact on yeast quiescence. This could be due to the Clb-1 gene that goes along with the Clb-2. For future direction both Clb-1 and Clb-2 genes will be deleted in order to look for a more dramatic effect. [This research was funded by grants from the NIH and the University of Washington GenOM project.]

56
Algal Functional Annotation Tool: A Web-based Analysis Suite to Functionally Interpret Large Gene Lists Using Integrated Annotation and Expression Data

David Lopez, University of California Los Angeles

High-throughput genomic experiments frequently produce large lists of "interesting" genes requiring further analysis. In the past, these gene lists had to be analyzed across several independent biological databases, often on a gene-by-gene basis. In contrast, gene list analysis tools integrate data from several annotation databases and reveal the underlying biological themes of large gene lists. These pathway analysis tools, such as DAVID, have proven to be extremely useful in the analysis of transcriptional data. While several such databases have been constructed for plants and animals, none are currently applicable to the study of algae. Due to the renewed interest in algae as potential sources of biofuels and the emergence of multiple algal genomes, a significant need has...
arisen for such a database to process the growing compendiums of algal genomic data.

We present the Algal Functional Annotation Tool, a web-based comprehensive analysis suite integrating annotation data from several pathway, ontology, and protein family databases to functionally interpret large gene lists of the green alga Chlamydomonas reinhardtii. These gene lists may be searched for functional terms and their enrichment, across numerous databases without the need to convert between several gene identifiers for each database.

To compensate for incomplete annotation coverage, several annotations are inferred by homology to proteins of better-studied organisms. Additionally, expression data for several experimental conditions was compiled and analyzed to provide an expression-based enrichment search. A tool to search for functionally-related genes based on gene expression across these conditions is also provided. Other features include dynamic visualization of genes on KEGG pathway maps, batch gene identifier conversion, and comprehensive single gene annotation lookup tools. These features are provided within a central framework, and all analysis results may be exported and downloaded for further processing.

The Algal Functional Annotation Tool aims to provide an integrated data-mining environment for algal genomics by combining data from multiple annotation databases into a centralized tool. This tool is designed to expedite the process of functionally interpreting genomic data for the green alga Chlamydomonas reinhardtii, such as those derived from high-throughput RNA-seq or proteomic experiments. [Research supported by NIH GM55052.]

57 The Expression and Regulation of osm-3 and arr-1 by ceh-36 in Caenorhabditis elegans

Maian Lopian, North Carolina Central University / Howard Hughes Medical Institute
Esther Serrano-Saiz and Oliver Hobert, Columbia University, NY

In evolutionary developmental biology, deep homology is used to describe growth and differentiation processes, which are governed by genetic mechanisms that are homologous and deeply conserved across a wide range of species. The evolution of eyes in mammalian systems has been studied by many scientists yet many questions still prevail.

To study this evolution, Caenorhabditis elegans is a model organism because it is a multicellular eukaryotic organism that is simple enough to be studied in great detail. Thus, a comparison was made between the role of genes in the mammalian photosensory system and the C. elegans genes involved in the chemosensory pathway.

In the mammalian photosensory system, there are homologs to terminal selector genes and genes involved in chemosensation in C. elegans. Because these homologs are present, it is hypothesized that the role they play in C. elegans is similar to those of the mammalian system. Specifically, it was hypothesized that ceh-36, a terminal selector gene in C. elegans, would regulate arr-1, a gene involved in the chemosensation pathway but ceh-36 will not regulate the gene osm-3, a kinase involved in the creation of ciliated neurons that plays a role in chemosensation, because it is not as specific as arr-1 in the cascade of events for the chemosensory pathway. To determine the expression and regulation of arr-1 and osm-3 by ceh-36, PCR fusions were performed and DII staining was utilized. Preliminary data suggests that arr-1 is not regulated by ceh-36 and further studies must be completed to determine the regulation of osm-3. [This research was funded by the Howard Hughes Medical Institute Exceptional Research Opportunities Program.]

58 The Use of Special Peanut Hair, Emergence, as Explant for Shoot Organogenesis

Kayla Love, Langston University, OK
Kanyand Matand and Ning Wu, Langston University

The main purpose of this experiment was to determine whether special peanut hair, emergence, could be used as an “explant” and cultured in vitro autonomously for inducing efficient shoot organogenesis comparable to standard plant organs such as leaf, stem, root, or cotyledon. The results showed unequivocally that indeed special peanut hair is potentially a valuable explant that could be used as effectively as, if not better, than any other standard plant organs for shoot organogenesis. The studies showed that efficient shoot formation was observed in single units as well as in clusters of two to four hair units. In all cases new shoots also induced repetitive multiple shoot, similar to those observed standard plant organs. These observations could be beneficial for improving peanut protocols for genetic engineering.

59 Comparing Ancestry Estimations from Y Chromosome, Mitochondrial DNA, and Autosomal Loci

Kevin Magnaye, University of Washington

Autosomal, non-recombining Y chromosome (NRY) and mitochondrial DNA (mtDNA) are all efficient means of predicting an individual’s genetic ancestry. Commercially available autosomal DNA ancestry estimates are obtained using loci that show large frequency differences between continental groups known as ancestry informative markers (AIMs). NRY and mtDNA ancestry estimates rely on haplogroup information to trace an
individual’s genetic lineage. Further distinguishing autosomal ancestry estimates from NRY and mtDNA, the NRY and mtDNA are uni-parentally inherited whereas autosomal DNA is bi-parentally inherited. Thus, autosomal DNA potentially contains more information regarding an individual’s genetic heritage than the NRY or mtDNA. Our goal was to determine the accuracy of NRY and mtDNA ancestry estimates for predicting autosomal ancestry.

As a first step towards this goal, mtDNA genotype data were obtained for 965 individuals from a global panel of human populations from the Human Genome Diversity Project (HGDP-CEPH). To date, 672 mtDNA haplogroups have been resolved. Next steps include comparing mtDNA ancestry estimate and published ancestry estimates for the NRY to published autosomal DNA ancestry estimates to determine if the former two markers accurately predict autosomal ancestry estimates in un-admixed global populations. This research will soon be extended to admixed populations residing in the United States.

[The University of Washington Start – Up Grant to Michael Bamshad, M.D. funded this project.]

60
Dissecting Zinc Acclimation Mechanisms in Chlamydomonas Reinhardtii

Rey Martin, University of California, Los Angeles (UCLA) Davin Malasarn, Janette Kropat, and Sabeeha Merchant, UCLA

Many organisms require zinc because numerous enzymes utilize its chemical properties to catalyze important biological reactions. Chlamydomonas is a eukaryotic green alga that serves as a good model organism for studying acclimation mechanisms activated in zinc deficiency because it can be grown in a defined medium and its genome has been sequenced. Wild-type Chlamydomonas cells grown under zinc-deficient conditions hyperaccumulate copper, however, the copper becomes biounavailable because it is sequestered in intracellular granules.

To cope with this secondary copper deficiency response, the copper response regulator Crr1 is required for acclimation to zinc deficiency. One of the functions of Crr1 is to activate a copper sparing mechanism that replaces plastocyanin, a copper-dependent protein, with cytochrome c6, a copper-independent protein, in the photosynthetic electron transport chain. crr1 mutants cannot make this switch and grow at a slower rate to a much lower cell density compared to the wild-type strain under zinc deficiency. From a previous UV mutagenesis screen, three suppressors of the crr1 phenotype (called revertants), UV-1, UV-2, and UV-3 were isolated based on their ability to survive under zinc deficiency. Intracellular copper concentrations were measured and showed a hyperaccumulation of copper in zinc-deficient revertants.

The growth rates of these revertants have been characterized in zinc and copper deficiency and show improved growth under both conditions when compared to the crr1 mutant. Immunoblots performed on copper-deficient cell samples determined that UV-3 accumulates both plastocyanin and cytochrome c6 like the crr1:CRR1 complemented strain while UV-1 and UV-2 accumulate plastocyanin only. Under copper replete conditions, all strains accumulate plastocyanin only. The revertants are being placed into complementation groups to assess the number of affected loci and to test the linkage between the original crr1 mutation and the suppressor mutation. The results may provide insight into the mechanisms involved in zinc acquisition and copper distribution in the cell.

[This research is supported by funding from the MARC Program and GM42143.]

61
Connecting the Natural Immune Response of Invertebrates with Neural Repair

Clarissa Martinez, SUNY College at Old Westbury, NY Celine Boidin-Wichlacz and Michel Salzet, Laboratoire de Neuroimmunologie des Annelides, Universite des Sciences et Technologies de Lille, Lille, France

The CNS of the medicinal leech, Hirudo Medicinalis unlike mammals, has the capability to regenerate neurites after damage to the nerve cord. The study conducted shows that the regeneration process occurs at a faster rate when the injured nerve is confronted with a bacterial challenge. This suggests the immune system plays a role in neural repair. Two recently discovered antimicrobial peptides Hm-lumbricine and neuromacin are found in high amounts at the site of axotomy.

To investigate this phenomena, CNS of the leech was dissected and exposed to live and heat killed bacteria. The regeneration was recorded by photomicrographs every 24hours for 8 days. In sterile conditions the restoration of the nerve cord began after 4 days. In comparison in live or heat killed bacteria repair began after 2 or 3 days. Antibacterial activity was monitored by a solid plate assay. The expression of Hm-lumbricin and neuromacin were investigated using real time PCR with random primers.

The data supports evidence that microbes stimulate transcription by microgial cells of both antimicrobial peptides. The two antimicrobial peptides are shown to increase the ability of CNS repair. This study is vital in the future studies of possible nerve repair in mammals. This project was funded by a grant from the National Center for Minorities and Health Disparities of the National Institutes of Health (MD001429) and the NSF SUNY LSAMP program.
62
Engineering Functional Vascular Construct from Adipose Tissue Derived Stem Cells

Robersy Matute, Fort Valley State University, GA
Dayana Matute, Fort Valley State University
Mehez-nagy A and Mironov Vladimir, Medical University of South Carolina

The replacement of damaged tissues and organs requires an overabundance of limited donor tissue. Tissue engineering scientists are developing new methods to overcome this problem by supplying manufactured implantable tissues.

Contemporary scientific efforts focus on using a patient’s own autologous cells, however, there is still much debate over the ideal cell source location. A number of experiments using skin fibroblasts, vascular miofibroblasts, bone marrow derived stem cells, umbilical cord derived cells have had limited success(1, 2). Recent evidence suggests that Adipose Tissue Derived Stem Cells (ADSC) may be the ideal cell source for clinical applications. ADSC are easy to isolate in large quantities; highly proliferative - they can differentiate into multiple cell lineages (multipotent), and most importantly they are autologous, so they don’t create immunological rejection.

Our goal was to create a functional vascular construct from ADSC. The ADSC in this experiment were treated with TGFβ1 in serum free DMEM media. Immunohistochemical markers specific to vascular smooth muscle cells (α - smooth muscle actin, calponin, SM22) were used to prove that the ADSC had differentiated into vascular smooth muscle cells. These markers are highly restricted to differentiated smooth muscle and, in particular, MHC and smoothelin are not detected in any other cell type and are only expressed in contractile SMC (3, 4). The hanging drop method was used to prepare tissue spheroids from differentiated smooth muscle cells.

The resulting tissue spheroids were then placed in a circular mold fabricated from non-adhesive agarose gel. The fusion of the spheroids resulted in a ring-like structure (torus). The functionality of this construct was determined by the reaction of this construct to different vasoconstrictr and vasodilator agents. We were able to differentiate vascular smooth muscle cells from ADSC and use these cells to engineer a functional vascular construct.

Future investigations include developing strategies for accelerated tissue maturation to reach material properties in these experimental constructs similar to native vascular tissue.

[This research was supported, in part, by a cardiovascular biology grant from NIH (#R25 HL092611).]

63
Expression Patterns of Translation Initiation Factors in Response to Stress

Travis McMillan, Norfolk State University, VA

The overall goal of this research is to understand how plant genes are regulated in response to abiotic stress factors. The focus of the current research project is to examine the expression of the translation initiation factors eIF1 and eIF4e in Cucumis sativus (cucumber) following stress.

The abiotic stress factors we are studying are wounding and salt stress. Many translation initiation factors, including eIF1 and eIF4e, have been demonstrated to be involved in the stress defense response. The protein expression level of these factors often changes following exposure to various stresses. If eIF1 and eIF4e are involved in the stress response, then their expression may increase or decrease in response to environmental stress. The expression patterns of eIF1 and eIF4e were examined using western blotting. Plants were subjected to either wound or salt stress and then tissue samples were collected at varying time points.

The results suggest that for eIF1 there may be an increase in expression in both salt and wound stressed cucumber plants at later time points. The expression of eIF4e appeared to decrease at some time points tested. The preliminary results of the study suggest that there may be some differential expression of eIF1 and eIF4e in stressed cucumber plants. Further research is needed to ascertain the exact patterns of expression for eIF1 and eIF4e. Future studies will focus on repeating the salt and wound stress experiments as well as examining the expression of these factors following heat shock and cold stress. [This research was supported by the NSF funded STARS-PLUS Summer Research Program.]

64
Diversity and Preliminary Systematics of the Genus Dicymbe (Leguminosae; Caesalpinioideae)

Sewalem Mebrate, University of the District of Columbia
Gabe Johnson and Karen Redden, University of the District of Columbia

Members of the tribe Deteriaea (Leguminosae; Caesalpinioideae) are of special interest because they are morphologically diverse, economically important and grossly understudied. Like other members of Detarieae, Dicymbe (20 spp.) occurs only on the Guiana Shield, one of the oldest geological formations in South America. Some species of Dicymbe have ectomycorrhizal associations, can form monodominant stands, and exhibit mass synchronized flowering/fructifying events. The genus contains both widely distributed taxa and narrow endemics found only on the tepuis. The biogeographic interest of Dicymbe is enhanced as its
sister group, Polystemonanthus, is restricted to West Africa. No modern comprehensive monographic revision has been done for Dicymbe, and species boundaries remain unclear.

This study examines the utility of the plastid gene, trnL, in assessing species-level relationships. Using a total evidence approach combining morphological and sequence data radiation patterns of these Shield endemics. The morphological analysis included 125 morphological characters, 79 of which were phylogenetically informative. The plastid data set included 726 molecular characters; 123 characters were phylogenetically informative including 11 gap characters. The plastid analysis showed well supported clades at the generic level, but did not resolve any species level relationships. Furthermore, the trnL analysis, like recent family-based phylogenies, placed Polystemonanthus as sister to Dicymbe. The morphological analysis supports the monophyly of Dicymbe with some species-level resolution, but Polystemonanthus was included within Dicymbe. The 1957 classification done by Richard Cowan was not supported by the results of the combined, molecular or morphological analyses.

Future research will include exploring the utility of additional molecular markers including ITS, psba-trnH, CNGC4, and rbcl for resolving species-level relationships. A comprehensive species-level phylogeny will allow us to explore and assess the relationships among tepui endemics, lowland taxa and the African sister group. [This study was supported by the University of the District of Columbia’s STEM program in providing stipend for the principal investigator and the actual research was funded by NSF-DIG and Si-BDG grants.]

65 Modeling Human Autism and Language Impairment Through Developmental Expression of Protein Cntnap2 in Zebra Finches

Guillermo Milian, University of California, Los Angeles

Autism Spectrum Disorder (ASD) is characterized by impairments in communication, social interactions, and behavior. Through case studies and gene analysis, mutations in contactin associated protein-like 2 (Cntnap2) have become associated with ASD and specific language impairment (SLI). Here we introduce the zebra finch model, an animal that shares the learned vocalization phenotype with humans, to study Cntnap2’s role in language.

Elevated mRNA expression of Cntnap2 in the frontal cortex of developing human brains suggests that Cntnap2 is involved in stenciling circuits that are involved in cognition and language. In this study, we track the expression of protein Cntnap2 in several song nuclei in zebra finches at key developmental stages through immunohistochemical analyses. Preliminary results have shown differential and sexually dimorphic expression of Cntnap2 within song nuclei. In males, Cntnap2 is enriched in the robust nucleus of the arcopallium (RA) and lacking in basal ganglia nucleus, area X, throughout development. In females, Cntnap2 is enriched in RA early in development, but wanes with age.

Additionally, through double labeling with synaptic vesicle protein 2 (SV2), we will investigate whether Cntnap2 is localized to synapses in RA. This will ascertain whether Cntnap2 signal in RA is a product of RA or the lateral magnocellular nucleus of the anterior nidopallium (LMAN) cell bodies. The source of Cntnap2 will then be the target for in vivo viral injections of Cntnap2 knockdown constructs, which will allow us to study changes in neurophysiology and behavior. [This project is funded by NIH R21 HD065271 (SAW) and the MARC U STAR Program at the University of California, Los Angeles.]

66 Evolutionary Dynamics of Small vs Large Sized Populations

Abel Morelos, University of California, Irvine
Michael R. Rose and Marta Santos, University of California, Irvine

Natural selection and genetic drift are two major forces that can drive evolutionary change. It is well-known that population size is very relevant for both mechanisms. Nevertheless, little is known about how much genetic drift interacts with natural selection as a function of population size. The present project involves laboratory populations of Drosophila melanogaster with controlled and replicated histories of selection, and contrasting population sizes. The study of their evolutionary dynamics after imposition of new selection regimes, both at small and at large population sizes, will help resolve the interaction between genetic drift and natural selection. Our goal is to study the evolutionary trajectory of fitness-related traits, as fecundity, longevity and starvation resistance.

67 Effect of Nitrate on Growth and Lipid synthesis in Chlorella vulgaris and Botryococcus braunii.

Brian Murry, Paine College, GA
Bibekananda Mohanty and C.R. Nair, Paine College

In recent years, production of bio-diesel from algal biomass has received importance to meet with the demand for global energy crisis. Current research was undertaken to study the effects of nitrate manipulation on lipid synthesis of two different strains of algae, Chlorella vulgaris and Botryococcus braunii maintained in photobioreactor conditions. Both C. vulgaris and B. braunii cells were obtained from the University of Texas culture collections.

The algal cells were grown in Bristol medium containing CaCl₂ (0.17mM), MgCl₂ (0.3mM), KH₂PO₄ (1.29mM), K₂HPO₄
(0.43 mM), NaCl (0.43 mM), and NaNO3 constituting 2.94 mM NO3. The growth of C. vulgaris and B. braunii was studied with low (1.47 mM NO3), high (5.88 mM NO3) and the normal concentration of NO3 as in Bristol medium. The absorbance of culture medium with algal cells was measured at 660 nm over a period of 18 days.

The results of this study indicated that C. vulgaris cells grown in low NO3 medium accumulated one and half times more lipid as compared to the cells grown in high NO3 medium. The lipid content in B. braunii cells showed a two fold increase when grown in low nitrate concentration as compared to the cells grown in high nitrate concentration. A comparison between B. braunii and C. vulgaris grown in low nitrate concentration showed lipid accumulation a three fold more in B. braunii than in C. vulgaris. As the atmospheric carbon capture and fixation to carbohydrate and lipid is modulated via photosynthetic processes by chloroplasts, changes in the absorption spectrum of chlorophyll pigments during lipid synthesis is currently under study in both the strains of green algae maintained in Bristol medium in the photobioreactor flasks. The separation of chloroplast pigments into chlorophyll-a, chlorophyll-b and xanthophyll would be performed through paper chromatography. [This work is supported in part by the UNCF/Mellon SEEDS grant awarded to Dr. C.R. Nair.]

68 The Impact of the ACE Inhibitor, Ramipril, on Neurogenesis in Whole-Brain Irradiated Rats

Rashida Mustafa, Spelman College / Wake Forest University School of Medicine
Dana G. Schloesser, Tammy C. Lee, Valerie Payne, Sriram Ramanan, Weiling Zhao, Mitra Kooshki, Debra Diz, Fang-Chi Hsu, and Mike Robbins, Wake Forest University School of Medicine

Brain metastases will develop in up to 30% of the approximately 1.5 million new cancer patients projected in the United States in 2010. Whole brain irradiation (WBI) is the principle procedure of treatment for brain metastases. Unfortunately, progressive, cognitive impairment will develop in up to 50% of brain tumor patients who survive for 6 months or more after radiation. One of the most effective approaches to reduce the severity of late radiation-induced injury in the lung, kidney, and CNS has been pharmacologic suppression of the renin-angiotensin system (RAS).

Although the pathogenesis of radiation injury remains uncertain, we hypothesize WBI may upregulate the brain RAS and lead to a neuroinflammatory response. This neuroinflammatory response is associated with an increase in the number of activated microglia, an established inhibitor of neurogenesis in the adult rodent hippocampus. Hippocampus plays a critical role in learning, memory, and spatial information processing. Active neurogenesis occurs throughout adulthood in the dentate gyrus (DG) of the hippocampus. Irradiation of the rodent brain leads to a marked decrease in the number of newborn mature and immature neurons in the DG.

We hypothesized in this study that angiotensin-converting enzyme (ACE) inhibitor, ramipril, could prevent radiation-induced cognitive impairment. To test our hypothesis, we used four experimental groups. The groups included fractionated whole WBI, sham-irradiation, WBI plus ramipril, and sham-irradiation plus ramipril rats. We assessed cognitive function using the Novel Object Recognition Test. Immunohistochemistry was performed on rat brains isolated 28 weeks postirradiation; four brains were selected from each experimental group. A modification of the optical dissector method was used for quantification of immunolabeled cells in the subgranular zone (SGZ) /hilus. ED1+ cells in the SGZ/hilus were then exhaustively counted using the Neurolucida system. The density of iba1+ cells in the SGZ/hilus, ED1+ cells in the perirhinal cortex, and DCX cells in the dentate gyrus was estimated by the optical fractionator method using Stereo Investigator software.

Our results showed that administration of ramipril before, during, and after fractionated WBI prevented the radiation-induced cognitive impairment in rats. Also, ramipril prevented the radiation-induced increase in microglial activation and had no significant effect on neurogenesis. This study suggests that the brain RAS plays a vital role in the progression of cognitive impairment and the neuroinflammatory state of the irradiated brain. The future research question is whether Ramipril will be a promising therapeutic strategy for improving the quality of life of patients receiving WBI. [This research was supported by NCI CA122318 and NHLBI R25 HL 092618.]

69 Affinity Purification of Two Methyl-DNA Binding Domain Proteins, MBDS and MBD7 in Arabidopsis thaliana

Gindy Nagabayashi, University of California, Los Angeles (UCLA)

Epigenetic modifications to DNA represent a method of gene regulation conserved in plants and mammals. Cytosine methylation, a well- studied epigenetic modification, is thought to repress gene expression. First observed in mammals, proteins containing methyl binding domains (MBD) have been shown to bind to methylated DNA in both plants and mammals. Arabidopsis thaliana (A. thaliana) contains a large family of 13 methyl binding domain proteins, two of which, AtMBDS5 and AtMBD6 are homologous to human MBD containing proteins. Additionally, MBD7, which is unique to plants, contains multiple MBD domains. AtMBDS5, AtMBD6, and AtMBD7 have been shown to bind to methylated DNA in vitro. The roles of these proteins in plants have yet to be characterized.
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We hypothesize that AtMBD5 and AtMBD7 may play a role in maintaining DNA methylation or act downstream influencing heterochromatin formation and gene silencing. Indeed, mammalian MBD proteins form complexes and these complexes are thought to interpret DNA methylation and to establish heterochromatin formation. To gain further insight into the functions of AtMBD5 and AtMBD7, we generated transgenic plants expressing MBD5-Flag and MBD7-HA. A. thaliana Columbia ecotype was the wild-type line used. All mutants were in the Columbia background. Using flower tissue from these lines, we performed immunoprecipitations to purify proteins interacting with AtMBD5 or AtMBD7.

We determined by Silver stains that unique proteins may be co-immunoprecipitated with Flag-MBD5 and HA-MBD7. Finally, we will perform a Mass Spectrometry of the immunoprecipitated proteins, which should provide valuable information regarding the types of proteins that may interact with AtMBD5 and AtMBD7 and further our understanding of the role of MBDs. [This work has been funded by the NIH, NIH IMSD GM 55052, and Howard Hughes Medical Institute.]

70 Role of the Proline Hinge in Inactivation of Kv1.4 Voltage-gated Potassium Channel

Shamsor Naher, University at Buffalo, NY

Voltage gated potassium channels are fundamental components of electrical activity in the heart. These channels pass an inward current which contributes to repolarization of the cardiac action potential. We studied Kv1.4 voltage-gated potassium channels which have rapid inactivation and which are thought to be responsible for the slowly recovering potassium current in the endocardium of many mammalian species, including humans.

We wanted to determine the role that a particular structural feature of Kv1.4 channels, the proline hinge, plays in Kv1.4 gating. There are two type of inactivation of Kv1.4, N-type and C-type. We used an N-terminal deletion construct that lacks N-type inactivation, but exhibits C-type inactivation. The oocytes of the Xenopus laevis were used for the heterologous expression of mammalian Kv1.4 channels.

We examined the role of the “proline hinge” of kv1.4 channels, which is formed from a proline-valine-proline sequence. Oocytes were injected with RNA for wild type Kv1.4 channels, Kv1.4 channels with the N-terminal deleted and these two forms with the prolines in the proline hinge mutated. The second proline in the hinge of Kv1.4 was mutated to glycine. The kinetics of the Kv1.4 and mutated channels was by studied with the two electrode voltage clamp.

We found that the flexibility of the proline hinge plays a critical role in the activation and inactivation of the Kv1.4 channel. This information enhances our understanding of the structure-function properties of the Kv1.4 channel and will help in the design of antiarrhythmic drugs.

71 Sensing and Processing in the Six- Protein “Brain” of Bacteria

Rose Ndeto, Benedict College / University of Tennessee
Gladys Alexandre, University of Tennessee

The ability of cells to move along a chemical gradient (whether it is an attractant or a repellent) is referred to as chemotaxis. In a fluctuating environment, chemotaxis allows cells to sense changes in their surroundings and to respond to them. Among other behaviors, chemotactic responses could include the regulation of gene expression or a change in motility bias.

Recent findings suggest that one of the chemotaxis signal transduction pathways (Che1) of A. brasilense was responsible for modulating cell length, flocculation, and cell surface characteristics (including exopolysaccharides, production), with an indirect effect on the motility bias, it was suggested that one of the other three chemotaxis pathways encoded within the genome of A. brasilense may primarily regulate chemotaxis.

Here we report that the Che4 pathway may be involved in regulating chemotactic behavior. We suggest some “cross-talk” between the Che1 and the Che4 signal transduction pathways. In order to find further evidence to support this hypothesis, the sub cellular localization of chemotaxis proteins was tested in different genetic backgrounds. The fluorescent proteins were expressed from plasmids that were transferred in bacterial strains and observed under florescence microscope to detect the localization patterns of the chemotaxis proteins. Western blotting was also carried out to see the expression of the different chemotactic proteins in the cells. We show co-localization of the six proteins as seen in the mutants, indicating that with further analysis, it could be proven that the fourth and the first operon work synergistically in A. brasilense to promote chemotaxis and/or other cellular functions. [Supported by UT, Knoxville, HD038342 and HRD0411486.]

72 Assessing Trichomonas Vaginalis in Women Meeting the CDC and USPSTF Screening Criteria for Chlamydia Trachomatis

Uchechi Ndooh, Norfolk State University, VA

Trichomonas vaginalis (TV) is a common sexually transmitted protozoal infection associated with many adverse health outcomes in women, including HIV transmission. The annual incidence of TV is estimated to be 3-5 million cases in the U.S. The U.S. Preventive Services Task Force (USPSTF) does not have screening guidelines for TV, but does have guidelines for other sexually transmitted infections (STIs) impacting women, such as
chlamydia (CT), the most common reported infectious disease in the U.S. The USPSTF CT guidelines include primarily young sexually-active women, but also include recommendations for screening older women with risk factors (such as multiple partners or history of STIs). New testing technology makes combined TV/CT testing possible, so we sought to estimate the prevalence of TV in women meeting the screening criteria for CT.

We analyzed the TV prevalence in women 14-49 years using 2001-2004 data from the National Health and Nutrition Examination Survey (NHANES). We used age and sexual behavior data to determine which women met the CDC and USPSTF CT screening criteria and compared the prevalence of TV in women meeting the criteria with those who did not.

The overall prevalence of TV in women 14-19 years was 3.1%. The prevalence of TV among those who met the USPSTF CT criteria was 4.2% vs. 2.6% in those who did not (p<0.05). Women 14-24 years who met the USPSTF CT screening criteria had a prevalence of 2.0% vs. 6.9% in older women 25-49 years who met the USPSTF criteria (p<0.01). Women 14-24 meeting USPSTF guidelines also had a lower TV prevalence than 3.5%, which represents all other women combined. This includes older women meeting the CT screening criteria and women not meeting the criteria, such as older women without risk factors and younger women who were not sexually active (p<0.05).

Women meeting the USPSTF CT criteria have a higher TV prevalence than women not meeting the criteria, but this is due to a higher prevalence of TV in older women meeting the CT criteria due to risk factors such as multiple partners or history of other STIs. The TV prevalence in younger women meeting the USPSTF CT criteria is significantly lower than the overall prevalence of TV in all other women aged 14-49 years, suggesting that the USPSTF CT screening criteria for young women do not identify women at elevated risk for TV.

We hypothesize that at extreme temperatures activity of enzymes will be low and between these extremes there is an optimal temperature for activity. Also, changes in season will affect activity based on weather patterns.

To test these hypotheses, alkaline phosphatase, 6-glucosidase, f,-N-acetylglucosaminidase, and leucine aminopeptidase enzyme activities were assayed fluorimetrically. We measured enzyme activity in water samples collected once a week off the Newport Beach, CA pier at seven different temperatures (4°C, 10°C, 16°C, 22°C, 28°C, 34°C, and 40°C). Seasonal data revealed spikes in winter and spring due to the rainy seasons causing runoffs and increased upwelling.

We also found that enzyme activities generally increased with temperature. Once an optimal temperature was reached the activity began to decline forming a bell like curve. The presence of optimal temperatures may indicate that the enzymes are adapted to function at ambient seawater temperatures; however, the optimal temperature may change with season.

74 Improving Heart Rate Predictions of Energy Expenditure in Quiescent and Active States

Naomi M. Nihipali, Kapi‘olani Community College, Honolulu, HI
Gerry Vasquez RRT, Hoang H. Nguyen, and Patrick S Moon Jr., Kapi‘olani Community College

Within the past few decades, studies have shown that everyday lifestyles have become more sedentary, contributing to an increase in risk factors for a variety of chronic diseases (i.e. cardiovascular diseases, type 2 diabetes). The Flex-method has been most commonly used to determine the relationship between heart rate (HR) and energy expenditure (EE).

This method assumes that the expenditure for all states from Basal Metabolic Rate (BMR) up to the start of exercise have the value of BMR for each individual. The energy requirements for quiescent activities such as resting supine, sitting, and standing are likely to be greater than BMR and distinct from each other due to the progressive increase in muscular activity required to maintain posture. Under free-living conditions, there is usually motion accompanying sitting (i.e. desk work) and standing (i.e. gestures) which requires additional energy use. In addition, any change in posture alters the HR/EE relationship due to its effect on hydrostatic pressure of the cardiovascular system.

It can be hypothesized that there are different relationships between HR and EE when comparing the value for BMR to the values of the distinct quiescent states for each subject. Measurements were made for HR and EE over a range of activities from resting to sub-maximal exertion (resting, sitting, sitting with arm motion, standing, standing with arm motion, and treadmill activity at 1, 2, 3, 4 mph, up to 80% of age-

73 Temperature Response of Microbial Enzymatic Activity

Valerie Neino, University of California, Irvine

Rising temperatures affect many ecosystems around the world. Within the past century global sea surface temperatures increased 0.4-0.8°C. Microbes drive decomposition in oceanic environments via production of extracellular enzymes. For instance, heterotrophic bacteria play a crucial role in nutrient cycling in the ocean through their extracellular digestive enzymes, which they synthesize to degrade organic matter. Across seasons, nutrients vary in abundance in seawater due to changes in ocean upwelling, runoff, and biological activity. By measuring the enzymatic activity within seawater, fluctuations of nutrients can be effectively followed.
Abstracts

predicted maximum HR). The average value, n, and standard deviation (SD) were determined for ten consecutive one-minute measurements of EE, for BMR and the different quiescent states. A student T-test was used to determine statistical differences between the values for BMR and the distinct quiescent states. Also, polynomial regression equation (3rd and 4th order) relationships were generated between HR and EE over the range of activities.

24-hour HR data was collected for 6 subjects, who had previously established their HR/EE relationships. The HR data will be applied to the Flex-method equation, the polynomial regression equation, and the relationships determined for the different quiescent states (distinguished by activity logs). The estimates of daily energy expenditure for the different equations will be compared to determine relative distinctions between methods. [This study was supported, in part, by a grant from NSF awarded to KCC STEM, and in part, by a Perkins Grant awarded to Dr. Ronald Dunn PhD, Professor, and Amy P. Yamashiro MS, Instructor of Anatomy and Physiology of KCC, TCUP University, Honolulu, HI 96816.]

75 Effects of Chronic Methamphetamine on EEG and Synaptic Plasticity in the Hippocampus in Vivo

Ericka N. Oliver, Tuskegee University
Adwoa Aduonum, Philadelphia College of Osteopathic Medicine
Kiera-Nicole Lee, Neuroscience and Pharmacology, Meharry Medical College, TN
Sanika Chirwa, Tuskegee University

Neural output from the hippocampus controls memory formation and its dysregulation results in memory dysfunctions. Here we examined the chronic effects of methamphetamine on hippocampal EEG and synaptic plasticity in CA1 and found that the psychostimulant caused significant shifts of theta power to higher frequencies, diminished coherence between theta-gamma bursting and attenuated LTP maintenance.

We conclude that drug-induced alterations in hippocampal oscillations and CA1 discharge patterns, coupled with diminished capacity for LTP maintenance, probably causes lost fidelity in memory performance that is associated with methamphetamine administration. 9 male guinea pigs (150–300 g) were obtained from Charles Rivers and housed where they were kept on a 12:12 light/dark cycle, with food and water supplied ad libitum. Guinea pigs, randomly divided into 3 treatment groups, underwent initial handling, behavior assessments and recordings.

Each group underwent 3 days of handling, 1 day baseline recording, 7-8 days of IP injection, 24 hr observation post-final series injection, and LTP study. Guinea pig behaviors were monitored in Phenotyper home cages using EthoVision XT behavior acquisition system from Noldus.

At the end of behavior assessments, guinea pigs were prepped for recordings as follows: A stimulating electrode was placed into the CA3 (coordinates from bregma in mm: P, 4.5; L, 5.0; H, 5.0) and a recording electrode in the CA1 (P, 5.0; L, 2.5; H, 3.5). Local EEG was recorded in CA1 as well as population spikes evoked after stimulation in CA3 region (stimulus: 100-150 μA, 0.15 ms, at 0.017 Hz). Baseline responses were recorded for 30 min before tetanization (100 Hz, 1 sec; 3 trains at 1 min intervals) to induce LTP. Recordings were monitored for 180 min post-tetanus. After recordings, guinea pigs were euthanized with pentobarbital, transcardially perfused with fixatives before dissecting out the brains.

Our preliminary assessments in this on-going study shows that exposure to chronic METH is associated with increased bursting activity and attenuation of LTP maintenance in vivo. A full assessment, together with statistical analysis – i.e. ANOVA with Tukeys posthoc – is in progress for all animal treatment groups. [This work was partly supported by Grants 3G12RR003032-24S1 from the National center for Research Resources (NCRR), and R24DA02147 from the National Institute of Drug Addiction, both components of the National Institutes of Health.]

76 Role of the MAM-domain Proteins MLT-9 and ZC13.3 in the Molting Cycle of Caenorhabditis elegans

Beatriz Osuna, University of California, Los Angeles

Caenorhabditis elegans periodically sheds and remakes its exoskeleton (the cuticle) in order to grow. During this molting process, epidermal cells fully renovate local extracellular matrices (ECM) and related cell-ECM and cell-cell attachments. Because the C. elegans exoskeleton is a collagenous ECM similar to human skin and connective tissue, findings about the regeneration of the nematode exoskeleton will likely apply to ECM homeostasis in vertebrates, which is critical for normal development and wound repair.

This study investigates the mlt-9 and zc13.3 genes, which were previously identified in an RNAi-based screen for larvae unable to shed cuticles. Both genes encode annotated secreted proteins with MAM domains characteristic of adhesive molecules. It is expected that interactions between the MAM domains of MLT-9 and ZC13.3 contribute to dynamic changes in adhesion among epidermal cells and the ECM critical for molting. Genetic and cell biological analysis will be used to test this hypothesis. Specifically, mlt-9 and zc13.3 null mutants are being examined for defects in the cyclic detachment and reattachment of epidermal cells to the cuticle and each other during molting.
Thus far, several distinct mutations in mlt-9 and zc13.3 have been obtained, confirmed by PCR-based genotyping, and out-crossed to wild-type C. elegans. Further, additional molting defects have been observed in larvae of each genotype by Nomarski microscopy. Specific phenotypes observed to date are consistent with the hypothesis that MLT-9 and ZC13.3 regulate cell-ECM adhesion during the molting cycle. [This work was supported by funds from the David Geffen School of Medicine at UCLA, CARE Fellows/Scholars, and UC LEADS.]

77 Developmental Changes in the Regulation of CNS-intrinsic Immunity

Yohan Penny, University of California, San Diego / University of California, Riverside

Nasu-Hakola disease is a recessive genetic disorder characterized by early onset cognitive dementia apparent by the time an individual reaches their 20s, which is also the same time the human CNS reaches full maturity. Nasu-Hakola disease is a direct result of genetic defects in the function of the orphan receptor, TREM2. Based on the clinical presentation of dementia, the genetic defect was presumed to be a primary disorder of central nervous system (CNS) neurons.

However, our research group demonstrated that TREM2 was not expressed by CNS neurons, but was expressed constitutively by microglia. Microglia are a tissue macrophage specialized to support central nervous system (CNS) function and comprise ~10% of all CNS cells. We and others have demonstrated that TREM2 promotes microglial phagocytosis of cell debris and tissue repair, processes that are required for normal CNS development and maintenance.

In the current study, we seek to define when and in what brain regions TREM2 ligands are expressed so that we can define where and when TREM2 activation of microglia is required in normal brain development and maintenance. As yet, the ligands for TREM2 have not been identified.

Therefore, we are using the following strategy to detect putative TREM2 ligands in tissue sections from young postnatal and young adult mice. A fusion protein has been generated consisting of the extracellular ligand binding domain of TREM2 fused to the Fc region of human IgG. This reagent, referred to as TREM2FP, is then used to label brain sections in conjunction with fluorescently labeled antibodies directed against proteins specific for CNS neurons (NeuN), CNS astrocytes (GFAP) and CNS microglia (Iba1).

From these studies, we will determine whether expression of TREM2 ligands are restricted regionally or developmentally. These studies will contribute to defining where and when TREM2 mediated activation of microglia is required for the development of normal brain function and thus, where and when the absence leads toward early onset cognitive dementia. [Research completed at University of California, Riverside.]

78 Low Dose Methylprednisolone Prophylaxis to Reduce Inflammation During One Lung Ventilation

Wachen Peters, Lincoln University, PA
Mary Theroux, Thomas Shaffer, and Alicia Olivant, Alfred I. DuPont Children’s Hospital, Wilmington, DE

One-lung ventilation (OLV) is an intentional collapse of a lung. It is performed to facilitate surgical procedures in the thoracic cavity. During this process, the non-collapsed lung is maintained on ventilation which potentially results in injury to the lungs. Several studies have evaluated the extent of injury from OLV in adults, but only a few in children. Similarly, no studies have evaluated different interventions to minimize injury in children from OLV. Methylprednisolone, an anti-inflammatory drug was used as an intervention to evaluate the extent of injury from OLV in children during this study. Injury was measured by the level of cytokines (IL6, IL8, and TNFα) produced in the lung.

We hypothesized that when a low dose of methylprednisolone is given to children prior to OLV, it will reduce inflammation and improve preoperative stability during and after OLV. Twenty-five patients (ages 3-18) scheduled to undergo thoracotomy or thoracoscopic procedures were randomly assigned to two groups, the placebo and Methylprednisolone (MP) groups. Two (2) mg/kg methylprednisolone was administered to the MP group via IV while 2.0 mL saline was administered to the placebo group via IV approximately 45 minutes prior to OLV. Blood samples were drawn before, during and after OLV and in relation to MP administration. Tracheal aspirates were all drawn before the lung was blocked and after the lung was unblocked. These samples were evaluated using ELISA to determine the level of cytokines.

The results show that there was lower level of TNFα, IL6 and IL8 in the MP group than the placebo group. However, there was no significant difference. On the other hand, there was higher level of IL10 in the placebo group than the MP group. There was lower level of all tracheal aspirates cytokines in the placebo group. In conclusion, injury measured was low in the MP group compared to the placebo group.

79 Th Evolution of an Incipient Cooperative System

Jose Mario Pineda, University of Washington
Barbara Bengtsson and Wenying Shou, University of Washington
Abstracts

Cooperation is thought to drive major transitions in evolution. Division of labor and reciprocation between cooperators allow for the emergence of biological complexity. For instance, multicellular systems consist of cooperating cell types performing complimentary functions. How might an incipient cooperative system evolve?

To study this, I have used CoSMO (Cooperation that is Synthetic and Mutually Obligatory), an engineered yeast cooperative system, as my model for incipient cooperation. It consists of two complementary strains, one tagged with a red fluorescent protein that overproduces adenine but requires lysine to grow, and the other tagged with a yellow fluorescent protein that overproduces lysine, but requires adenine to grow. By identifying changes in CoSMO, we will gain the first quantitative insights into the major mechanisms underlying the evolution of cooperation.

Evolved CoSMO cocultures have developed increased viability, manifested in their ability to remain viable at significantly lower starting cell densities compared to their ancestors. This improvement in viability occurred in two stages. I have determined that the first stage viability improvement is heritable by measuring the viability of reconstituted evolved CoSMO pregrown in rich media which allow cells to grow in the absence of cooperation. I further found that the adenine-overproducing strain was responsible for increased viability after mixing evolved strains with ancestral partners.

This evolved cooperation-promoting strain harbors a petite mutation, possessing defective mitochondrial DNA. We are determining whether this petite mutation is responsible for viability increase in evolved CoSMO by introducing functional mitochondria, but not nuclear genome, into the evolved petite strain through cytoduction. If viability increase is absent after cytoduction, then the loss of mitochondrial DNA is required for the initial improvement in viability. If an increase in viability persists after cytoduction, a nuclear mutation is implied.

In both cases, we will identify phenotypic changes and assess whether they are “self-helping”, such as through increased starvation tolerance and higher affinity for metabolites, or “partner-helping”, such as through increased metabolite release. I will develop bioassays for measuring metabolite release and consumption scaled down to a 96-well format.

Finally, the molecular basis of these pro-cooperation changes will be identified using genome-wide re-sequencing. Performing similar analysis on independently evolved CoSMOs will reveal the diversity in evolutionary trajectories of an incipient cooperative system. [This research was supported by grants from the NIH and the W.M. Keck Foundation]

80
Identification of Arabidopsis MIOX4 Over-expressing Lines with High Vitamin C Content

Kiara Potts, Philander Smith College, AR

Ascorbic acid, AsA, is an antioxidant that is found in all plants. The biosynthetic pathways in which ascorbic acid produced from are widely misunderstood. This is where the basis for the experiment is established. It was initially stated that ascorbic acid could only undergo one pathway in order to synthesis within plants but recent studies have shown some alternate routes that are also linked with myo-inositol, a key element in AsA biosynthesis. The gene MIOX4 is hypothesized to be in connection to increasing the amount of ascorbic acid found in plants.

Another experiment using the same plant, Arabidopsis, and process opposes the view of the MIOX4 gene generating a more rapid synthesis of AsA. It is believed that the MIOX4 gene had been silenced in the sequence of plants coming from the original tested plants. When beginning this experiment the hypothesis was the Arabidopsis plant could be manipulated to develop more AsA if the gene MIOX was inserted in the appropriate locus of the plant chromosome. Our hypothesis was supported due to the MIOX4-L4 plant presenting results of more ascorbic acid than the wild type plant.

81
Effects of Ouabain on Intestinal Sodium Reabsorption in Procambarus clarkia

Raven Price, University of Kentucky, KY

Procambarus clarkii, or swamp crayfish, experience daily fluctuations in salinity, and are known to both osmoregulate, as well as osmoconform. In a previous experiment I have found that the lower gut of the decapod P. clarkii will reabsorb normal crayfish solution (~200mM NaCl) at an average of 28.7µl/min. I hypothesize that saturating the outside of the GI track with ouabain will decrease reabsorption rate. Ouabain binds to and inhibits Na+/K+ ATPase. The inhibition of the Na+/K+ pumps will stop the transfer of Na+ out of the intestinal lumen, in turn stopping reabsorption. Since Na+/K+ ATPase are mostly located on the basolateral membrane, ouabain is administered on the outside to effectively block the Na+ pumps. Large P. clarkii (25-30g) were obtained from Atchafalay Biological and allowed to acclimate for 2 weeks.

Crayfish were sedated in an ice water bath prior to experiment. Polyethylene tubing was inserted into the anterior opening of the GI tract for perfusion, as well as the anus for collection of perfusate. Five different concentrations of ouabain saturated the outside of the GI track for 20 minutes: 10^{-3}M, 10^{-3}M, and 10^{-}^{3}M. Simultaneously a constant flow of normal crayfish solution
was perfused through the GI track and the perfusate was collected. Results did not show a uniform decrease or increase of the reabsorption rates.

I conclude that the potential osmoregulatory function of the intestine of the freshwater crayfish P. clarkii is not regulated by Na+/K+ ATPase. Future experiments will be carried out to investigate a potential role for osmeregulation in the intestine of P. clarkii. [Supported by NSF grants #0437768 and #0431552, and the Gertrude and Flora Ribble Foundation.]

82
Identifying Interacting Partners of Human Small Timm Proteins
Geizhar S. Ramirez Enriquez, University of California, Los Angeles

Mohr-Tranebjaerg Syndrome (MTS) is a disease that causes postlingual progressive deafness, followed by progressive dystonia, mental deterioration, blindness, spasticity and psychiatric manifestations. MTS results from a mutation in hTimm8a transport protein found in the TIM22 import pathway of the mitochondria. In yeast, Small Tim proteins Tim8p, Tim9p, Tim10, Tim12 and Tim13 behave as chaperone-like components that guide hydrophobic precursors across the mitochondrial intermembrane space. Research has shown an interaction between Tim8p and Tim13p as well as Tim9p and Tim10. Human homologues of these small Tims are known as hTimm8a, hTimm8b, hTimm9a, hTimm9b, hTimm10 and hTimm13.

We aim to find all interacting partners of the human small Timms. Small Timm proteins will be purified in a native state by forming human stable cell lines that express His-PC tagged small Timms. Interacting partners can be identified through western blotting and LC-MS/MS analysis. Preliminary studies suggest a unique interaction between hTimm8a and Oxa1L. Defects in Oxa1L causes multiple respiratory chain deficiency (MRCD), with physical manifestations similar to MTS. Research focused on the import mechanisms that involve human Small Timms may help us develop treatments that better the lives of people with MTS.

83
Characterization of Human Cytomegalovirus pp71-containing Complexes in Latently and Lytically Infected Cells

Shye Richardson, Fort Valley State University, GA
Robert Kalejta and Jiwon Hwang, University of Wisconsin-Madison

Human cytomegalovirus (HCMV) is capable of establishing both a productive lytic infection as well as a latent infection. This establishment of latency allows the virus to persistently infect the host for the remainder of its life span. The most distinguished effect that occurs is the expression of viral immediate-early (IE) genes, which is facilitated by the viral protein pp71. pp71 seems to be one of the determinants that controls whether HCMV will establish a lytic or latent infection upon entry into a cell.

We hypothesized that pp71 forms different complexes in latently infected cells and lytically infected cells. Here we analyze the mechanisms that control the subcellular localization of pp71 in different cell types. To analyze the pp71-containing complexes, we performed sucrose gradient centrifugation using protein lysates from HFs and NT2 cells. We have previously described that in cells that are destined to be lytic infections (such as human fibroblasts (HFs)), pp71 migrates to the nucleus and neutralizes Daxx-mediated cellular intrinsic defense by inducing Daxx degradation. Daxx is a cellular protein that has been proven to induce a transcriptionally repressive chromatin structure at the viral IE promoter.

Thus pp71-mediated degradation of Daxx allows IE genes to be expressed. When latency is established (such as undifferentiated human N-Tera2 (NT2) cells), pp71 remains in the cytoplasm unable to enter the nucleus and viral IE genes are repressed due to the presence of Daxx, implying that localization of pp71 may be the determinant for the outcome of infection. Our results indicated that pp71 appears to form different complexes in different cell types, as we had hypothesized. [This research was supported, in part, by a grant from NSF HBCU-UP (#HHRD-0625289) awarded to Dr. Sarwan Dhir* Ph.D., Director for the Center for Biotechnology, Fort Valley State University, Fort Valley, GA 31030.]

84
Using the Drosophila Vesicular Monoamine Transporter to Investigate Neuroprotection and Identify Novel Pathways Regulating Locomotion

Logan Roberts, University of California, Los Angeles

Parkinson’s disease is characterized by the selective loss of dopaminergic (DA) neurons in the substantia nigra resulting in severe motor deficits. The oxidative properties of DA have been proposed to play a role in PD pathology and to account for the susceptibility of dopaminergic neurons to cell death in PD.

However, the mechanisms underlying PD and an approach for effective therapeutic treatment are still uncertain. The Vesicular Monoamine Transporter (VMAT) is a twelve transmembrane domain protein essential for regulating the packaging of all cytosolic monoamine neurotransmitters including dopamine, serotonin, and octopamine.

Studies have shown that octopamine is critical for the activation of the central pattern generator that controls behaviors like locomotion. We investigated whether reduced locomotion in VMAT-mutants could be rescued by potentiating the
octopaminergic circuit. Recent evidence suggests that VMAT function is also neuroprotective against models of PD. We hypothesize that molecules capable of increasing VMAT function would therefore serve as neuroprotectants.

Accordingly, we sought to identify drugs capable of increasing VMAT function. Using locomotion as a phenotype, we conducted drug screens to identify molecules capable of increasing Drosophila VMAT (dVMAT) function in dVMAT mutant larvae. DVMAT mutants show severely retarded locomotion and drugs capable of rescuing this were selected for further screening. This screen revealed 41 drugs that significantly improve locomotion; some of which may act directly through dVMAT. These agents have the potential to serve as novel therapeutic agents for PD as well as further our understanding of the mechanisms underlying dopaminergic cell death in PD.

We are currently developing a robust system for assaying DA neuron loss in response to pesticide exposure, and we report a robust loss of DA neurons in Drosophila larva exposed to the pesticide rotenone. This model will allow us to test the neuroprotective potential of drugs identified in our screen. [I have been funded for my research by the MSD Program (Maximizing Student Diversity).]

86
A Small Molecule Drug Screen for Inhibition of the Wnt/β-catenin Signaling Pathway in Human Embryonic Kidney Cells

Miguel Sanchez, University of California, Irvine

The problem of current cancer cell therapies is still a lack of effective drugs to slow down tumor growth. The Wnt/β-catenin signaling pathway is commonly linked to cancer related cell behaviors, such as the growth of tumors. Since the Wnt signaling pathway is one of the fundamental mechanisms that control cell proliferation, there is much work being done to find drugs that interfere with Wnt and slow down cancer growth. By testing a family of small molecules on human embryonic kidney cells, we are searching for a drug that will prevent the activation of Wnt signaling, and thus slow the growth of tumors.

The basis of our study is transient transfection into 293 cells and the use of a Wnt luciferase reporter plasmid in the presence and absence of small molecule drugs. Wnt activity is measured by luminometer detection of the amount of luciferase activity in cell extracts.

While our study is still in progress, we have found at least one small molecule, DAC, which causes significant inhibition of Wnt signaling. We plan to analyze twenty-four DAC-related compounds in a structure/function comparison of Wnt inhibition. By targeting the Wnt/β-catenin signaling pathway, we hope to find a drug that will ultimately slow the growth of tumors dependent on Wnt signaling for proliferation and survival. Our experiments could lead to further testing of positive drugs on several cell types involved in tumor growth, in human and other mammalian organisms.
87
Systemic Review of the Genetic Variants that Affect Blood Pressure Response to Exercise

Rahja Sharp, Savannah State University, GA

High blood pressure (BP) is a major risk factor for cardiovascular disease. The importance of treating pre-hypertension [Systolic BP (SBP) 130-159 mmHg and/or Diastolic BP (DBP) 85-89 mmHg] with lifestyle interventions is essential to delay the progression to hypertension. A single exercise session immediately reduces BP 5-7 mmHg and is termed post exercise hypotension (PEH).

There is a clinically significant genetic component to PEH with heritability estimates of 45% for SBP and 55% for DBP.

Therefore, current literature was systematically reviewed examining the influence of genetic variants on PEH among adults. Studies were included if they involved exercise, BP, and genetic analysis. All analyses were completed using Stata version 11.1. A total of 893 articles were reviewed and 13 studies satisfied all requisite inclusion criteria. BMI indicated 82% of the subjects were overweight or obese. Mean SBP decreased by 3.3 ± 14.1 mmHg from pre (127.9 ± 12.6 mmHg) to post exercise (124.6 ± 15.3 mmHg) but the difference was not significant (p=0.57). Mean DBP did not change from pre (76.6 ± 6.4 mmHg) to post exercise (76.6 ± 7.2 mmHg) (p=0.97). The major finding of this research was that a single bout of exercise reduced SBP over 3 mmHg.

88
Levels of Drosophila Female Receptivity to Male Courtship Correlate with Differential Expression of Specific Genes

Deondra L. Short, Delaware State University
Charles Eke, Tim Pierpont, and David Scott, South Carolina State University
Harb S. Dhillon, Delaware State University

Drosophila is a useful model organism for understanding behavior. Courtship in Drosophila involves a series of stereotypical behaviors. When naive males and virgin females are paired, there is substantial variation in terms of the time taken for a successful copulation to take place. Previously in our lab, it was noticed that while males tend to actively court females, there is considerable variation in their rate of success in mating with a female.

Based on this, our working hypothesis is that mating success primarily depends on female receptivity. We are interested in identifying genes that are involved female receptivity response to male courtship. Results from mating assays and micro array data were used to shortlist candidate genes involved in differential mating with the D. melanogaster. We are now characterizing fly strains in specific mutants in genes from the above shortlist in terms of their mating behavior and female receptivity. These include strains 1944, 7203, 13114, 16884, 4836, and 5494 from the Bloomington insertional mutants, and RNAi lines14898, 12699, 8498, 7151, 2668, 4836, 11719, 1944, 10842, and 6372 from Vienna.

Our preliminary results point toward support to our hypothesis that there are specific genes whose expression in the female fly modulate their receptivity to male courtship. Detailed results and implications of our mutant characterization will be presented and discussed.

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Biomphalaria glabrata: Genetic Variability Among Susceptible and Resistance Strains

Michael Smith, University of the District of Columbia (UDC)

Biomphalaria glabrata, the intermediate host to Schistosoma mansoni, is a major participant in the life of this flatworm. There is much phenotypic diversity within this species of snail. Several laboratories stains are resistant to the invading schistosome which always proposes the possibility of them serving as a curtailing agent for the life cycle if they were to replace the susceptible snails in the field.

We have found several phenotypic differences in the variety of snails that we have previously examined. For example LAC-Line, a resistance snail, loses its resistance when mated for multiple generations. The loss in resistance appears to be coupled to major abnormalities in its albumen gland. It is felt that there maybe a correlation between the resistant phenotype and reproductive capabilities.

The objective of this study was to examine four strains of Biomphalaria glabrata snails, both susceptible and resistance at the molecular level to determine their genetic variability and at the ultrastructural level to examine details of their albumen glands. These procedures would be done in resistant and susceptible snail strains at baseline (as soon as eggs are produced) and after having mated or selfed for two generations.

BS-90 (resistant) and NMRI (susceptible) and LAC (variable in its susceptibility), where the strains were examined and their albumen glands extracted and processed for transmission electron microscopy. DNA was extracted from another set of the same snails using lys buffer containing 2 % CTAB) and incubated with proteinase k following the standard phenol/ chloroform extraction. Ten different primers were used to perform DNA amplification by RAPD-PCR. The PCR products were run on polyacrylamide gel electrophoresis and silver stained. Products from 5 of the 10 primers presented polymorphic makers lineage and the albumen glands showed variations among the different organisms. [Support by NIH Grant 1R25CA129-035.]
Abstracts

90 Analysis of Flanking Sequences Around Arabidopsis Pre-mRNA Splicing Sites

Brittany Stoutermire, Langston University, OK

Pre-mRNA splicing is a critical process in the gene expression, which occurs at the specific sequence sites that are not fully understood. However, it is known that the intron splicing is determined by the interactions of small nuclear ribonucleoproteins with a number of pre-mRNA sequence elements. Efforts have been made to identify the splicing signal sequences around the 3’ and 5’ splicing sites in eukaryotic genes. Subsequently, loose consensus sequences were identified around the 5’ and 3’ splicing sites as 5’-(exon)-(C)AAG/GT(AG)-(intron)-3’ and 5’-(intron)-TAG/-(exon)-3’. The objective of this study is to determine the splicing signal sequences in plant. Arabidopsis genome was selected for this study. The presence of nucleotides in the area of +/−50 positions around splicing site were evaluated. 2,000,000 nucleotides contained 514 genes and 3570 splicing sites were screened.

The results showed that on 5’ splicing site, G and T were highly conservative in +1 and +2 positions. The +3 position was mostly consistent with purine (A). G and A were conserved in position -1 and -2, respectively. There was no nucleotide preference in -3 position. On the 3’ splicing site, position -1, -2, and -3 in the intron were consistent with nucleotides G, A and C, respectively. A pyrimidine was more likely to occur in the position -5 with the preference of T and then was followed by a polypyrimidine tract with the preference of T upstream to the -18 position. A purine that showed the preference of G was conserved at the +1 position in exon and was followed by a purine dominant sequence downstream to the +50 position. Respective pyrimidine percentages in 5’ and 3’ intron regions (57% and 56%) with the preference of T are higher than that in the flanking exon regions (49% and 45%).

91 Role of Ubiquitination in Hepcidin-Mediated Internalization of Ferroportin

Priscilla Sugianto, University of California, Los Angeles (UCLA)

Anemia of inflammation is one of the most common immunopathological disorders that affect patients with acute and chronic infections or inflammatory diseases. Inflammation causes increased production of hepcidin, which binds to the only cellular iron exporter ferroportin and induces its internalization and degradation, thus blocking iron efflux from cells into plasma. This then restricts iron flow to the developing red cells in bone marrow, limits hemoglobin synthesis and results in anemia of inflammation. Preliminary studies have shown that ferroportin is ubiquitinated prior to its internalization, but it is still unknown where ferroportin is ubiquitinated and whether this modification is necessary or sufficient for ferroportin internalization.

The goal of this study was to characterize the sites of hepcidin-induced ferroportin ubiquitination and the effect of ubiquitination on ferroportin internalization. A number of ferroportin mutants were constructed by site directed mutagenesis and analyzed for hepcidin-induced internalization (by fluorescence microscopy) and for ubiquitination (by immunoblotting). Upon hepcidin treatment, ferroportin with substitution in lysine 240 and 258 was not internalized and one with substitution in lysine 240 was not ubiquitinated.

Lastly, we detected that pathogenic ferroportin mutants which were resistant to hepcidin and were not internalized, did get ubiquitinated. Our result suggests that lysines 240 and 258 are the two important sites for ferroportin ubiquitination and that ubiquitination is necessary, but not sufficient for its hepcidin-mediated internalization. Better understanding of the structural basis and the role of the hepcidin-mediated ferroportin ubiquitination and internalization should facilitate the rational design for the treatments of anemia of inflammation. [This study was supported, in part, by a grant from NIH IMSD GM 55052 awarded to Dr. Tama Hasson, Ph.D., Director of URC/CARE, UCLA, Los Angeles, CA 90024.]

92 The Role of the Small GTPase Rem2 in Inhibitory Synapse Development

Rahilla A. Tarfa, University of Maryland Baltimore County (UMBC)

Chemical synapses are the routes of communication between neurons in the nervous system. Although many proteins that play a role in the development of chemical synapses are currently being studied, the exact molecular mechanisms that govern synapse formation remain to be elucidated. Rem2 is one such protein and has been shown to regulate both excitatory and inhibitory synapse development (Paradis et. al., 2007).

Rem2 belongs to the Rem, Rad and Gem/Kir (RGK) family of GTP binding proteins. Rem2, along with other RGK family members, has been shown to play a role in calcium channel regulation and rearrangement of the cytoskeleton (Correll et al., 2007). Interestingly, Rem2 is the RGK family member that is best expressed in the nervous system (Finlin et al., 2000).

It has been shown that decreasing the amount of Rem2 by RNAi in hippocampal neurons results in a significant decrease in the number of excitatory synapses (Paradis et. al., 2007). In addition to that, recent unpublished data shows that the introduction of an RNAi-resistant Rem2 cDNA to neurons in which endogenous Rem2 was reduced by RNAi rescues this synapse phenotype to
control levels. This validates the previous finding that Rem2 is necessary for the development of excitatory synapses (Paradis et al., 2007).

The goal of my project was to look at the role of Rem2 in inhibitory synapse development. I hypothesized that the re-introduction of an RNAi-resistant Rem2 cDNA to the neurons in which Rem2 has been reduced by RNAi, would rescue the inhibitory synapse density back to control levels, similar to what was observed with excitatory synapses.

My data shows that Rem2 knockdown causes a decrease in inhibitory synapse density as expected. The rescue condition showed a synapse density intermediate between control and Rem2 knockdown conditions. Thus, we cannot definitively conclude that we have rescued the Rem2 knockdown phenotype.

We hope that this rescue assay will be used in future studies that will ask which Rem2 protein domains are required for inhibitory synapse development.

However, our data resolved three subgroups among G. mangostana accessions, despite apomictic reproduction. Garcinia benthamii, and G. portoricensis clustered with accessions of G. mangostana in Group 2, indicating that they may be closely related and could potentially serve as sources of rootstocks for grafting or for useful genes for the agricultural improvement of G. mangostana. Group 3 contains G. cornea, G. intermedia, G. livingstonei, and G. madruno. Garcinia cymosa was genetically far removed from all accessions studied and that agrees with it’s unique morphological features, amongst these a very columnar growth and pendulant branches, that distinguish it from the other species evaluated.

The clustering of Mammea americana with other accessions in Group 2 raises identity questions that calls for more inquiries. Overall, the genetic diversity and relationship information obtained from this research will enhance the future conservation and improvement efforts of species of the genus Garcinia. [Acknowledgement: We are thankful to Bowie State University (BSU) for funding this project through the faculty BETTER grant award program.]

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Genetic Diversity in Garcinia Mangostana and Related Species

LaShay Taylor, Bowie State University, MD
George N. Ude, George Acquaah, and Chioma Ebiringa, Bowie State University
William J. Kenworthy, University of Maryland
Brian M. Irish, USDA-ARS, Mayaguez, Puerto Rico

Genetic diversity and relationships were assessed among 18 accessions of Garcinia mangostana (mangosteen) and accessions from 13 other related genera and species in the family Guttiferae (Clusiaceae) using RAPD technique. Garcinia mangostana (mangosteen) produces the most treasured fruit in the Guttiferae family with a total world production estimated to be about 150,000 tons per annum.

Despite the usefulness of this crop and the dependency of many economies on the commercial export of the fruits, very little is known about genetic variation within and among the species in the genus. Random amplified polymorphic DNA was used to study the accessions. The amplification with nine RAPD primers resulted in 73 polymorphic bands. UPGMA analysis of the 43 accessions produced a dendrogram with three distinct clusters.

Generally, accessions with similar morphological characteristics (leaf, flower and fruit traits) grouped together. Group 1, which included Clusia major, G. cochinchinensis, G. venulosa, G. xanthochymus, and G. subelliptica was the most genetically diverse with similarity index between 65 and 97%. The accessions of G. mangostana clustered closely within the similarity index range of 93 and 100%.

94
Biological Sciences
Nitric Oxide and Hypertension in Male IUGR Rats

Lateia Taylor, Tougaloo College, MS

Our laboratory utilizes a rat model of placental insufficiency that results in intrauterine growth restriction (IUGR) and hypertension in male IUGR offspring. We previously reported that an increase in oxidative stress contributes to hypertension in male IUGR offspring.

Thus, the purpose of this study was to determine whether uncoupling of endothelial nitric oxide synthase (eNOS) may serve as a source for the increase in oxidative stress in male IUGR, and whether impaired nitric oxide (NO) bioavailability also contributes to male IUGR hypertension. L-NAME (nitro-L-arginine methyl ester), an inhibitor of NOS, was given in the drinking water for 40 days at a dose of 10mg/kg/day.

Chronic blockade of NOS led to a greater increase in mean arterial pressure (MAP, measured in conscious chronically catheterized rats) in control offspring (an increase of 66 mmHg) relative to IUGR offspring (an increase of 43 mmHg, P<0.05 vs. control + L-NAME−) indicating that control rats were more responsive to NO synthase (NOS) inhibition than IUGR. Renal protein expression of endothelial NOS or α-phospho-eNOS, the activated form of eNOS, did not differ upon comparison of male IUGR to male control. Since renal eNOS expression is not altered; yet NO bioavailability is impaired in male IUGR offspring, these data indicate that uncoupling of eNOS may contribute to the increase in oxidative stress and hypertension in male IUGR offspring.
Abstracts

Future studies may investigate other isoforms of NOS such as inducible NOS (iNOS). The research findings are important because Mississippi, my home state, is number one for cardiovascular disease deaths and low birth weight babies born full term. [This research was funded by HBCU-UP.]

95 Shoes Kept Stored in Luggage May Contain higher CFU’s of Soil Bacteria and Yield More Types Compared to those Worn During International Flights from Madagascar and South Africa Back to the United States

Nichell Thompson, Shaw University, NC
Erica Lafredes, Shaw University

It is estimated that approximately 14 million passengers travel in and out of 38 international airports into and from the United States annually. Though plants, animals and food are regulated, Homeland Security does not regulate the entry of soils transported by shoes through our borders. It is a concern, that unidentified pathogenic new strains of soil bacteria transported by shoes may freely enter the country and cause a potential threat to the well being of human population and crops without our knowledge. This study investigates the number (CFU’s) and types of soil bacteria transported by 10 rubber shoes worn for 10 days at least 2 hours a day in Madagascar and South Africa in the spring of 2010. Five pairs kept in luggage during the return flight served as control; 5 other pairs worn during the return flight of 11 hours served as experimental group. We hypothesized that the experimental group will yield at least 15% less CFU’s, and fewer types (at least 15) of soil bacteria compared to the control group.

Samples were aseptically stored at 23°C upon arrival to the US prior to processing. Soils sampled from each pair of shoes (5mg) were transferred onto sterile Petri dishes then were streaked onto sterile (Luria-Bertani) LB medium containing 1.5%agar, with stock concentration at around 109 CFU ml 1agar plates for culture. The plates were then incubated for 72h at 37°C to allow bacteria of different growth cycle to grow. The unknown bacteria collected were re-plated for isolation on selective growth medium; then let grown overnight at 37°C. The CFU’s of each isolate were then determined and finally Gram stained using Crystal Violet, Gram’s iodine and Safranin.

The result was consistent with the hypothesis. The experimental group had 15% significantly less CFU’s (average 148 compared to our control (average 175 CFU’s). It also yielded 16 less types of soil bacteria in the sample overall. The precision of the estimate is further increased by averaging 2 replicates measurements to achieve a 4.3% confidence interval at 95% confidence level. Shoes worn during flight back carry fewer bacteria compared to the ones stored in luggage due to loss of soil to abrasion with the floor.

Our future research will consist of identifying and characterizing all the strain of soil bacteria, determining the effects of temperature and oxygen on the growth of the bacteria, determining the growth curve, running DNA analysis of each strain. All of the manipulations were performed under sterile conditions. [This study was supported in part, by a grant from NFS/ awarded to the Department of Natural Science and Mathematics at Shaw University; Dr. Greenfield's research team; HBCU-UP University, Washington, D.C 20001.]

96 The Effects of Cigarette Smoke on the Levels of Plasma Glucose, Insulin, and Cortisol of Swiss Webster Mice

Erika Todd, California State University (CSU), Stanislaus K. Battenberg, T. Khayou, R. Shakir, M. Thao, and F. Watson, CSU, Stanislaus, Department of Biological Sciences

In humans, cigarette smoke has been linked to a lower body weight and an increase in insulin resistance which may lead to type II diabetes. Insulin sensitivity is important in maintaining normal levels of plasma glucose. Another hormone affected by the nicotine from the cigarette smoke is cortisol, a corticosteroid that is excreted in response to stress. The objective of this project was to develop a plausible animal model to study the effects of cigarette smoke exposure on the levels of plasma glucose, insulin, and cortisol in Swiss Webster mice.

Mice were randomly divided into experimental and control groups. The experimental mice were exposed to first hand cigarette smoke once a day for five days a week for 14 weeks. The animals were fed and weighed daily. Blood was drawn biweekly for plasma glucose and insulin determination, and the fecal pellets collected during this procedure were used for cortisol determination. Plasma glucose levels were determined using a glucose meter. The levels of insulin and cortisol were determined using ELISA.

The experimental group had a lower weight gain and lower levels of plasma glucose and insulin than the control group. Furthermore, the experimental group had a lower sensitivity to insulin than the control group. There was no difference in the cortisol levels of the experimental and control groups.

The results of this experiment showed a lower rate of weight gain in the experimental group even though the amount of food consumed was the same as the control group. This decrease in weight gain and insulin sensitivity suggest that the cigarette smoke may be acting as an inhibitory factor that binds to glucose receptors, decreasing the uptake of glucose into tissue cells. This result is consistent with a number of studies conducted in humans. Thus, this experiment supports the possibility of using an animal model in place of humans to study the effects of cigarette smoke. [Acknowledgments: California State University, Stanislaus Louis Stokes Alliance for Minority
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Alternative Open Reading Frames for Genes of Halothiobacillus Neapolitanus c2

Quanisha Vickers, Langston University, OK
Charles Bland, PhD, and Abigail S. Newsome, PhD., Mississippi Valley State University

Annotation of genomes is the process of locating and identifying the placement of genes. The main focus and goal of annotation is to extract from the genome of a specific organism all of its biological information, to explore in more detail all of its different levels. This process is a very complex procedure that has a lot of different steps to completion.

This project focused on annotating 31 genes of Halothiobacillus neapolitanus c2 (Hneap). Halothiobacillus neapolitanus c2 is a sulfur oxidizing chemosynthetic organ that is the model organism for structural and functional studies of carboxysomes. This organism is very important to science because of the virtue of their ability to satisfy their carbon and energy needs entirely with inorganic compounds (CO2 and reduced sulfur compounds, respectively). A complete genome will aid in elucidating regulatory strategies of carbon metabolism, integration of carbon and energy generating sulfur metabolism. To facilitate the annotation of genes of Hneap, BLAST (Basic Local Alignment Tool) was used. BLAST is one of the major programs used to annotate genes. This program allows the user to compare primary biological sequence information. Some of the major programs include nucleotide blast, blastx, protein blast, tblastn, and tblastx. In this project protein blast (blastp) was used (http://blast.ncbi.nlm.nih.gov/). The Alternate Open Reading Frame Module was used to verify previously identified open reading frames of coding sequences and to detect any open reading frames that might also be possible in the genome of Halothiobacillus neapolitanus c2.

Based on the results obtained, it is sufficient to state that not all computer generated ORFs are correct. As such there still exists a need for manual annotation either as a sole source or as a means of quality control. [The Bioinformatics program of Mississippi Valley State Funded and approved this project.]

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A Genetic Study of the Chromosomal Region of the Tyrosine Decarboxylate Gene in Lactobacillus Sakei and the Glutamate Decarboxylate Gene in Staphylococcus Carnosus

Camille Warner, SUNY College at Old Westbury, NY
Blanca de las Rivas, Instituto de Fermentaciones Industriales CSIC, Madrid, Spain

Alfonso V. Carrascosa-Santiago, Instituto de Fermentaciones Industriales CSIC, Madrid, Spain

A biogenic amine is an organic base with biological activity. Histamine, tyramine, putrescine and phenylethylamine have been associated with food poisoning. Lactobacillus sakei and Staphylococcus carnosus are two bacteria isolated from a fermented red sausage that has been connected with the production of the amines tyramine and phenylethylamine respectively. L. sakei strains with the ability to decarboxylate the amino acid tyrosine to tyramine and the gene for the enzyme tyrosine decarboxylase (tdc) responsible for this conversion have been identified. Similarly, strains of S. carnosus with the ability to decarboxylate the amino acid phenylalanine to phenylethylamine have been identified but not the gene responsible for the conversion.

The goals of this project were to: 1.) sequence the tdc gene for L. sakei and create a DNA library; 2.) determine whether the gene locus for tdc is in the chromosome or in a plasmid of the L. sakei; and 3.) determine if the hypothesized glutamate decarboxylase gene in S. carnosus is responsible for the production of phenylethylamine. In order to know the chromosomal region of the tdc gene in L. sakei the DNA and plasmid was cut with restriction enzymes and a ligation was done. A polymerase chain reaction (PCR) was done using specific primers for both the plasmid and the DNA. Afterwards the samples were run with gel electrophoresis and purified before they were sent to be sequenced. We were able to elongate the region of the DNA, adding to the 12kb fragment that is known. To determine whether glutamate decarboxylase gene in S. carnosus is responsible for the production of the amine the gene was cloned in a plasmid, transformed into competent E. coli cells to if these if the cells would produce the amine. Thin layer chromatography (TLC) was used to verify the production of the amines. After production, analysis of the protein will be done to get a better understanding of its activity.

The TLC image suggested that the gene was inactive or producing a very small quantity of the protein. L. sakei and S. carnosus should be considered biogenic amine producers; this should be taken into account in the food and health industry when choosing bacteria for starter cultures and in cases of food poisoning. [This project was funded by a grant from the National Center for Minorities and Health Disparities of the National Institutes of Health (MD001429) and the NSF SUNY LSAMP program.]

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The Role of Endoplasmic Reticulum Protein Unc93b in Toll-Like Receptor 9 (TLR9) Trafficking to the Endolysosomal Compartment

Jasmine Washington, Tougaloo College, MS
Bettina Lee and Dr. Gregory Barton, University of California, Berkeley
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Better understanding of the trafficking of nucleic acid sensing TLRs can lead to clearer knowledge regarding how the immune system is able to fight against pathogens. Toll-like receptors (TLRs) are expressed in innate immune cells and are important for sensing the presence of pathogens. Intracellularly localized TLRs (TLR9, 7, and 3), which sense nucleic acid sequences derived from pathogens, have been shown to traffic to endolysosomal compartments where they are cleaved into functional receptors and encounter their ligand for signaling.

Recent studies have shown that intracellular TLRs are dependent on Unc93b for proper trafficking; however, the mechanism is unknown. Preliminary data also suggest Unc93b influences the exiting of TLR9 from the ER. One possible mechanism is that Unc93b directly recruits cytosolic proteins (COPII proteins) and, through its interaction with nucleic acid sensing TLRs, facilitates entry of TLRs into vesicles that traffic out of the ER.

To test this model, five putative COPII recognition motifs on Unc93b were mutared to determine its effect on the trafficking of nucleic acid sensing TLRs. Using these mutants, a mouse embryonic fibroblast (MEF) luciferase assay was utilized to test TLR9 signaling. Additionally, a 293T transfection assay was used to test whether the cleaved TLR is present in the endolysosomal compartment. In both assays, the wild type Unc93b served as a positive control and the nonfunctional Unc93b (H412R) and cells with no transfected Unc93b (Filler) served as negative controls.

From these assays, it was determined that in the presence of any of the five Unc93b mutants TLR9 can signal and is cleaved, suggesting that these motifs are not important for TLR9 trafficking to the endolysosomal compartment. In the future, other single-motif and combination-motif mutants will be tested for Unc93b-dependant TLR9 trafficking using the MEF luciferase and 293T transfection assays. Furthermore, these mutants will be tested in Unc93b-null mutant macrophage cell lines to determine if the data found from the above assays are consistent in biologically relevant cells. [This research was supported, in part, by grants awarded to the Jackson Heart Study Undergraduate Training Program at Tougaloo College and the Research Experiences for Undergraduates Program in Cell, Developmental, and Evolutionary Biology at the University of California, Berkeley by the NHLBI and NSF, respectively.]

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The Hunt for Mycobacteriophage JamRock a target of Mycobacterium Smeagmatis
Stephanie N. Watson, Brooklyn College, NY

In recent decades the number of fatal infections caused by Mycobacterium tuberculosis has steadily increased as reported by the Center for Disease Control. M. tuberculosis is the bacterium that is responsible for tuberculosis (TB). Contemporary research links those high rates to factors such as multidrug-resistant strains of M. tuberculosis. Researchers associated with the Howard Hughes Medical Institute (HHMI) have turned their attention to locating bacteriophages that target the TB bacterium. During The Phage Hunter’s Workshop held at Brooklyn College, students worked with Mycobacterium smegmatis, a relative of M. tuberculosis; with the intent of isolating and purifying bacteriophages from the immediate environment that would infect M. smegmatis. The discovery of bacteriophages for M. smegmatis would provide essential genomic information required for understanding the life cycle of M. tuberculosis and may provide a possible cure for the disease.

To test this theory, soil samples were collected from environments believed to have high concentrations of M. smegmatis, such as parks, salt water marshes and flower beds. The samples were analyzed using virus enrichment and direct plating techniques. Collectively the workshop members isolated 12 phages from sites in Brooklyn and Manhattan, New York. From a Manhattan soil sample collected at 40.80170° N, 73.96262° W, a lytic and a lysogenic phage were isolated. I selected the lysogenic phage and named it JamRock. The phage JamRock was purified from the other viruses in the soil sample and its DNA was extracted and digested with various endonucleases to establish its Restriction Fragment Length Polymorphism (RFLP) fingerprint. Phage JamRock’s DNA remained uncut by Bam-HI and HindIII, yet was cut twice by Cla-I, and several times by Eco-RI and Hae-III. Phage JamRock’s fingerprint indicates that it may be a member of the E family of phages and is similar to phage 244 located within the HHMI database.

Further testing is needed to determine JamRock’s full genetic sequencing and relation to the other phages in the database. In addition photos will be taken using the TEM in order to determine its morphology. The hope is that JamRock is a novel phage and will further increase the knowledge of new treatment methods for bacterial infections. [Funding for this project was provided by the New York City Louis Stokes Alliance for Minority Participation (LSAMP) and The Howard Hughes Medical Institute (HHMI).]

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Predator Prey Mathematical Modeling of Dynamic Behavior of Transposons

Ashlea White, Southern University at New Orleans
Illya Tietzel, Southern University at New Orleans

The aim of this research is to investigate what happens when transposons are the “predators” and the Genome DNA is the “prey” using mathematical modeling. Transposons move to different positions in the DNA of a cell and can also increase their own numbers. This will cause mutations and increases the amount of DNA in the genome. Retrotransposons move by a “copy and paste” mechanism but in contrast to the transposons
described above, the copy is made of RNA, not DNA. Recently, research was undertaken to find mathematical models for the behavior of transposons.

Therefore, it is hypothesized that mathematical modeling can be used for this project to describe predator prey interactions over a time period. The chosen predator prey model will use the Lotka-Volterra Equation, has two dependent variables and both are functions of time. G(x) for the number of prey (“G” for genomes using “x” for time) and T(x) (“T” for transposons). When predators are absent, having ample enough food supply would support exponential growth at a rate that would be proportional to itself: \( \frac{dg}{dt} = kR \) (k is a positive constant). A bacterial strain without transposons could serve as a control for growth of genome in the absence of a predator. Another assumption would be that the two species interact with each other at a rate that would be proportional to the product GT. (As the number of both populations increases, the number of encounters will also increase.)

Our results are as follows: We successfully cultured E. Coli and used the Gram stain to confirm the Gram negativity of this microbe. Our literature research found out that the growth rate of our E. Coli is 1.73, which will be confirmed in our lab. Future research will use the Lotka-Volterra Equation and graphs will be plotted addressing these predictions. Biological research involving the prokaryotic genome of E. coli and the ISS transposon will observe actual populations of genomes and transposons over time intervals exposed to different gravitational environments. We will use the Trizol method to isolate RNA and DNA. A PCR machine will be utilized for the quantification of transposon numbers and genome numbers. It is concluded that the E. Coli are Gram negative and can be successfully grown. [This research was funded by the NASA/LEQSF(2005-2010)-LaSPACE Subcontract 43709. Ms. Ashlea White was sponsored by the SENS scholarship of Dr. Kambhampati, a NSF DUE S-STEM grant.]

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Aeromonas salmonidae and Pfiesteria piscicida and How Hurricanes influence these bacteria in Gulf Menhaden

Aurellia Whitmore, Southern University at New Orleans
Illya Tietzel, Southern University at New Orleans

Hurricanes increased detectable amounts of microbes that are pathogenic for fish and humans. This was shown for waterways in the New Orleans area after Katrina. Furthermore, SUNO students Ms. Henry, Mrs. Johnson and Mr. Watson, found in pilot experiments in 2009 (after Hurricane Gustav and Ike) evidence of Aeromonas salmonidae and Pfiesteria piscicida in limited fish samples of Louisiana’s coast.

Thus it is hypothesized that Aeromonas salmonidae and Pfiesteria piscicida can be found in the Gulf Menhaden fish exposed to the water after hurricanes at Louisiana’s coast. This finding would be important as these fish can die due to Aeromonas salmonidae and Pfiesteria piscicida and potentially harm humans. In 2009, 2010 and 2011 Gulf Menhaden fish will be studied for the presence of these microbes.

The following procedures will be applied: Peroxidase stain and Polymerase Chain Reaction (PCR) will be used to detect the presence of Aeromonas and Pfiesteria. The positive control for the Peroxidase stain are Microocccaceae and the negative control are Streptococceae. The positive stain for PCR will be found in vitro synthesized DNA fragments and the negative control will be no DNA template. Microbial stains include motility stains and flagellum stains to determine motility because Pfiesteria is a motile microbe with flagella. The positive control for Flagella stains is Pseudomonas and Proteus and the negative control is Micrococcus luteus with no flagella. Pfiesteria and Aeromonas have specific shapes. A simple methylene blue stain will determine the microbial shape.

Preliminary results show that isolated fish microbes from the gill where motile in methylene blue stains and microscopic videos were taken. Furthermore, two differently shaped types of microbes were found. There was a majority of round shaped microbes which resembled cocci or other round shaped microbes like Pfiesteria. Furthermore, some few rod shaped microbes were seen. It is concluded that these results are consistent with the hypothesis that Pfiesteria and Aeromonas are infecting the fish of Louisiana’s Gulf coast. More stains, more fish samples and PCR technology has to be used to confirm these findings.

Future research would be to test the predators of the Gulf Menhaden to determine if they are being harmed by Aeromonas salmonidae and Pfiesteria piscicida.
[Acknowledgements: Dr. Kambhampati for the SENS Scholarship of the NSF, DUE grant 0806894, and Mr. Tietzel for mentoring.]

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Congo Red Detection of Edwardsiella ictaluri Hemin Binding

Kimtrele Williams, Tougaloo College, MS
Bianca Garner and Betty Sue Hennington, Tougaloo College
Atilla Karsi, Michelle Banes, and Mark Lawrence, Mississippi State University

Edwardsiella ictaluri is a bacterium that is currently an economic threat to catfish farmers in Alabama, Georgia, and Mississippi. E. ictaluri has numerous genes that are regulated in response to iron concentration. Microorganisms are able to exploit host iron sources, tapping into an ample supply of iron during an infection. Alterations in levels of iron might influence the susceptibility of the host to the infection. Mechanisms of iron uptake have been examined in some pathogenic E. tarda strains, but not in E. ictaluri. We propose that fully virulent strains of E. ictaluri require iron and have numerous ways to acquire it from the catfish.
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Our hypothesis is that hemin binding by E. ictaluri is an important strategy for obtaining iron and is a virulence factor. The ability of pathogens to bind to heme on E. ictaluri has been directly linked to heme binding and microbial virulence. Similar to others such as E. tardi, E. ictaluri accumulates heme on agar and can bind hemin. Congo red can be used as a screening technique to effectively identify E. ictaluri incapable of receptor mediated heme uptake. [Funding includes grants from the following: USDA #MISV-0801310, NSF#352480, NIH #P20MD002725-03, NIH#P20RR016476-09A1.]

104 Regulation of Tumor Growth By PIN1

Lashira Williams, Virginia Union University

Recent evidence has shown that PIN1 regulates the conformation of proteins phosphorylated on serine or threonine before proline (S/T)-P. It was found that depletion of PIN1 (Knockdown) increased the growth of breast cancer in mice. Therefore, PIN1 controls the activity of many proteins. The purpose of this research was to understand how PIN1 and various phosphorylated proteins regulate the growth of tumor cells as it relates to breast cancer. The first goal of this research was to determine if there was an increase in mitosis or a decrease in cell death in tumors lacking PIN1 compared to control tumors containing PIN1. The second goal was to determine whether the increased growth of tumors lacking PIN1 is associated with the increase formation of blood vessels in the tumor.

The effect of PIN1 on the tumor cells response to hypoxia was also measured. Previously, tumors containing or lacking PIN1 were developed in the mammary fat pad of mice and were sectioned with a microtome for immunocytochemistry. Tumors were immunostained with antibody to a marker of mitosis (Ki67) and proliferating cell nuclear antigen (PCNA) or with an antibody to a marker of cell death (cleaved Caspase3). Ki67 and PCNA are proteins elevated in mitosis (cell cycle). Cleaved Caspase 3 is an enzyme activated in the form of cell death called apoptosis. Tumors were immunostained with an antibody to CD31, a protein that is found on the surface of endothelial cells to measure blood vessel density. Cells were grown in 21% oxygen or in a chamber with 1% oxygen. Proteins will be extracted and separated by electrophoresis and blotted on nitrocellulose. Ki67, PCNA and Cleaved Caspase 3 were detected with antibody. Image analysis software was used to measure the intensity of the light signal and data was quantified using a test analysis.

We determined that hypoxia treatment increased cleaved caspase-3 in both EMT6 PIN1 KD and control cells. However, depletion of PIN1 reduced the levels of cleaved caspase-3 in both normoxic and hypoxic conditions. This suggests that cell death is less in KD vs. control cells. Blotting indicated that hypoxia increased PCNA in PIN1 KD cells, but not in control cells. This suggests that proliferation was increased by hypoxia when PIN1 was depleted. Consistent with the in vitro results, cleaved caspase-3 levels were reduced in PIN1 KD tumors in mice compared to control tumors. Using PCNA there was a significant increase in mitosis within cells containing PIN1 versus cells lacking PIN1. In response to hypoxia PCNA increased in cells lacking PIN1 with no further increase in cells containing PIN1. Also, there was no significant change in Ki67.

In conclusion, depletion of PIN1 reduces tumor cell death, and it increases proliferation in hypoxic conditions. This may explain the enhanced growth of PIN1 KD tumors in mice. It remains to be determined which proteins containing p(S/T)-P are responsible for these effects. [My research was funded by the summer research opportunities program at the Ohio State University to Dr. Dale Hoyt.]

105 S-4CPG Induced Cell Death in Human (MV3) Cells

Tiffany Williams, Talladega College, AL

Skin cancer, known as Melanoma, is the most serious type of cancer. It represents 3 percent of all cancers and is the most likely to metastasize. Melanoma originates in skin cells called melanocytes. Melanocytes gives skin color and protects skin from UV rays. If the cells receive too much light, they begin to grow abnormally and become cancerous. Melanoma affects adults and infants.

Currently, there are no drugs that affect the Melanoma in the neonatal population. Neonatal researchers are striving to find answers to save the lives of millions of babies. In human melanoma cells (MV3), the glutamate and L-cystine pump, system Xc, controls the amount of glutamate and L-cystine the cell receives. Elevated levels of glutamate cause cell death.

The goal of this research project was to determine if S-4CPG inhibits System Xc causing apoptosis. In this experiment, MV3 cells were treated with S-4carboxyphenyl Glycine (S-4CPG) to block system Xc and induce apoptosis. Immunocytochemistry (ICC), a common laboratory technique, uses antibodies that target specific peptides or protein antigens in cells, which allows researchers to evaluate cells in a particular sample expressing the antigen in question. MV3 cells were treated with 1µm, 1µm, 10µm, 100µm, and 1mMof S-4CPG at different dosing times. ICC showed that the cells began to die around 100 µm dosing of S-4CPG with 1mM killing the most cells. Thus, ICC seems to show that S-4CPG blocks system Xc causing apoptosis. [This study was supported by Ronald E. McNair Program Project Number P217A070071.]
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A New Polyclonal Antibody Against Mouse Zip14 Zinc Transporter Protein

Kirkland Wilson, North Carolina Central University

Zinc is a metal that serves a structural function in many proteins, through zinc finger motifs, or is a catalytic cofactor, and is essential in all organisms. The exact mechanism of its cellular uptake is largely unknown, but it is thought that since it cannot pass through biological membranes by passive diffusion, it must be actively transported across the membrane. Many genes are now known to be involved in zinc transport, most of the proteins function in the uptake, intracellular storage and passing out of the cell of zinc, and they have eight trans-membrane domains with both N and C termini located outside the cell.

The Zip family LZT, named after the LIV-1 or Zip6 protein, contains the protein of interest, Zip14. The full length Zip14 protein has previously been shown to function as a zinc transporter from intracellular storage or the extracellular environment into the cytoplasm.

Recently, we cloned a truncated variant of the mouse Zip14 gene at North Carolina Central University; however its function has yet to be determined. It is assumed that if it is functional, it will be expressed in a tissue specific manner at both the mRNA and protein levels. So far, its expression relative to the full length gene is unknown. So reverse transcriptase polymerase chain reaction results showed that the truncated variant Zip14 mRNA is expressed in a tissue specific manner. To determine whether the expressed mRNA is translated into protein, a sequenced-based polyclonal antibody was produced in a rabbit. Western blot gave results showing that the antibody produced has high titer and is specific for the Zip14 protein. As such, the antibody can now be used to determine whether the truncated version of the Zip14 gene is expressed at the protein level in a tissue specific manner. [Funding provided by the Louis Stokes Alliance for Minority Participation.]

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Clip1 as a Candidate Gene for repro29 Male Infertility

Olivia Yee, New Mexico Highlands University
Lisa F. Bentson and Carol C. Linder, New Mexico Highlands University

The main goal of this project is to determine the gene that causes infertility in the repro29 mutant mouse strain. Mutant repro29 males have defective spermatogenesis and are completely infertile. Finding genes and understanding their function will help us understand the underlying causes of human infertility. Gene mapping using meiotic recombination techniques has narrowed the possible genes to: Clip1, Zcchc8, Rsre2, and Kntc1.

These genes are found on Chromosome 5 in a ~0.29 Mb region. Clip1 is the best candidate gene because it is required for normal spermatogenesis (Akhamanova et al., 2005, Genes Dev 19, 2501-2515). The Clip1 gene encodes the CAP-GLY domain containing linker protein 1 that is a microtubule associated protein. repro29 mutant mice do express Clip1 protein but preliminary research using real time PCR found that Clip1 mRNA was up-regulated 100 fold in mutant testes compared to controls.

We hypothecize that Clip1 is the gene responsible for defective sperm development in repro29 testes. Cells could be making non-functional protein and the mRNA is up-regulated to try to compensate. There are multiple Clip1 transcripts. PCR primers were designed to span the entire mRNA Clip1_001 transcript and mutant and C57BL/6J control cDNA was sequenced.

Interestingly, we have discovered that the mutant transcript matches the Ensembl published sequence. However, the C57BL/6J control cDNA sequence had an extra 40 bp fragment. This difference is localized to exons 9, 10, and 11. The next step involves sequencing genomic DNA because we believe there is alternative splicing. Other future research includes confirmation of gene expression using real time PCR and further characterization of the repro29 phenotype. [This research is supported by grants from the NSF Louis Stokes Alliances for Minority Participation/Western Alliance to Expand Student Opportunities (S2009UR0024/S09UR016 Antonio Garcia, PD) and the NIH/NCRR NM-Idea Networks of Biomedical Research Excellence (P20RR016480, Jeffrey Arterburn, PI).]

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Functional Analysis of a Novel Rhoptry Effector Protein in Toxoplasma gondii

Earl Yoon, University of California (UCLA)
Peter Bradley, Kay Nguyen, and Angelica Riestra, UCLA

Toxoplasma gondii serves as an important model organism for Apicomplexa, a phylum of parasitic protists that includes Plasmodium spp. (causative agents of malaria) and other pathogens that impact the health of humans and other animals. The parasite causes serious diseases in immunocompromised individuals and neonates, such as chorioretinitis and encephalitis.

T. gondii is a haploid organism that uses specialized secretory organelles necessary for invasion and habitation within the host cell. One of those organelles is the rhoptries, which inject effector proteins that modulate the host cell. We have identified a novel rhoptry effector protein (named 10072) by epitope tagging, which confirmed that the protein localizes to the rhoptries and is secreted into the host cell during invasion. This protein is present in both Toxoplasma gondii and
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Plasmodium spp., suggesting a common role in these two important pathogens.

To assess the function of 10072, we used a knock-out strategy to disrupt the gene in T. gondii. Parasites were transfected with a knock-out vector containing a drug resistance gene against pyrimethamine surrounded by flanking genomic sequences. Knock-out parasites were isolated through drug selection and parasite cloning, and the knock-out was confirmed by PCR and western blot analysis.

We are currently assessing the phenotype of the knockout in vitro and in vivo, which will provide insight into the role of this novel rhoptry effector protein. [This research was supported by the University of California Leadership Excellence through Advanced Degrees (UC LEADS) Program.]

CHEMISTRY & CHEMICAL SCIENCES

109 Differential Behaviors of Osmolytes on the Stability of all β-sheet Proteins

Malena Ageymang, Norfolk State University, VA

A few challenges cells face are drastic variations in water content and disturbed levels of ions resulting from osmotic stress. When faced with such stress, cells develop "coping mechanisms" to help aid in osmotic regulation by importing or producing organic compounds called osmolytes. Osmolytes are small organic molecules that tend to stabilize the protein structure. Commonly known osmolytes are betaine, sarcosine, proline as well as many salts found within the cell. The primary function of these compounds is to combat the effects of dehydration in the cell. Primary to this function is the stabilization of proteins, which are particularly susceptible to osmotic stresses but have great importance to the cell. Osmolytes have been shown to directly impact the stability and solubility of proteins. It has also been shown that organic osmolytes aid in protein folding and refolding, as well as regaining biological function and in preventing aggregation. The methods by which osmolytes aid in assuring protein stability are considered as a solvent-oriented process by which protein folding is facilitated by the preferential ordering of solvent molecules. However, though it is proven osmolytes impact proteins stability and solubility, it is assumed that they behave the same way for all proteins, which is not true. The purpose of this research is to determine the effect of proline on protein stability and to uncover the mechanism of its function. We investigated the effects of proline on structural stability of two β-sheet proteins, FGF and D2 domain. Methods used included monitoring the thermal stability by using steady-state fluorescence, conformational stability of solvent accessibility by limited proteolytic digestion followed by a computational analysis. The thermal stability significantly increased in FGF upon binding to proline compared to the D2 domain. Proteolytic digestion experiments showed that solvent accessibility of both proteins decreased upon binding to proline. The computational analysis data elucidates several possible reasons for this different behavior of FGF and D2 domain upon binding to proline. Currently, a more detailed computational Molecular Dynamic Simulation is underway. [This work was supported by a National Science Foundation Research Experience for Undergraduates (REU) grant DBI-1004665.]

110 Biological Clock in Aloe Vera and Mimosa Pudica

Kara Baker, Oakwood University, AL
Jacqueline Clemens, Oakwood University

The circadian clock regulates a wide range of electrophysiological and developmental processes in plants. Plant tissue has biologically closed electrochemical circuits that regulate its physiology. This paper presents for the first time the direct influence of a circadian clock on biologically closed electrochemical circuits in the Mimosa pudica pulvinus in vivo.

We present circadian variation of the plant responses to electrical stimulation. The biologically closed electrochemical circuits in the leaves of Aloe vera and Mimosa pudica were analyzed using the charge stimulation method. The electrostimulation was provided with different timing and different voltages. Discharge of the capacitor in Aloe vera at night was faster than during the day. This response is probably influenced by the plant’s crassulacean acid metabolism (CAM). Discharge of the capacitor in a pulvinus of Mimosa pudica was faster during the day. These results show that the circadian clock can be maintained endogenously and has electrochemical oscillators, which can activate ion channels in biologically closed electrochemical circuits. We present the equivalent electrical circuits in the leaf and their circadian variation to explain the experimental data.

111 Nelfinavir (Viracept®) and its Silicon Analogue as Hiv-1 Protease Inhibitors

Latricia Bowman, Norfolk State University, VA

There is no known cure for HIV/AIDS; it is imperative to develop a drug that will prevent the replication of the virus, without the stressing concern for resistance. Scientists across the globe all struggle to create a mechanism that will slow down the mutations of the virus and isolate viral load in the infected human. This study considers the history of HIV-1 inhibition therapy and utilizes the drug Nelfinavir(Viracept®) as a starting platform for preparation of a newly improved drug. These
experiments focus on the synthesis and advantages of a silicon analogue.

HIV, also known as Human Immunodeficiency Virus, is classified as a Lentivirus; a member of the Retrovirus family, and the causative agent of Acquired Immune Deficiency Syndrome (AIDS). There are currently two known strands of HIV present globally: HIV-1 and HIV-2. The first case was reported in 1981, but was acknowledged in the European countries. As of 2007 from the CDC, about 1.1 million people were reportedly infected in US and about 33.4 million people were reportedly infected globally.2 HIV targets the body’s CD4 receptors of T-lymphocytes or T-cells. The virus Tricks the T-cells into believing that the virus is part of the body and uses an enzyme named Protease to mature and replicate, as new infectious viruses. Having used the body’s DNA to replicate the virus is now able bud off of the infected CD4-t cell and is ready to attack and damage the immune system, by disabling the body’s ability to fight infection.

Two popular choices for drug treatment are Nucleoside analogue reverse transcriptase inhibitors (NRTIs) and Protease inhibitors (PIs). NRTIs are currently used alongside HIV type 1 PIs (HIV-1 PR); the combination has been proven to be a valuable therapeutic in the treatment and prevention of AIDS.

Nelfinavir (pronounced nel’fin’ a veer) and commercially known as Viracept®, is a leading NRTI pharmaceutical drug for HIV-1. Nelfinavir received approval from FDA in 1997; manufactured by Pfizer, is proven to significantly decrease viral load in the body. Dosage: Tablets: 250 mg; Oral powder: 50 mg/g. This study has initiated an attempt to successfully modify and ultimately improve the effects of Nelfinavir with the implementation of a Silanediol analogue (transition state analogue; substrate designed to mimic the properties or the geometry of the transition state of reaction).

The ideal modification of Nelfinavir replaces will replace a carbonyl with a silanediol. The implement of silicon allows for the addition of one extra hydroxyl group. The two hydroxyl groups extend the reach of the inhibitor and provide a reinforced bond for the attachment to the active site of the protease enzyme. There are 3 main reactions necessary to create the compound Nelfinavir.

With the synthesis of (Chloromethyl)diphenylchlorosilane and the synthesis of 3-acetoxy-2-methylbenzoic acid , we are now enabled to proceed with the synthesis of Structure 2. This step will organize for the final modifications of the desired compound.

Carbohydrates play an important role in biological functions. The ability to analyze carbohydrates can provide a deeper insight into their physiological role in biological systems. Microchip electrophoresis is a technique capable of analyzing carbohydrates. Microchip electrophoresis embodies the same concepts as capillary electrophoresis, but it is less expensive while offering increased portability and rapid analyses. If you apply an electric field to a microfluidic chip filled with a ladder of glycans then they will move down the channel and eventually separate.

In the work presented here, microchip electrophoresis was used to separate a five member maltooligosaccharide ladder under normal and suppressed electro-osmotic flow conditions. The electro-osmotic flow was suppressed using a phospholipid coating comprised of 1,2-dimyristoyl-sn-glycero-3-phosphocholine (DMPC) and 1,2-dihexanoyl-sn-glycero-3-phosphocholine (DHPC). The phospholipid coating also decreased the analyses time by 40%. The oligosaccharide ladder was derivatized with the fluorophore 8-aminopyrene-1,3,6-trisulfonic acid to facilitate detection using a CCD camera coupled to a Nikon TE300 inverted fluorescence microscope. The approach demonstrated here can be adapted to separate glycans obtained from glycoproteins through enzymatic cleavage. It can also be adapted to monitor enzymatic processes in real-time.

The results show that microchip electrophoresis can be used to separate a five member maltooligosaccharide ladder under suppressed conditions. Previous reports also indicate that enzymatic processes involving the cleavage of glycosidic oligosaccharide linkages can be studied with capillary electrophoresis using suppressed electro-osmotic flow and the DMPC/DHPC phospholipid preparation. Translating this separation method to a microfluidic platform would combine the advantages of microfluidics with a versatile separation strategy. [This research was funded by the National Science Foundation and Wvnano.]

113 Characterization of Na⁺Dependent Dicarboxylate Transporter (NaDC) in Bovine Brain Microvessel Endothelial Cells (BBMCE) Courtney Carroll, University of Arkansas at Pine Bluff Phyllis Sims, Johnmesha Sanders, Trenton Ware, and Antonie H. Rice, PhD, University of Arkansas at Pine Bluff

The delivery of therapeutic drugs to the brain continues to be a challenge for the pharmaceutical industry. The blood-brain barrier (BBB) regulates the influx and efflux of a wide variety of substances, and remains the major obstacle in the delivery of drugs to the central nervous system (CNS). Various strategies have been devised to circumvent the BBB in order to increase drug delivery to CNS. The purpose of this work was to assess the potential mechanistic pathways present at the Blood-brain
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barrier in bovine microvessel endothelial cells (BBMECs) and to demonstrate that active transporters exist at the BBB that may provide alternative routes for delivering therapeutics to the brain that may exhibit poor brain/CNS bioavailability, and to also assess the potential mechanistic pathway of a newly synthesized taxane, TX-67, across the BBB.

Previously, we demonstrated the functionality of the following transporters in the BBMEC cell culture system: a) the monocarboxylic acid transporter (MCT), and b) the organic anion transporter (OAT). The following work demonstrates the presence and activity of Na+dependent dicarboxylate transporter (NaDC) in BBMEC cell culture system. To characterize the functionality of the NaDC transporter, typical substrates were selected to perform uptake and transport experiments. The NaDC substrates selected were succinate, glutarate, fumarate, α-ketoglutarate, and maleate. Competitive inhibitions studies using each of the substrates and Taxane analogue Tx-67 were also performed.

The results demonstrate that the transporter is present and functional in BBMECs. The data also suggest that the enhanced permeation of Tx-67 may be explained by the utilization of the NaDC transporter at the BBB. [Funding Source: NIH/NCCR 2P2ORRO16460-09.]

114 Vaginal Smooth Muscle in Pelvic Organ Prolapse

Crystal Carter, Jackson State University, MS

Pelvic organ prolapse (POP) refers to a pathological condition in which there is downward descent of female pelvic organs, including the bladder, uterus or post-hysterectomy vaginal cuff or rectum, down the vaginal canal. While the exact etiology is unknown, advancing age, vaginal child birth, and increasing body-mass index are the most consistent risk factors. The normal is comprised of vaginal smooth muscle and connective tissue that provides the extracellular support matrix for pelvic organs.

During this experiment, there was an identifiable decrease in the vaginal smooth muscle content, less organized smooth muscle bundles, and increased collagen content with women who exhibit POP. The aim of this experiment was to evaluate the mRNA and protein expression of calponin, smooth muscle myosin heavy chain (SMMHC), and alpha SM actin (ASMA) in the anterior vaginal wall of women with and without pelvic organ prolapse. Furthermore, immunohistochemistry, Western blots, and real-time polymerase chain reaction (PCR) was used to analyze the expression of the various proteins on the smooth muscle cells. Calponin and SMMHC are present in the smooth muscles of large and small vessels as well as the muscularis. Calponin protein expression is increased 62% in women with POP. The mRNA expression of this protein was increased by 1.2-fold, however, this difference was not statistically significant. In contrast, there is a 1.4-fold decrease in SMMHC mRNA expression and a 25% decrease in SMMHC protein expression.

Although these differences are not significant, our findings are consistent with prior investigators. Our mRNA findings suggest that in addition to finding less SM cells/surface area, there is decreased expression of SMMHC in the remaining cells. As Calponin plays a role in binding calcium and inhibiting ATPase activity in smooth muscle, it is possible that the dramatic increase in women with POP may affect smooth muscle tone and functionality.

More work in this area is essential to elucidating the importance of this finding. Furthermore, more research can be done to evaluate the role that Calponin plays in the binding of calcium and its inhibitory affect as it relates to POP. In addition, a better correlation could be drawn between the decreased smooth muscle function as it relates to woman who have POP, and the additional reasons for this correlation to make women more informed and aware. [My research would not have been possible if it were not for the funds and efforts of the NIH-NHLBI. (National Heart Lung and Blood Institute of the National Institute of Health).]

115 Determining Temperature Differences between Emulsions during Microwave Heating by Studying Underlying Heating Mechanisms of Two Layered Systems

Daryl Cunningham, Morgan State University, MD

Microwaves are replacing conventional ovens in chemical labs because it allows rapid heating, causing reactions to occur faster and making it easy to identify the heating rates of substances like multiphase layered systems quickly. This research focuses on how microwave heating is used to measure the temperature differences between polar and non-polar substances using mixtures of ethylene glycol, water, and hexane.

The purpose of this research is to use these measurements to identify the underlying heating mechanisms of these multiphase layered systems especially in the non-polar region. Previous research has proven that the polar phase heats faster than the non-polar phase. This is because the polar phase is heated by microwave radiation while the non-polar phase heats through conduction and convection. The orientation of the upper and lower phase of the system determines which heating mechanism would be dominant in the non-polar region. If the non-polar phase is on the top it would be heated by convection (circulation of heat) and conduction (transfer of heat through contact) but if the non-polar phase is on the bottom then this phase could only heat through conduction. By heating a 40 mL (20mL each substance) sample of the ethylene glycol/hexane and water/hexane mixtures it has been shown that in water/
hexane mixtures, water heats up faster than hexane at a rate of about a 20 degree difference while in the ethylene glycol/hexane mixture, the ethylene glycol heats up faster than hexane at about a 40 degree difference.

According to the data, the polar phase always heats faster than the non-polar phase. Although water and ethylene glycol are both polar substances their heating rate when mixed hexane are very different. This could be because of their molecular structures and their individual interactions with the non-polar phase.

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Antioxidant Zinc (II) Chelates in Amelioration of Toxic Kidney Injury

Keisharra Eldridge, University of Arkansas at Pine Bluff
Richard B. Walker, PhD, and Grant Wangila, University of Arkansas at Pine Bluff
Alexei G. Basnakian, PhD, and Nicholas Braman, University of Arkansas for Medical Sciences

It has been shown that zinc has cytoprotective activity by stimulating antioxidant enzymes and inhibiting apoptotic enzymes. Zinc combined with an antioxidant ligand has even greater cytoprotective effects. Studies show that zinc complexes of amino thiols and salicylates have better cytoprotective activity than either metal or ligand. Both in vivo and in vitro data collected in this study strongly indicate that these metal complexes satisfy many of the criteria for prevention and treatment of kidney injury, as they are active, stable, and nontoxic antioxidants.

The study started with synthesis of the new zinc compounds, characterization by elemental analysis and spectrochemical methods, followed by antioxidant activity using NBT assay and in vitro toxicity studies. The zinc compounds with lower IC50 and less toxicity in vitro were further studied in animals. The animal study involved the elaboration of the model to ensure that the used does of cisplatin induces kidney injury did not induce animal death. A total of 130 animals were used for these experiments. The mice are euthanized 96 h after cisplatin injection (IP, 20 mg/kg), and blood and kidneys are collected. Our endpoints included: serum blood urea nitrogen (BUN) and creatinine to measure kidney function, and H&E histology to assess structural injury to the kidney.

In a parallel pilot study we have tested 3 Zn chelates, including Zn-NAC, ZnDIPS, and Zn-RibCys in another model of acute kidney injury, rhabdomyolysis model induced by intramuscular glycerol injection (50% solution, 8 ml/kg). Our unexpected finding was that the compound that was previously shown to be radioprotective, Zn-DIPS, appeared to be rather toxic in this model. However, two other compounds demonstrated partial (Zn-NAC) or complete (Zn-RibCys) nephroprotection as measured by BUN and serum creatinine. The tissue samples are currently being evaluated by histology. These metal complexes may be useful agents in preventing kidney toxicity and eventually can be used for nephroprotection during skeletal muscle trauma leading to rhabdomyolysis. [NIH/NCRR 2P20RR016460-09]

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The Effect of Microwave Heating on Various Microwave Stoichiometry

Brittany Fisher, Morgan State University, MD

Microwaves have been very useful in organic microwave-assisted reactions by utilizing the absorptivity of the given substance to increase reaction times. The presiding assumption is that there is predominantly pure irradiative heating with the use of microwaves. However, contrary to initial though, depending on the type of vial used, such as quartz and Pyrex (borosilicate glass), one may observe a greater amount of conductive heating in conjunction with microwave heating. By studying a specific reaction and utilizing different stoichiometric ratios in a single mode microwave system, one may be able to study how the use of a different type of vial allows for more uniform microwave heating, such that various reactions can be studied to determine the reaction mechanism under microwave conditions.

We hypothesize that the CEM microwave system with the use of quartz vials rather than Pyrex vials will provide the best conditions to determine whether microwave or conductive heating is most prevalent in a microwave assisted reaction. We then expect to observe that microwave heating on stoichiometric ratios, as opposed to non-stoichiometric ratios, might affect reaction efficiency, product distribution and yield when compared to thermal reactions.

Results suggest that the CEM microwave system with the joint Explorer and Discover system is most consistent for measuring the heating profiles of the various solvents in the quartz and Pyrex vials. However, the CEM Discover microwave system is most suitable for future experiments that will obtain heating profiles with the use of a fiber optic probe. For the organic substances, we saw that the 2,3,3-trimethylindolenine heated to each set temperature in the Pyrex vials while only reaching a maximum of 150°C in the quartz vials; 2-methylbenzothiazole and iodoethane did not reach any of the set temperatures. Future research will incorporate the use of a fiber-optic probe to monitor the internal temperature of the utilized solvents under during microwave heating.
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The Role of MtdA: A Key Enzyme in Methanol Metabolism

Yuriana Garcia, University of Washington
Norma Cecilia Martinez-Gomez and Mary Lindstrom, University of Washington

*Methylobacterium extorquens* AM1 is a methylotroph that is able to metabolize one carbon compounds such as methanol (MeOH). MtdA and MtdB are two dehydrogenases involved in MeOH metabolism. *In vitro*, both MtdA and MtdB are able to use methylene H2MPT as a substrate, however *in vivo* the role of MtdA is not completely understood.

Two problems are associated with the lack of MtdB in the cell: the accumulation of formaldehyde in the presence of methanol and the lack of production of formate for further metabolism. However, the mtdB mutant strain containing high levels of MtdA was no longer methanol sensitive, suggesting a role of MtdA in the oxidation step. Why then is MtdA unable to complement an mtdB mutant strain? One possible explanation may be due to the accumulation of formate, which may lower the pH and inhibit the growth of AM1. Our goal was to determine the role of MtdA in the H2MPT pathway, if any.

To test this hypothesis, a construct of MtdA in a high expression plasmid, pCM80, was introduced into an mtdB mutant to further study its growth under controlled pH conditions. Using various techniques, our first step was to construct the plasmid that highly expressed MtdA.

The molecular biological techniques took the experiment through various obstacles where we encountered difficulty in the procedures to digest and ligate pCM80 and MtdA. Once we were able to successfully ligate and recreate the plasmid we encountered problems with the plasmids’ ability to be transformed in various competent cells which included *E. coli* Top10, *E. coli* JM110, and *E. coli* S17. Thereafter, the method of breaking AM1 cells, which already contained the plasmid pCM80/MtdA, was applied to isolate the plasmid. This was done using a French Press apparatus and then a Mini-Beadbeater.

From both methods the results were negative; retrieving the plasmid from AM1 was not visible in gel electrophoresis testing. The final method was to use genetic techniques to mate AM1 with *E. coli*. In a mating DNA is transferred from one strain to another, in this case transferring a previously made construct containing mtdA from AM1 to *E. coli* to isolate the plasmid. We were able to get positive results from the mating approach. The overall goal of the project has stayed the same and even though we have taken longer to isolate pCM80/MtdA we are ready to introduce pCM80/MtdA into an mtdB mutant and thereafter test the growth of AM1 and study the effect on pH and growth.

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Synthesis and Characterization of TiO2/CaCO3 Hybrid Nanoparticles

Ashley Heard, Tuskegee University, AL
Vijaya Rangari, Vitus Apalangya, and Shaik Jeelani, Tuskegee University

Calcium carbonate and its analogue materials such as hydroxyapatite have been extensively used in medicine for implants owing to its similarity with mineral constituents found in hard tissue (i.e. teeth and bone). Because of its high level of biocompatibility, it is one of the materials of choice in fabrication of dense and porous bioceramics such as prosthetics. Unfortunately, due to low mechanical reliability, especially in aqueous environments, calcium carbonate fails in heavy load-bearing applications. TiO2/Ti has been used as synthetic biomaterial in bone graft due to its low density, corrosion resistance, low linear coefficient of heat of expansion and high load-bearing potential.

Due to the high cost and environmental hazard of the petroleum and mineral derived products, a growing effort has emerged in recent years on the research, development, and application of bio-materials obtained from renewable resources such as eggshell. Chicken eggshell is an industrial by-product that has been considered as one of the worst environmental hazards; however, it can offer a great material for bioceramics.

The objective of this project is to explore the synthesis and characterization of hybrid nanoparticles of CaCO3/TiO2. These hybrid nanoparticles were synthesized from titanium precursor (titanium (IV) isopropoxide) and eggshell using mechanochemical (ball mill) and microwave irradiation techniques. Pre-crushed CaCO3 (brown eggshells) was ball milled in the presence of 10 ml of polypropylene glycol and stainless steel balls. A 500 mg of ball-milled calcium carbonate dispersed in (10:6) ratio of ethanol/distilled water mixture along with 200 milligrams of cetyl trimethylammonium bromide (CTAB). The reaction mixture was irradiated with microwave for 30 minutes. The final product was washed with water and ethanol several times and dried under vacuum overnight at room temperature. The as-prepared hybrid nanoparticles were characterized using X-ray diffraction (XRD), and transmission electron microscopy (TEM).

XRD results of the as-prepared CaCO3/TiO2 hybrid nanoparticles show only the diffraction peaks corresponding CaCO3. This indicates that the as-prepared hybrid nanoparticles may contain amorphous TiO2. To further confirm this, we have heated the hybrid nanoparticles in argon inert atmosphere and tested for XRD. The results show the combination of both CaCO3 and TiO2 nanoparticles. This clearly confirms that the heated particles are crystalline hybrid nanoparticles. The TEM results of these
samples show that the particles are highly porous and size measures are ~5-10nm. Further studies are underway to reduce the TiO2 to Ti in the presence of CaCO3. [This study was partially funded by HBCU Research Infrastructure for Science and Engineering (NSF-RISE), Partnership for Research and Education in Materials (NSF-PREM), and Research in Disabilities Education (NSF-RDE).]

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Synthesis of Substituted Vinlyc Benzamides as Potential Anti Asthmatics

Patricia Hernandez, Bowie State University, MD
Alan J. Anderson, PhD, Kareemah Muhammad, Shawnita Briggs, and Adeola Oredeko, Bowie State University

The main thrust of this research effort is the development of potential novel antiasthmatics. Asthma is a chronic inflammatory disease of the airways. Many of the drugs currently on the market today are limited. Short and long acting $\beta_2$-Adrenoreceptor agonists produce instant and delayed bronchodilatation respectively, yet they have little effect on the underlying inflammation. Conversely, corticosteroids have great anti-inflammatory properties, but lack immediate bronchodilatator actions.

There is yet a demand for a novel drug with both bronchodilator and corticosteroid-like anti-inflammatory properties. Emerging research areas of interests in the therapeutic development of antiasthmatics is focused on drugs capable of inhibiting phosphodiesterase 4 (PDE4), a cAMP-specific and Ca$^{2+}$- independent enzyme. PDE4 is the key isozyme in the hydrolysis of cAMP in mast cells, basophils, eosinophils, monocytes and lymphocytes.

In this work, ten novel catechol N-benzyol analogs of enamiones from cyclohexane-1,3-diones were synthesized in good yield, 70-92%, in an effort to discover novel potent phosphodiesterase IV (PDE4) inhibitors as potential antiasthmatics. The novel targets are analogues of 3-cyclopentlyoxy-4-methoxy-N-(5-methyl-3-oxocyclohex-1-enyl)-benzamide, Structure I, a bioactive molecule possessing modest PDE4 inhibition activity on human U937 cells that were previously published by our group.

The methodology involved the N-deprotonation of the enamione system with two equivalents of sodium hydride in tetrahydrofuran (THF) under a nitrogen atmosphere. After workup, the resulting enamide will be purified in-house via a column chromatography. All reactions, intermediates and products characterized using analytical techniques. Future work involves PDE4 inhibitory studies of the imides that is shortly underway at MDS Pharma, located in PA, USA, employing standard assay procedures on human U937 cells with Ro 20-1724 as the reference compound (IC$_{50}$ 1.22 $\mu$M).

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Meprobamate: Its Components and Response to $\beta3$ HEK-T Rat cells show Similarities to Carisoprodol

Brian Holmes, University of Arkansas at Pine Bluff
K. Manoj, C. Bell-Horner, and G.H. Dillon, PhD, University of North Texas Health Science Center

Carisoprodol (N-isopropyl-2 methyl-2-propyl-1, 3-propanediol dicarbamate; N-isopropylmeprobamate), a substance frequently prescribed, is a skeletal muscle relaxant that has been widely abused. This white powdery substance is administered to various patients diagnosed with acute, painful musculoskeletal conditions. However, over the years drug abusers combine the carisoprodol (Soma) tablets with alcohol, opiates, and barbiturates to often enhance the drug’s tranquilizing capabilities.

Tests have shown that carisoprodol mixed with Xanax and Vicodin can produce a heroin high, and many drug abusers take advantage of this combination. Once digested the drug metabolizes into meprobamate, a drug prescribed to patients with severe anxiety. Carisoprodol is easily obtainable through online pharmacists. It is abused primarily for the sedative and relaxant effects, with some individuals taking 30 to 40 pills daily. Meprobamate was listed as a schedule IV controlled substance in the 70’s. Nonetheless, carisoprodol is not issued as a controlled substance despite the direct connection. Soma has a half life of about 1.5 hours while meprobamate’s half life amounts to 11 hours. Many who come across carisoprodol experience withdrawal symptoms dealing with abdominal cramps, insomnia, chills, headaches, nausea, muscle twitching, states of cognitive confusion, hallucinations much like abusers of benzodiazepines and even meprobamate products.

Our lab has shown previously that carisoprodol can allosterically modulate, directly gate, and inhibit GABA receptors. Because of the close similarities, one would infer that FDA would take necessary measures into controlling the commerce of Soma. In this study, we compared the effects of the non-controlled substance, carisoprodol, and the controlled substance meprobamate on recombinant $\beta3$ GABA receptors expressed in HEK-T cells by utilizing whole cell-voltage clamp and cell culture methodology. Our results, to date, indicate the profile of meprobamate and carisoprodol on recombinant $\beta3$ GABA receptors is similar, providing additional support for the contention that carisoprodol, like meprobamate, should be scheduled at the federal level.

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Profiling Mitochondrial Respiration Challenged by Abrupt Ethanol Withdrawal

Michael Holmes, University of Arkansas at Pine Bluff
Xiaohua Ju, Daniel Metzger, and Marianna Jung, PhD, University of North Texas Health Science Center
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124 Symmetry Change of [Co(2,9-dimethyl-1,10-phenanthroline) (H2O)4]2+ in Sol Gel Material and Comparisons of Similar Chemical Binding Behavior using Dimethyl-2,2-dipyridyl and 2,9- Dimethyl-4,7-diphenyl-1,10 phenanthroline.

Cordell James, Virginia State University
Jennifer Leach, Virginia State University

Sol-gel glass materials are used to encapsulate a variety of dopants from enzymes to metal complexes for use as optical materials, sensors and catalysts. The study of surface interactions with these dopants has led to a better understanding of the factors that can affect the design of these types of materials. Previous studies showed a unique interaction of a cobalt complex that is sensitive to the sol-gel environment. [Co (2,9-dimethyl-1,10-phenanthroline)(H2O)4]2+, [Co(DMP)]2+, undergoes a change in symmetry from octahedral to tetrahedral complex upon introduction to sol-gel and as a result changes both color and intensity. The complex binds to inner pore walls under increasing pH conditions which in turn increases the Lewis base properties of the interior surface silanol/siloxane groups.

We hypothesized that the use of 6,6-dimethyl-2,2-dipyridyl ligand, DMDPy, or 2,9- dimethyl-4,7-diphenyl-1,10 phenanthroline DMDPh, instead of the DMP ligand, should produce the same tetrahedral complex type in sol-gel because of the similar structural characteristics of these ligands at the bidentate binding site. A titration was performed with the sol-gel/metal complex doped material. Increased base addition relative to metal concentration was examined to see its effect on increased loading and material structure. Initial data indicated similar spectral profiles but differences in spectral intensities and binding curves. The similar surface binding behavior occurs because of the presence of the 2,9-dimethyl groups.

125 A Greener Biofuel, Biodiesel from Micro Green Algae

Daniel Jennings-Kam, Kapiolani Community College
Chelsea Goto, Kapiolani Community College

After exploring the process of making high quality biofuel from used cooking oil, the project’s focus was shifted to producing biodiesel from micro green algae in hopes of producing a more sustainable and viable fuel product. Micro green algae can hold well over 60% oil from biomass which is much higher than any land growing crop. The current focus of this project is the process of lysing the algae cell, through mechanical, chemical, and temperature methods. Additionally, other algal species may be more suited for biodiesel production in the Hawaiian marine environment, so further studies will be needed to explore this area.

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Experimentation with various methods of cell lysis is a significant portion of this project as micro green algae are protected by strong cell walls. Spirulina platensis (Spirulina), a readily available and commercially grown species, was chosen because of its cellular structure and the fact that it contains 71% oil by mass on average.

The specific types of stress methods used include; ultrasonic cell disruption, mortar and pestle, pH buffers, freezing as well as boiling. For each method, variables tested will include algal cell concentration and duration of applied stress. Samples will be analyzed for evidence of cell lysis and the amount of oil obtained will be measured to determine which method is the most efficient for biofuel production.

126 Genetics Education amongst Minority Women 65 Years and Older

Whitney Lagrone, University of Arkansas at Pine Bluff
DeSha Farmer, Nancy Greer Williams, PhD, Gloria Sarto, and Kieber-Emmons, PhD, University of Arkansas for Medical Sciences

The purpose of this research is to help find different approaches to develop an educational tool. This has been done by conducting focus groups in the Madison WI, area. The participants in the focus group met once to discuss and answer survey questions orally. Upon assessment, it was shown that there was a lack of knowledge and a lack of trust within the health system, as well as the lack of a generalized test being performed. This research focused on African American Women ages 65 and older. After conducting the program, the goal was to have more women walk away from with a sense of knowing how to help prevent cancer and other illnesses that occur among African American Women. [INBRE/Idea Network, Women's Health Initiative, National Science Foundation.]

127 Electronic Effects for the Hydrolysis of Phosphate Esters

Bianca Lascano, Norfolk State University, VA

It is known that catalysis can be fine-tuned, both sterically and electronically, through a judicious selection of ligands, neutral molecules, or ions bound either covalently or electrostatically to a catalytically active metal ion center. We will establish how electron density at the active site affects a specific catalytic reaction, the hydrolysis of phosphate esters, using copper mono-bipyridine (bpy) complexes with different electron withdrawing groups attached to the bpy ligand i.e. Cu(4,4’-X2-2,2-bipyridine) (OH)(OH2)3+ where X = NO2, Cl, H, CH3, OMe. We will report on the initial results of a study on the hydrolytic kinetics of modified Cu-bpy as a function of the covalently bound group, X, to the parent bpy. By plotting the concentration of product vs. time, the initial rate of the reaction can be determined from the slope of the line. To do this we will use Methyl Parathion and Bis-nitrophenyl phosphate as substrates and monitor product formation at 400 nm as a function of time using UV-vis spectroscopy.

The reaction conditions included: 10-mL 1mM Methyl Parathion, 10-mL of 10mM Bis-nitrophenyl phosphate, 20-mL 0.5mM 1:1 Cu:bpy, 10-mL 15mM Bis-nitrophenyl phosphate, and 10-mL 0.5mM copper mono-bipyridine complexes. The catalyst was prepared by reacting a 10-mL stock solution of Cu(NO3)2 to a 10-mL stock solution of bpy and placing them in the same vial. Eventually the Cu:bpy catalyst was prepared through synthesis which is explained below. I prepared 5-mL 0.1M stock solutions in ethanol of the copper mono-bipyridine complexes with different electron withdrawing groups attached to the bpy ligand. Slowly adding the bpy solution to the Cu a precipitant formed. After heating the solution to 50 degrees Celsius for thirty minutes, the precipitant was filtered into a different vial. The following day, after the filtered portion of the experiment had evaporated, the solid remaining in the vial was then measured and the mass was recorded. The previous experiments were repeated using the synthesized Cu-bpy solid as opposed to the aliquots of Cu and bpy. Being that some of the withdrawing groups are insoluble in ethanol, methanol may be used instead. [This work was supported by the National Science Foundation.]

128 Adsorption-Desorption Study of BSA Conjugated Silver Nanoparticles on Collagen Immobilized Substrates

Richa Mandlewala, Howard University, Washington, DC
Dharmaraj Raghavan, Chemistry Department, Howard University

Studies of the relationship between nanoparticles and proteins in the formation of a biocompatible and defensive substrate are important to biomedical science. Upon coating a synthetic polymer with a protein and then allowing the adsorption of nanoparticles within the proteinous layer, the materialized conjugate can subsequently be placed in a biological environment with the compatibility and defense mechanisms necessary to survive.

Such a conjugate is medically useful for the repair of various tissues within the body. However, understanding the interaction between proteins and nanoparticles in this conjugate is imperative before it can be tested biologically. The complexity of protein chains and sheer size of nanoparticles allows for the coupling of these two agents. Rather than superficial adhesion, it has been noted for nanoparticles to imbide themselves within protein layers. Thus, a substrate that has been coated in protein and exposed to nanoparticles does not form a surface layer of
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Inhibitors of Lactate Dehydrogenase A as Therapeutics for Cancer
Andrea Martinez, University of New Mexico

In 2010, there have been more than 36,000 deaths and 43,000 new cases of pancreatic cancer. These numbers demonstrate a need for new chemotherapeutic regimens. Inhibition of lactate dehydrogenase A by 2,3-dihydroxy-6-methyl-7-(phenylmethyl)-4-propynaphthalene-1-carboxylic acid, an analogue of gossypol, induced significant oxidative stress and cell death in cancer tumors. Using molecular modeling and enzyme kinetic inhibition studies naphthoic acid analogues, having groups in various positions on the naphthalene ring, have been synthesized to determine their importance for inhibition. The synthesis of new naphthoic acid inhibitors begins from veratrole to form the key intermediates, substituted benzyltetralones, which are converted to naphthoic acid analogues using a twelve-step synthesis.

Kinetic studies will be performed on the analogues and the resulting data along with the molecular modeling data will be used to determine structure activity relationships. This information will allow the development of a minimal naphthoic acid structure for inhibition of lactate dehydrogenase A as a potential therapy for pancreatic cancer. [This study was supported, in part, by a grant from NSF/AAAS awarded to Dr. Lorraine Deck Ph.D., Chemistry and Chemical Biology, University of New Mexico, Albuquerque, NM 87131.]

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Design and Synthesis of Benzimidazole as Potential Antioxidants
Pilanda McDougald, Spelman College, GA

As one ages our body develops free radicals that can cause carcinogenic effects. To prevent free radical damage, the body relies on antioxidants. Therefore, our research focuses on designing antioxidants that would prevent bodily damage from free radicals that develop over time. It is hypothesized that a molecule with a benzimidazole skeleton and a hydantoin substituent can be used as an effective antioxidant and potentially prevents cancer cell development. The target benzimidazole was synthesized using traditional heating methods. The molecule was purified using flash chromatography and characterized using NMR, MS and Elemental Analysis. Computational analysis of the potential antioxidant behavior of the benzimidazole molecule has been conducted. Future efforts will involve the biological analysis of the molecules to determine if the molecule is effective as an antioxidant agent. [This research is funded by NIH/MBRS-RISE program.]

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Detection of a Sulfenic Acid-Modification in the Protein Dermcidin
Brittney Nobles, Norfolk State University, VA

Dermcidin is a 11-kDa protein that has been identified in skin, mammary, and brain tissues as well as numerous cancer cell lines. The processed peptides of dermcidin have been shown to have distinct biological activities. While the C-terminal proteolytically processed 47-amino acid peptide has been demonstrated to have antimicrobial activity, a second N-terminal peptide promotes survival of neuronal cells under conditions of severe oxidative stress. Dermcidin was recently identified, from a mass spectral screen of proteins from cervical cancer cells, as capable of forming a cysteine sulfenic acid.

The aim was to confirm the formation of a cysteine sulfenic acid in dermcidin and map the residue which formed the modification. Recombinant overexpressed and purified 11-kDa dermcidin appeared as a mixture of hexamers, trimers, and monomers which ran anomalously at ~16-kDa on reducing SDS-PAGE. The methods used included Chemo-specific Reaction of DAz-2 with Protein SOH, and Expression and Purification of Dermcidin. The overexpressed histidine tagged protein was
purified by: HisTrap Column (Affinity), Sepharose-Q Column (Anion exchange), and the purity was checked with 15% SDS-PAGE gel. Hydrogen peroxide-dependent sulfenic acid formation of dermcidin was demonstrated by chemo-specific labeling with the probe DAc-2. The cysteine-34 modification was only detected in the trimeric and hexameric forms of the protein and may have implications for the functional form of dermcidin.

In the future, three goals will be accomplished. First, it is imperative to show that Dermcidin goes through (ROS) modifications. Once this occurrence is displayed, the loci where these changes occur needs to be mapped. Lastly, it is crucial to determine and show the purpose for such modifications. [The research was conducted at and funded by The University of Michigan in the Carroll Lab under the chemistry Research Experience for Undergraduates program.]

132
An Efficient Synthesis of the Calcimimetic Agent Cinacalcet

Olivia Owodu, Illinois State University
Shawn R. Hitchcock, Illinois State University

This project is focused on the efficient synthesis of the calcimimetic agent cinacalcet as a racemic mixture. Calcimimetic agents are medical compounds used to treat secondary hyperparathyroidism. Primary hyperparathyroidism originates in the parathyroid gland and is often manifested through a parathyroid adenoma. In contrast, secondary hyperparathyroidism originates externally from this gland and is commonly associated with chronic renal failure. Calcimimetic agents can serve to alleviate the problems associated with secondary hyperparathyroidism.

The racemic mixture is being prepared to serve as an analytical standard for the enantioselective synthesis. Two synthetic routes were developed and pursued to determine which route might prove to afford the best option. It was determined that the synthetic pathway that involved the formation of the product through a sequence of amide formation, hydrogenation, and reduction was the most efficient. Finally, a related derivative of cinacalcet was also prepared as a racemic mixture. Future work will involve the asymmetric synthesis of cinacalcet through amine chemistry. [This research was funded by the Petroleum Research Fund as administered by the American Chemical Society.]

133
Drug Discovery’s Headlights: Jorgensen’s Rule of Three and Lipinski’s Rule of Five

Edjohnier Phillips, Tougaloo College, MS

Drug discovery and development have been greatly impacted by the advancement in computational speed and prediction of important physicochemical features of therapeutics allowing estimation of the feasibility of drugs as candidates for clinical trials. General rules incorporating the physicochemical properties act as guidelines to quickly eliminate molecules unlikely to enter the clinic. The two most widely used criteria are Jorgensen’s Rule of Three (RO3)1 and Lipinski’s Rule of Five (RO5). We hypothesize that drugs that are prescribed for the treatment of hypertension obey RO3 and RO5 to a greater degree than those prescribed to treat depression.

In this project, work began by identifying the 50 drugs most prescribed by doctors. The list was compiled by searching the internet and various databases and ultimately discovered on the AARP website. The drugs were put into classes based on what ailment the patient suffered. Then, a search for the drugs’ structures began. These structures where found in both MarvinView and on the internet within the Drugbank4 database, after which they uploaded into Maestro and converted into 3D structures. The physical properties of the compounds were subsequently analyzed by QikProp. Testing was also done to apply RO3 and RO5 to experimental compounds. The results were compared to experimental solubility measurements.

Our results show that anti-depression drugs adhere to RO3 and RO5 better than anti-hypertension drugs (As shown in Table 1). The experimental compounds (Table 2) show that both RO3and RO5 are good predictors of oral availability and absorption but there are other factors that also have an effect on oral availability and absorption. These factors could not be studied in this experiment due to time constraints. [This material is based upon work supported by the Howard Hughes Medical Institute under Grant No. 52005873 also from the Jackson Heart Study which is supported by NIH contracts N01-HC-95170, N01-HC-95171, and N01-HC-95172 provided by the National Heart, Lung, and Blood Institute and the National Center for Minority Health and Health Disparities in conjunction with Tougaloo College grant number NIH-NHLBI-HC-04-27.]

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Synthesis of 3-carboethoxyethylidene cyclobutane to Serve as a Reactive Platform for the Formation of [4+2] Cyclohexene Core Products

Ryan Quiroz, University of California, Los Angeles (UCLA)

There is a high demand for the synthesis of sterically hindered yet stereoselective poly-substituted cyclohexene ring structures, which can function as part of the core structure in many natural products. Thus, facile and high-yielding synthetic schemes of these compounds are exceedingly desirable.

To accomplish this goal, ethyl-2-(3-oxocyclobutylidine) propanoate must be generated from the corresponding ketal to serve as the reactive platform to form these cyclohexenes. This ketal precursor was formed through a [2+2] addition of 1-(tert-butyldimethylsilyloxy)-1-methoxyethene and ethyl 2-methyl-2,3-
butadienoate, followed by acid hydrolysis to generate the desired cyclobutanone.

This cyclobutanone was then subjected to nucleophilic addition of various organolithium reagents, followed by deprotonation of the resulting alcohol to initiate ring opening, rearrangement, and intramolecular Michael addition to generate the desired compounds. This rearrangement and corresponding products are highly dependent on the nucleophile and reaction conditions selected, and so many combinations were tested to generate useful and diverse core structures.

Ultimately, the first key step in creating a reactive cyclobutanone served as an effective synthetic building block for the formation of complex cyclohexene rings that are common in antitumor and other natural, biologically active products. [This research was funded thanks to the NIH-MARC scholarship program at UCLA.]

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Preparation of Lactones from Carbon Dioxide and Vinyl Organometallic Compounds

Jasmine Reedus, Oakwood University
Glenn Phillips, Monique Woodson, and Rushelle Julien
Oakwood University

The broad scope of the work proposed involves the development of the Chemistry of gamma and delta lactones which are biologically active. The syntheses of gamma and delta lactone derivatives are important to human health but also provide a unique learning tool to investigate principles of organic chemistry. Successful drug candidates of the lactone family can give insight into the structure relationship activity (SAR) of these molecules. The lactones are prepared using aldehydes and propargyl bromide as starting materials. The resulting alcohols are then re-brominated with bromine and potassium hydroxide, and reduced to vinyl bromides using NBSH (nitrobenzyl sulfonfylhydrazine). The final step employs cyclization with carbon dioxide. All the synthetic transformations until the vinyl bromides have proceeded in yields of greater than 70%. Upon completion of the library of lactones, each compound will be tested against various cancer cell lines for their cytotoxic activity. [Acknowledgment: We would like to thank NSF for funding this opportunity to carry out this research.]

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Chemistry & Chemical Sciences
Design and Synthesis of Benzimidazole for DNA Intercalation

Brittany Rhodes, Spelman College, GA

According to the American Cancer Society in 2010, an estimate of 207,000 new cases of breast cancer among women was reported. It is important that more anti-cancer drugs are created to help inhibit the growth of cancer cells. DNA intercalation specifically is used in anti-cancer therapeutics as a means of inhibiting DNA replication in proliferating cancer cells.

This research is focused on the synthesis and biological activity of benzimidazole compounds as DNA intercalators. There are main steps in the synthesis process, amination or addition of an amine, reduction of a nitro group to a second amine and condensation or closing of the ring to create the benzimidazole.

We have successfully synthesized the first two steps and currently working on the last step. Once the synthesis is complete it can be used to see if it would be a good DNA intercalator. [Acknowledgment: I would like to acknowledge the MARC U STAR program for funding me.]

137
Chemistry & Chemical Sciences
Investigation of the Bioactive Chemicals of Nigella-sativa using UV Spectroscopy

Sade Rhodes, Winston-Salem State University, NC

Nigella-sativa (NS) or black-seed is well known for its mysterious healing effects and great potential for prevention and treatment of various diseases. Researchers have suggested that the bioactive chemicals of NS are responsible for inhibiting variety of cancers. According to recent reports, however, the use of highly concentrated bioactive chemicals of NS has shown acute toxicological effects. The knowledge of the relative concentrations of the bioactive chemicals of NS is thus important for its effective use as anticancer drug.

To this end, we have measured the ultra-violet (UV) spectra of Nigella-sativa (NS) and its bioactive chemicals, thymoquinone (TQ), linoleic acid (LA), oleic acid (OA), palmitic acid (PA), ethyl linoleate (EL), ethyl oleate (EO), ethyl palmitate (EP), and alphahederin (AH). We used a two-beam Varian100-Bio UV spectrometer to measure the spectra of NS oil and its bioactive compounds in the spectral range of 190nm-400nm with 0.2nm spectral resolution. The spectrum of NS oil exhibits a relatively narrow peak near 196nm, a broad peak near 233nm, and a shoulder near 273nm.

To quantify the relative concentrations of the bioactive chemicals of NS, we employ a multivariate technique that assumes the spectrum of a mixture is a linear combination of the spectra of its components and that signal intensity is directly proportional to chemical concentration. We have determined the relative concentrations of NS bioactive chemicals by fitting NS data to a linear combination model of the eight basis spectra of TQ, LA, OA, PA, EL, EO, EP, and AH.
138
Synthesis of a Verdazyl Analog of Terpyridine

Cardius Richardson, San Jose State University, CA

Verdazyl radicals are unique amongst stable free radicals for two reasons. First they carry three potentially variable substituents to give a variety of different structures. Second, the nitrogen atoms which carry the bulk of the spin density can coordinate metal ions giving the potential to form extended metal-organic structures with unusual magnetic properties. We hypothesize that verdazyl radicals with two pyridyl substituents should coordinate transition metals analogously to the common ligand terpyridine. Furthermore, the central location of the verdazyl in the ligand should give strong metal radical interactions when coordinated to paramagnetic metal ions. A dipyradiyl substituted verdazyl radical was synthesized in three steps from pyridine carboxaldehyde pyridyl hydrazone.

In the final step, oxidation of an intermediate tetrazane using NaI04 gave the free radical. The identity of the radical was confirmed by Electron Spin Resonance (ESR), UV-vis, mass spectrometry and IR. The addition of nickel triflate gave a nickel complex that was identified by X-ray crystallography. The X-ray structural data confirmed the analogy with terpyridine. Both UV-vis spectra and magnetic properties are significantly different from either isolated nickel ions or the verdazyl ligand supporting the hypothesized strong metal-ligand interaction.

We are now interested in synthesizing a metal complex using Cobalt and Iron triflate for the characterization of metal-radical interactions. UV-vis data that we have obtained of the Ni complex and Co complex are more intense and red shifted compared to the radical. Other verdazyl-metal complexes only show weak perturbation of the verdazyl electronic spectrum. The Co complex shows three reversible oxidation waves at 0.63, +0.22 and +0.60 V vs Fc/Fc+.

We have yet to assign these redox reactions; both ligand and metal can undergo one electron oxidation and reduction, but the observed processes may not correspond simply to metal or ligand oxidation. In the future we hope to run Electron Spin Resonance on the Cobalt complex as well as test other metals such as Iron triflate. [This research was supported in part by the NIH MBRS RISE Program (5R25GM071381) and the Petroleum Research Fund (grant # 39923-B1). I am also an active member of LSAMP.]

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Extraction, Isolation and Pharmacological Evaluation of Phytochemicals Present in Tropical Medicinal Plants

Bianca Richwood, Shaw University, NC
Christopher Njue, Shaw University

The emerging disease resistance to western medicine and the ever increasing disease complexity has led to a surge in the search for alternative and complimentary medicine. In plant sources, most pharmacologically active components may be present in levels that are not adequate to sustain the treatment requirements for the affected human population as was the case for Taxol, an anticancer drug.

In our ongoing study, we sought to develop faster and robust surfactant based media methods for extraction, isolation and identification of pharmacologically active components present in plant leaves. Solvent extraction with methanol was used as control. A comparison between the aqueous surfactant media isolates and methanol isolates will be presented. Future work will involve screening of the isolates for their pharmacological activity. [This work is supported through the NSF HBCU-Up project at Shaw University.]

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Investigation of the Mechanism of Association of Gold Nanoparticles with Humic Substances

Jameyca M. Teno, Louisiana State University
Loice M. Ojwang and R. L. Cook, Louisiana State University

The synthesis and use of gold nanoparticles (Au NPs) has increased dramatically in recent years. Au NPs have unique spectral properties which makes them applicable in a range of fields such as biomedical imaging1, cancer therapy and diagnostics2, and biological and chemical sensing.3 Humic substances (HSs), a major component of natural organic matter (NOM), are present everywhere ranging from terrestrial environments to large water bodies. HSs have a very diverse structure with both hydrophilic and hydrophobic domains.4 Thus HSs will play an important role in determining the fate and transport, as well as the bioavailability, of Au NPs. T

This study examines the association of Au NPs with HSs. Au NPs were successfully synthesized and characterized based on their size using dynamic light scattering (DLS) and UV-Vis spectroscopy and transmission electron microscopy (TEM) imaging techniques. Fluorescence spectroscopy was used to examine the mechanism of association of Au NPs with HSs. Au NPs were prepared by the reduction of hydrogen tetrachloroaurate (III) trihydrate (HAuCl4·3H2O) with tri-sodium citrate solution. HSs stock solution was prepared by dissolving Florida Peat Humic Acid (FPHA) in phosphate buffer at pH 4. Au NPs 30±5 nm in diameter were successfully synthesized. These NPs exhibited a maximum absorption band around 520 nm.

The DLS results agreed with the TEM results. Au NPs interact with and quench the fluorescence emission of HSs resulting in a decrease in the fluorescence intensity of HSs. HSs may interact with Au NPs by forming a HSs/Au NPs complex. [This research was funded and supported by LS-LAMP program and NSF.]
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Assessing the Inhibitory Effects of Herbs on Oral Bacteria that Cause Life Threatening Infections

Charne Thomas, Dillard University, LA
Alexander Broadnax, Curvelle Lewis, William Taylor, and Bernard Singleton, M.S., D.V.M., Dillard University

Tooth decay is a prevalent chronic disease that affects people of all ages. “Nine out of ten adults over the age 20 have some kind of tooth decay” (Center for Disease Control). Oral bacteria can attack deeper tissues in their hosts and produce disease outside the oral cavity. Oral bacteria that attack deeper tissues may cause abscesses of alveolar bone, lung, or the brain. If oral streptococci are introduced into the wounds created by dental procedures (including oral hygiene) and treatment, they could end up sticking to heart valves, via the blood and causing acute endocarditis which may be fatal.

For this reason, it is important that we identify compounds that can inhibit the harmful bacteria responsible for these diseases. Jian He and his team of researchers have found two compounds isolated from licorice roots that shows potent antibacterial activity against S. mutans. (He et al. 2006). The purpose of this study was to determine the antimicrobial effects of four herbs; garlic, serrano pepper, jalapeno pepper, and ginger on oral bacteria.

Samples of oral bacteria were obtained from the mouths of six individuals and were cultured on Nutrient agar plates containing filter paper discs saturated with juice extracted from the herbs. The plates were incubated for 48 hrs. at 37°C. The results showed that garlic exhibited potent antimicrobial activity against the oral bacteria. The bacteria grown were subcultured into selected differential broth to assist in identifying them – incubated 48hrs. at 37°C. This warrants further research in potentially using the component responsible for the antimicrobial activity of garlic as a natural ingredient in products that promote oral hygiene and use as a treatment or prophylaxis to prevent serious life threatening complications. Genetic DNA analysis is another consideration to identify the organisms. [This Study was supported by a grant from NSF/LAMP awarded to Dr. Abdalla Darwish, DU-Director, Dillard University, New Orleans, LA, 70122.]

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Physical Properties of Aliphatic and Aromatic Polyurea-Nanoclay Composites

Alex Trochez, Grambling State University, LA
Naidu V. Seetala, Gabriel Burks, and Danny Hubbard, Grambling State University
Valery Khabashesku, University of Houston

Thermo-mechanical analysis was performed on aliphatic polyurea with 1-5% nanoclay using a penetration probe at a constant pressure of 0.2 N and the surface displacement was obtained over a temperature range of 20°C to 250°C. Thermo-mechanical analysis showed systematic decrease in the glass transition temperature at around 63°C with increasing wt% nanoclay in the aliphatic polyurea-nanoclay composites. Also, positron lifetime, magnetometry, tensile strength, and thermo-mechanical measurements were made to study the 1-5% nanoclay incorporated aromatic and aliphatic polyurea films.

Results obtained during the study showed there were decreased glass transition temperatures noted for each nanoclay/polyurea sample in comparison to samples of polyurea, only. The magnetic curves showed mostly diamagnetic with a small ferromagnetic component for all polyurea samples. The ferromagnetic component is higher for aliphatic and nanoclay showed a drastic change in aliphatic compared to aromatic polyurea. The ferromagnetic component saturation magnetization (Ms) showed 61% decrease in aliphatic polyurea due to nanoclay, while aromatic polyurea showed only 49% decrease; and the magnetic coercivity (Hc) showed 300% increase in aliphatic compared to 40% increase in aromatic films.

This suggests a strong interaction of nanoclay with aliphatic chains compared to aromatic chains. This may explain the corresponding changes in the tensile strength observed for these aliphatic and aromatic polyurea films with and without nanoclay. The strength at break point is increased by 57% in aliphatic polyurea by introducing nanoclay, while aromatic polyurea showed only 14% increase.

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Nanoseed Project: Enhancing Enzyme Stability

Tashiana Verna, Norfolk State University, Department of Chemistry, VA

Vaccines are thermally unstable, and therefore, transporting them to resource-limited settings is difficult due to temperature-hindered loss of active vaccine during shipment. This loss affects the ability to effectively treat those living in areas where there is no electricity for refrigeration. The following project is
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being conducted in hopes of enhancing the thermal stability of enzymes, and eventually vaccines.

A seed-like structure will be the ultimate product in which the enzyme will be coated with a sugar polymer coating and then encapsulated with a responsive polymer coating. To obtain the sugar polymer coating, three compounds need to be synthesized: the modifying group, sugar monomer, and the cross-linker. Thus far, the sugar monomer has successfully been produced, and the synthesis of the modifying group is in process. The yield of the sugar monomer was unable to be determined as a result of purification difficulty. When analyzing protein modification with a commercially available succinimide, using mass spectrometry, it was observed that all seven amino groups, of the lysozyme protein, were modified. Once the modifying group is synthesized, the cross-linking compound will be prepared. The modifying group will then be used for protein modification. The polymer coating will be constructed from the sugar monomer and cross-linker in a one-pot synthesis. [Acknowledgement: NSF (funded REU program).]

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An Investigation of the Relationship Between Air Pollutants and Lung Function

Kennedy- Kiet Tuan Vu, California State University, Fresno
Dianne Lim, Akihiro Ikeda, and Alam Hasson, California State University, Fresno
Tim Tyner and Jose Joseph, Department of Surgery, UCSF Fresno

Previous studies have shown that the San Joaquin Valley has high levels of particulate matter (PM) which may exacerbate health problems such as asthma and cardiovascular disease. It is hypothesized that following a viral infection, an individual’s immune system may be weakened to the point where exposure to quinones may trigger an asthma attack. To investigate the possible link between air pollution, viral infection, and asthma exacerbation and the exposure of an individual, the levels of the pollutants or their metabolites in the urine of the subject may be monitored.

Experiments were carried out by evaluating urinary quinones as biomarkers for exposure to air pollution and PM. Urine samples were collected from a cohort of 19 patients during the period from November 2007-August 2008. Daily PM mass loadings and polyaromatic hydrocarbons (PAHs) were simultaneously measured at two sites in Fresno County. Extracts were derivatized and analyzed by gas chromatography/mass spectrometry. In separate work conducted by another group, the presence of markers of viral infection is also being evaluated. Spirometer tests and daily symptom diaries are used to simultaneously track the lung function and asthma symptoms of the patients.

Of the ten monitored quinines, 3 were detected to be above the limit of quantification along with five PAHs. Urinary levels of two quinines (phenanthroquinone and anthraquinone) are positively correlated with atmospheric mass loadings of the corresponding quinines monitored. Implications of these results for the use of urinary quinines as biomarkers will be discussed.

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Electrochemical Circuits in Mimosa pudica

Astian J. Waite, Oakwood University, Huntsville, AL

The bioelectrochemical systems in plants not only regulate stress responses, but photosynthetic processes as well. Mimosa pudica is a thigmotastic plant that reacts in response to stressors such as electrostimulation, wound, wind, vibration, touch, drought, change of illumination, and hot or cold stimuli. Mimosa pudica reacts to stimulation by closure of leaves and descent of petiole. The anatomy of M. pudica is unique and contributes to the bioelectrochemical response mechanism of the plant. The propagation of action potentials is a signaling mechanism in M. pudica.

The action potentials that occur in plants have many of the same properties as action potentials that occur in animals. This includes the all-or-nothing law, threshold potential, and refractory period. Tactile stimulation of M. pudica induces transmission of an action potential that stops at the base of a single pinna with no further transmission occurring, leaving leaflets from neighboring pinnae unfolded.

In the study reported, the biologically closed electrical circuits in Mimosa pudica through electrostimulation using a charged capacitor method were analyzed. Biologically closed electrochemical circuits operate over large distances in biological tissues. The activation of such circuits can lead to various physiological and biophysical responses. [This research was funded by a HBCU-UP grant from The National Science Foundation.]

146
Tolerance of Bacillus subtilis Against Triorganotin Carboxylates

Hirut Yimer, University of the District of Columbia

Triorganotins, compounds with three Sn-C bonds, are well documented to have biocidal activities against various species including fungi and bacteria. Previous studies have shown that triorganotins are toxic to Escherichia coli. B. subtilis is a gram-positive bacterium regularly found in soil, and is often used as an alternative to gram-negative Escherichia coli, since it is easily cultured in the laboratory. It has been hypothesized that the
B. subtilis would be more susceptible to the triorganotins than Escherichia coli. The purpose of the project is to determine whether triorganotins are effective against a gram-positive bacterium.

The compounds were synthesized according to literature procedure. The stock solutions were prepared by dissolving the desired compound in acetone. The gram-positive bacterium, B. subtilis, was exposed to multiple dosages of triorganotins and placed in a water bath at 37°C and shaken for 24 h. After the 24 h period, the absorbance was recorded by a Unico 1200 spectrophotometer at 600 nm. Preliminary results indicated that the 2,2,3,3-tetramethylcyclopropane carboxylate complexes were more effective than the 2-(p-chlorophenyl)-3-methylbutyrates in the inhibition of B. subtilis. In both instances, the ethyl derivatives were the most effective. Another modified components/fragments of pyrethroids (triorganotin 2,2-dimethyl-3-(2-methyl-1-propenyl) cyclopropanecarboxylate) will be screened against Bacillus subtilis to determine which modified fragment is the most effective. Results from the study will indicate if this series of triorganotins should be investigated further as possible biocides. [Supported by, AAAS-Merk, STEM Center for Undergraduate Research at the University of the District of Columbia, and Department of Chemistry and Physics at the University of the District of Columbia.]

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Introductory Robotics in a First Programming Course: A Laboratory Example

Jason Allen, University of the District of Columbia
Fikre Kiros and Trevor Saunders, University of the District of Columbia

The use of introductory robotics can help to enhance creative thinking and problem solving skills in a CS-0/first programming course. Our goal is to see if using graphical interface robotics programs can be as or more effective in an introduction to programming course than other introductory programming methods. The basic programming constructs of sequence, selection and looping were tested in a visual environment. Example labs were created to illustrate these concepts, using the Lego Mindstorms NXT and Robt-C programming languages. A final project example: “Envision a robot that serves a societal need,” was created using NXT.

Our group created a program that instructs a robot to travel from its home point to a predetermined destination via a predetermined route utilizing sonar and light sensors while carrying a payload then empty its payload at its destination and return home. Further applications of this program would allow certain custodial services to become automated on a scalable platform.

The modules created have not yet been tested on a class. Our next step is to introduce this concepts to students in the Introduction to Programming courses and to assess the progress of the class, with and without the use of robotics. [This work was supported, in part, by a grant from NSF, the Washington/ Baltimore/Hampton Rhodes Louis Stokes Alliance for Minority Participation Program (WBHR LSAMP).]

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The Genomic Sequencing of Halotiobacillus Neapolitanus C2 and the Intergaration of Annotation with National Center for Biotechnology Information Software Form

Tristan Allen, Langston University, OK
Abigail S. Newsome and Charles Bland, Mississippi Valley State University

The main purpose of our research was to get an annotation, which is, the summary made about information that one has collected from a few, or many different documents about the gene they are studying, in our case, Halotiobacillus neapolitanus c2. Annotations were used mainly for the purpose of expanding code documentation and comments. The annotation of halotiobacillus neapolitanus c2 has become a big factor of study because it is a carbon fixing compound. Some annotations were simply to sum up the source of the data mining.

Others were to confirm what it is that we had found within our research study. What are the main arguments? Why are we studying this gene? What is the point of this literature review or article? How will your research be beneficial to others? What topics are covered? Did you cover your topics clearly? If someone asked what this research or topic is about, what would you say? The length of the annotations will determine how detailed the summary is, which is based upon the research that was conducted and how far in depth the data mining goes.

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Information Extraction and Pattern Matching for the Voice Field Medical Card in a Battlefield Environment

Jihad Ashkar, Bowie State University, MD
Sharad Sharma, Bowie State University

Combat medics face many challenges on the battlefield when reporting an injury. They are typically required to complete a hardcopy TCC card by hand, which requires a relatively long amount of time and occupies the medics’ hands, preventing them from concurrently treating the wounded soldier. This
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Effects of Social Networking Among Youths

Nurudeen Busari, New York City College of Technology

A social network is a group of individuals that come together for common interests such as, sports, education, and business. ProjectStem is an example of a social network that is based on educational values, while Facebook integrates sports, belief systems, culture, background, relationships etc in addition to education. Facebook is currently the most popular social network among youths with over 500 million users. Each user has an average of 150 webpage friends.

Facebook has been subjected to many criticisms due to its lack of adequate privacy and security settings. A survey was conducted to determine the types of information users feel comfortable sharing on Facebook. This study shows that 80% of surveyed users posted personal information, while the other 20% shared educative or informative materials. 50% of “education based users” also use the website to search for employment opportunities. With this, it may be concluded that more users can benefit from the academic and educational aspects of Facebook than have been thus far. Furthermore, educating the youth about the risks of social networking is important. Youth spend so much time on Facebook that it affects their scholastic performance.

There is increasing evidence that social networks are impacting youths. The first recognizable social network site was launched in 1997. SixDegrees.com allowed users to create profiles, list their Friends and surf the Friends lists. AIM and ICQ buddy lists supported lists of Friends, although those Friends were not visible to others. Classmates.com allowed people to affiliate with their high school or college mates, but users could not create profiles or list Friends until years later. AsianAvenue, BlackPlanet, and MiGente allowed users to create personal, professional, and dating profiles. MySpace was introduced in 2003. MySpace was able to grow rapidly by capitalizing on Friendster’s alienation of its early adopters (Christopher Nickson, 2009).

Facebook was launched in February 2004, and operated and privately owned by Facebook, Inc. Users can add people as friends send them messages, and update their personal profiles to notify friends about themselves. Additionally, users can join groups organized by employment, or school. Facebook became more popular unlike other social Networks; According to Facebook Press release, Facebook has over 140 million users all over the world as at this time. Users may also chat; play games, and comments on pictures, statuses, and notes.

Social networking is the most common activity among youths between the ages of 15- 24 this day. Youths gets so addicted to social networking that they forget to do their class assignments and end up faling their classes as a result. Social networks serve
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as information source as network friends share news. It is commonly observed, in both ethnographic and empirical studies, that the behavior of individual agents is affected by that of their peers (Antoni Calvo, 2009). Many scholars from various fields have worked on social networks to see what the nodes are used for and why youths get so addictive to it. One of the recent concluded that the peer effects game has a unique Nash equilibrium where each agent strategy is proportional to her Katz-Bonacich centrality measure.

Two thousand people from different backgrounds, cultures, and countries were added as friends to a Facebook account to be used for the purposes of this research. The account was used every day for 2 months. Of particular interest for this study was documenting the types of the information people shared, their Facebook activities, their likes, comments, and the rate at which they updated their statuses.

A field survey was also conducted. Youths between the ages of 15 and 24 were asked a series of questions, such as: what they do on social networks, how often they use it, who they talk with, and how long they can stay off social networks without experiencing withdrawal. Since the conclusion was that the negative effects of social networks is much more than its positives, Educating the youth of the positive uses of social networking, and the risks involved in social networking can help in bridging this gap.


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Fast Image Clustering
Martese Crichlow-Clay and Shuhua Lai, Virginia State University

The purpose of this research is to implement a system using C++ for fast image clustering. Image clustering is the assignment of a set of pixels into subsets (called clusters) so that pixels in the same cluster are similar in some sense. Clustering is a method of unsupervised learning, and it has been widely used as a common technique in many applications, such as machine learning, data mining, pattern recognition, image analysis, bioinformatics and etc. There are plenty of images on the World Wide Web. To search the desired image in the web by content, for example find images contain animals, are called content based image retrieval. Clustering is an effective way to recognize the objects or patterns in an image and is widely used in web image search engine. This project is aimed at clustering images using K-means++ technique. The proposed system will extract information of images and the extracted information will further help recognize objects in the images. Once such system is build, it can provide a platform for us to construct image search engine in the future. [Research work of this project is supported in part by NSF HBCU-UP program.]

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Automated Software Testing & Deployment: The Graphyte Web Toolkit

Carl Chinatomby, The City College of New York

The Graphyte toolkit is an interactive web-based IDE that integrates various technologies in order to facilitate high performance computing and cope scientific computation on large datasets. Examples include statistical computations on remotely sensed data, to aid global climate analysis. It is vital that through expansion of the Graphyte toolkit, the system retains its modularity and robustness. This necessitates setting up an automated testing environment.

Using a continuous integration system, Hudson, as a starting point, we have integrated various testing, deployment and quality assurance tools. These include python-based software and libraries such as twill, pylint, coverage, nosetests, mercurial, and fabric. Using this software we have developed an automated system that thoroughly tests the overall functionality, evaluates good programming practices, and continuously produces reports.

With this automated testing system, when new features are added to Graphyte, they are thoroughly tested along with regression tests on all the previous features to ensure the toolkit works as expected. Future applications will be the expansion to include newer versions of Graphyte, verification of scripts dealing with scientific data, and server side testing. [This research has been funded and sponsored by The National Science Foundation under Grant No. ATM-0755686.]

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What’s for Dinner? An Apple iPhone Application

Damien Damte, University of the District of Columbia
Nii-Emil Alexander-Reindorf and Lucius Thompson, University of the District of Columbia
Adrian Flowers, University of the District of Columbia and Rutgers University

Reports on Research and Markets.com, since 2007, show that smart-phone application development has risen by 140%.
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Computer Sciences & Information Management
Using Data Sets to Display Weather Hazards

David Etim, North Carolina A&T State University
Albert Esterline, PhD, North Carolina A&T State University

This presentation describes my research during two months as a NOAA Affiliate at the David Skaggs Research Center in Boulder, CO, using Google Earth and coding KML (Keyhole Markup Language) files. I worked with a research team on a project for Integrated Hazards Information Services (IHIS).

The purpose was to create a provider of services to help locate and collect data on weather activity in certain places around the US. I also collaborated with a colleague in the Global Systems Division on a task using KML and Google Earth to collect data on the locations of weather forecast offices and emergency management centers in the United States. I collected information on latitudes, longitudes, addresses, locations, office names, etc. I formatted the data into spreadsheets then converted it into KML files, which are rendered in Google Earth for geographic visualization. Converting the files allows the horizon of emergency management and how broad weather forecasting is the United States. This project is to eventually lead to a result of offices displayed across a map and possible hazards in different regions for the offices to pick up, track, and communicate warnings to others about the possible weather activity.

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Computer Sciences & Information Management
Volume Rendering: Creating 2D Images From 3D Datasets
Sean A. Francis, University of Florida / University of the Virgin Islands, St. Thomas, VI
Alizera Entezari and S. Mahsa Mirzargar, University of Florida

Have you ever imagined being able to see a person’s skull simply by examining a photograph of the head? Volume rendering has become an increasingly popular field for its usefulness in medicine, engineering, and even astrophysics; it is a technique used to project 2D images from 3D datasets. A 3D dataset is a set of cross sectional scans of a certain object scanned in an MRI or other acquisition devices.

Usually, an MRI scan is taken for every millimeter of the object to complete a dataset. When the dataset is rendered, we have the ability to visualize the internal structures along with the external structures in a single projection. During the process of volume rendering, an initial image of a dataset is projected on a grid though the use of voxels. These 3D pixels are each assigned a value from 0 to 255 based on their intensity level.

Now a person would manipulate a transfer function, a “linear piece-wise function”, to determine which voxels are to be rendered transparent and which are to be rendered opaque and to determine the color of these voxels. This is what creates the 2D image from the 3D dataset.

The current volume rendering programs are slow, inefficient, and subject to research. Using the program “vuVolume”, we created transfer functions to generate 2D images from 3D datasets that will be used for benchmarks for examination of algorithms that promise to be a faster, more reliable program. The transfer functions, developed over the summer, have yielded lovely results and for future research, more transfer functions will be needed to test the upcoming program which, after completion will be distributed for academic purposes.

[This research has been funded by the South East Alliance for Graduate Education and the Professoriate (SEAGEP) program.]

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Instructing Early Literacy through Mobile Applications

John Franklin Jr., Purdue University, Indiana

With overcrowded classrooms leading to distractions, there needs to be a way to provide instruction outside the classroom. A readily available, inexpensive tool to supplement the teacher’s instruction is the smartphone. In this project, we use the ubiquitous Android platform for smartphones to create a mobile application that augments the teacher’s classroom instruction in early literacy. The application uses voice recognition software to drill students on pronunciation, spelling, and recognition of words and sentences. The application also lets teachers choose
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which words, chosen from a pedagogically sound vocabulary, students will learn through the device. Students are rewarded as they achieve higher levels of vocabulary. Use of the application is intended for all students in first through sixth grades.

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Computer Sciences & Information Management
The Robot Snack Food Coach for Reducing Childhood Obesity: Developing a Vision Algorithm
Amelia Henderson, Spelman College, GA

The growing increase in childhood obesity is a serious public health concern facing the United States today. Obesity has been attributed to a combination of genetic, behavioral, and environmental factors. The numerous health problems resulting from childhood obesity include high blood pressure, high cholesterol, Type 2 diabetes, asthma, liver disease, and sleep apnea. Also, obese children often suffer from low self-esteem, anxiety, and depression.

One means of addressing childhood obesity is through changing behavior by educating children on proper nutrition and healthy food choices. An effective and interactive way to provide this education will be through programming a robot to act as a snack food coach. This paper explores the development and use of a vision algorithm to detect barcodes on snack foods.

To identify the barcode, Open Source Computer Vision (OpenCV) was used. OpenCV is a library that contains over 500 functions for use with computer vision, which were useful when creating the algorithm. Taken from OpenCV were the functions used to create a histogram, threshold the image, and perform hough transform, all of which were essential to locating and identifying the barcode. To find the correct threshold level to be used with the image, a histogram was created from the given image. OpenCV also contains thresholding functions. Thresholding allows unwanted pixels in the image to be discarded. It is a process that allows the next step (hough transform) to be performed with more desirable results. Hough transform is a technique that is used to isolate the curve of a specified shape in a given image. To detect the lines in the image, the standard hough transform method is performed.

The algorithm was tested on video containing noise and video without noise. In the case of the video with noise, the algorithm was able to detect the barcode with an 81.05 percent accuracy rate.

Identifying the barcode is just step one of the process. The algorithm would have to be adjusted to work with the camera that comes with the robot. Once the barcode is detected, a motion algorithm should be created to get the robot to physically scan the barcode. After scanning, this information would then be used by a database to determine the nutritional facts and whether or not the child should eat the item and, if so, how much of it he or she should eat.

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The Use of Artificial Neural Networks for Promoter Prediction in E. coli Based on DNA Stability
Amber M. Johnson, LeMoyne Owen College, TN
Jessica A Myles, Claflin University, SC
Justin Booker, Alcorn State University, MS
LaDavey Merriweather, Charles Bland, PhD, and Abigail S. Newsome, PhD, Mississippi Valley State University

Accurate distinction of promoter regions is one of many challenges in biology. This process is challenging because promoters can differ subtly in sequence and still retain function. A computational method based on probing is an effective approach taken.

In this project, DNA stability energy was used to propose predictions through artificial neural network (ANN) software for finding promoters based on researched calculations found with given transcription start sites. Artificial neural networks were used to predict promoters based on DNA stability. There were 4,944 negative instances (non-promoter regions) and 1,648 positive instances (promoter regions).

After Tiberius, an artificial neural network, calculated and dispensed the predictions, the precision, recall, and f-score were able to be calculated using the positive and negative classes. Precision was 70.4%, recall was 51.3%, and f-score was 59.3%.

Results using this technique were effective in distinguishing promoter regions, resulting in a high accuracy rate for correct prediction. Over a wide range of precision-recall values, Tiberius was capable of identifying distinctive characteristics of promoter regions. [Congressionally directed grant from US Department of Education: Grant #P116Z090254.]

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Integrating Healthcare and Robotics for the Advancement of Assist(ing) Robots in the Healthcare Industry
Naquasia J. Jones, Spelman College, GA

A large percentage of elderly patients have difficulty in identifying medicines they take. This project investigates the feasibility to have the Nao Humanoid Robot identify various colored medicine bottles (or pills), and retrieve them for the elderly and patients with various disabilities such as cerebral palsy.
Vision is an important element for humans and more specifically for the Nao Humanoid Robot. The Nao Humanoid Robot can be used not only for the computer science industry but also for the healthcare industry. The Nao can be used to retrieve and sort pills for senior citizens and patients with disabilities. Through color specific markers, the Nao will be able to identify, retrieve, and sort items based on three specific color markers, yellow, blue and orange. In using basic open Computer Vision (openCV) along with simple C++ one will be able to command the Nao to find color coated objects and then retrieve those items for people such as patients with disabilities.

This project demonstrates how the healthcare industry can use the Nao Humanoid robot to identify pills and other color specific healthcare specific objects. This project will highlight some of the key components of the computer vision algorithm, and a set of motion sequences, to demonstrate the flexibility and versatility of assistive humanoid robots for impaired and disabled patients.

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Comparison of Different Experimental Settings in Radiation Hybrid Mapping
Tracie King, Mississippi Valley State University

Radiation Hybrid (RH) Mapping is a mapping technique used to order markers on a genome. The name RH mapping refers to the radiation being used to randomly break the chromosome into random fragments. It is the first step to get the full sequence of the wheat genome. This process was used to find the sequence of the full chromosome.

Data from biologists were used to order markers and find the sequence of the genome. CarthaGene software was used to build comprehensive maps. This software prepares the best map possible with the use of map improving methods. A map is put into the heap (storage) and CarthaGene improves the map in the heap. The understanding of the experimental process of how CarthaGene uses different algorithms, such as build, annealing, and other enhancement commands like flips and polish to order markers is the basis of this project. The role of high and low retention individuals on mapping was also investigated.

Three different maps using the full data set, only high retention individuals, and only low retention individuals, were created. Comparisons between the three different maps were applied and scatter plots of the position of each marker relative to each other were created. If the maps were consistent to each other, the points in the scatter plots would appear to be in a diagonal position. If the maps were flipped, the position would appear to be anti-diagonal. If it appears around the diagonal, then the positions of the markers were close. The relative positions of the markers on the high versus low retention map appeared to be independent.

The comparison of the maps between full data sets and high and low retention individuals, respectively, showed similar results as well. The scatter plots did not show any consistency throughout the maps. [This material is based upon work supported by the National Science Foundation under Grant No. IOS-0822100.]

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Modeling of Poly(4H-cyclopenta[2,1-b;3,4-b']dithiophene-4-one)
Carla S. McKinney, Norfolk State University, VA
A.V. Gavrilenko, C. Zhang, and V.I. Gavrilenko, Norfolk State University

Pi-conjugated polymers with low bandgap are being developed and studied worldwide for their application as solar cell materials. 4H-Cyclopenta[2,1-b;3,4-b']dithiophene-4-one (PCDTO)-based polymers (insoluble) have been reportedly synthesized using electrochemical oxidation and were shown to have very low bandgaps (1.2eV). The alkyl group substituted PCPTDO using multistep chemical synthesis was recently done, and from that good solubility allows the ability to fully characterize the chemical structure. Optical and electrochemical characterization of the polymer indicates that the polymer has a bandgap much higher than what was reported.

First, principles quantum physics modeling of the ground state, electron energy structure, and optical properties of the polymer has been performed. Monomer, dimer, and polymer levels are modeled. Now Development of materials from monomer to dimer and polymer results will indicate a predicted spectral red shift at absorption that was confirmed experimentally. Mechanisms of the optical spectra modifications of CPDTO studied in this work are discussed.

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An Accessible Java Interface to Quantitative Microbial Dose Response Risk Assessment Modeling in R
Crystal Ann Moreno, University of Washington

Quantitative Microbial Risk Assessment (QMRA) is the study of the relationship between microbial exposure and the likelihood of infection. Dose response models attempt to determine, as a function of dose, the probability an individual will become infected. To represent the probability of infection, we use a cumulative distribution function (CDF). A CDF is a monotonically increasing function that ranges from zero to one.

The objective is to determine the parameters for each potential CDF. To estimate those parameters we are using the Maximum
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Likelihood Estimation method. In addition, we are testing alternative methods by comparing our parameters estimates for the Beta-Poisson distribution of a rotavirus dataset against those computed in the Excel package Solver. Soon we hope to include a goodness of fit test for each candidate CDF, allowing the user to choose the most appropriate CDF for his or her data.

The purpose of our research is twofold. First, to migrate the Excel-based Solver solution of Charles Haas to R, and second, to develop a graphical user interface (GUI) to our R solution that greatly automates the modeling process while maintaining its integrity. Microsoft Excel is a closed source application with no way to verify the integrity of its results. In contrast, R is a free software environment for statistical computing, specifically designed to perform statistical modeling, with the peer review that comes along with an open source project. To make the use of R convenient, as well as powerful, we are developing a Java-based GUI to R optimized for a dose response modeling workflow. [Funded by the National Institute of Health (HG02360-10)]

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Boolean Algebra & If Statements: Tic-Tac-Toe Game(C#)

Matthew Simmons, Savannah State University, GA

Tic-Tac-Toe is a fairly simple game that has been around for centuries and will probably never be forgotten. It is usually a pencil paper game for two players who take turns marking the spaces on a 3x3 grid. When put into a computer program the game becomes a complex language coding process. The process involves strenuous problems of how to connect the 3x3 grid and make the program correspond with the rules of the Tic-Tac-Toe game.

In this research project, I used C-sharp programming language to create a Tic-Tac-Toe game. C-sharp is a high level programming language that is very versatile and similar to Java, Visual Basics, C++ and others. The program will perform the procedures of the Tic-tac-Toe game in real time. Player one picks “x” and the other “o” and if there is no winner the game ends in a draw. The program will be coded using a complex design of If statements and Boolean algebra. The form in the program will be a 3x3 board with a restart button. The end result of the computer program will be to play against another player and strategize a way to win or draw.

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Toward Creating Abstract Art Using Mobile Robots

Christina Sparks, Spelman College, GA

Enabling robots to create works of art based on music, or other audio inputs, aims to bridge the gap between the arts and sciences. Steps have been taken to incorporate science in the fine arts in other respects, such as in Georgia Tech’s music technology program, run by Gil Weinberg, where a robot is able to interact with humans to create improvised music. Last year, research began on the medium of sound to determine its viability as an input and this year will continue into studying the audio interpretation abilities of a robot.

However, this project will focus on programming a robot to recognize the basic elements of music and respond with pre-determined movements or actions. Once this has been established, the input will be expanded until the robot is able to interpret larger sections of music and respond accordingly. As the length and complexity of the musical selection increases, the robot will have to respond to not only the basic notes of scales, but also the patterns they make. The manner in which the robot reacts and the tools it is equipped with is to create a work of art based on the source of input. In the end, the robot will “perform” to a musical selection to determine the progress at each stage. The goal of this research is to create a working input system that will allow a robot to receive, analyze, and respond to certain patterns in music.

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Detonation Shock Dynamics (DSD)

Kendra Thompson, Mississippi Valley State University, Los Alamos National Laboratory

Detonation Shock Dynamics (DSD) and xRage (high explosive hydro code) were used to create test problems in the hopes of finding difficult geometries and bugs in code. The test problems were mainly to show the different effects DSD and xRage could have on certain geometries. The objective of this project is to find an impossible geometry that DSD can not accomplish or bugs in either code.

DSD is very geometry dependent and is commonly known to have problems with sharp corner geometries. DSD can only deal with sharp corners to a certain extent. Where sharp corners are normally an issue is actually in xRage and other Eulerian hydrocodes. Thus, DSD’s interpretation of the problem geometry depends on material interface reconstruction in Eulerian hydrocodes, including xRage, which often results in poor representation of sharp corners. The following steps were used to create different geometries to test the DSD model and xRage. For this large massively parallel to run DSD, it is a multi-step process:

- Run xRage for 1 cycle (produces an interface file)
- Run DSD (produces a burntime table)
- Run xRage to finish the problem and burn the HE

An analysis of data resulted in the following information. There was a setup from OSO (3-D interface) and output from xRage before DSD is run. The OSO setup and the output from xRage are totally different; this produced a problem because they should be similar. Also, we found that simple mistakes in the input file caused the DSD driver to produce strange error
messages (error 15). During the shape charge test, we found a bug in xRage, a gap in interface program, which created problems for DSD.

In conclusion, our goal of breaking and testing DSD was a success! We found issues with DSD, xRage, and general setup tools. Bug fixes have already been put into the code and are being used by the user community. There is much that can be done to improve this research. A few questions have been brought to attention: Why DSD or Eulerian codes have problems with sharp corner geometries? What improvements can be made to modify error messages; in order to tell code users more about the specific error in the code? [This study was supported, in part, by Los Alamos National Laboratory; awarded to Kendra Thompson, Mississippi Valley State University, HBCU-UP University, Itta Bena, MS.]

167 The Use of Social Networking to Aid in the Prevention of Obesity

Anissa Watkins, Talladega College, AL

Users of social networking sites can share information and communicate with one another. Social networks are very popular among teens and college students worldwide. Despite the rising popularity of social networking sites such as Facebook, the awareness of healthcare issues, including obesity, have not been highly discussed on Facebook.

There is a rising epidemic of obesity among young adults including college students in the United States. Due to the increase of obesity in young children and teens, the popularity of Facebook can be used to make this group more aware of this growing epidemic. Facebook has the potential to be utilized as a prevention tool.

The main objective of this research was to organize a group of students, known as “Young Adults Social Networking to Aid in the Prevention of Obesity,” to interact through Facebook to reduce the number of obese students at Talladega College. Feedback will be collected through a survey. Preliminary data from a pilot survey showed Facebook can be an effective educational tool to promote the awareness of obesity. The pilot survey showed that there is a need to promote obesity awareness in educational settings. This can be accomplished by actively engaging participants in dialog through Facebook which will help decrease obesity among young adults. [This study was supported by NSF/HBCU-UP Grant # 0811157.]

168 Computer Sciences & Information Management Using Model Railroading to Teach Real-time Control Systems

Basil Williams Jr, University of the Virgin Islands
Dr. Steven Case, University of the Virgin Islands

When teaching computer programming and computer architecture, most universities’ curriculum focus on preparing students for careers in developing desktop and web-based business applications. With nearly 99.5% of all processors installed in embedded systems, there is a great need for additional curriculum related to the development of embedded systems (McCormick, 2007).

At the University of Northern Iowa, students learn the details of embedded systems development by programming real-time control systems for a model railroad. This research investigates the viability of adapting the laboratory and instructional techniques used at the University of Northern Iowa, in order to enhance the computer science and engineering curriculum at the University of the Virgin Islands.

The software tools will be migrated from Ada to Java, the hardware will be migrated from HO-scale to N-scale, and the control systems will be migrated from analog-based to digital-based. These modifications are necessary in order to address the constraints and requirements that are unique to the University of the Virgin Islands. This migration of tools and techniques will enable development of a class at the University of the Virgin Islands that will better prepare students with an interest in Computer Science and Engineering for future work in real-time control systems. [This work is funded by NSF HBCU-UP Grant number HRD-0506096.] (References: McCormick, John W. (2007) “Model Railroading and Computer Fundamentals”, Computer Science Education, 17:2, 129-139.)

169 An Efficient Tabu Search-based Algorithm for Solving the Airport Gate Assignment Problem

Troi Williams, University of the Virgin Islands, US Virgin Islands

From the year 2000, through the year 2008, there has been an approximate 10.3% growth in the number of passengers flying around the world (733,850,823 in 2000 and 809,427,646 in 2008). As a result, airport administrators are continually searching for faster and more efficient ways to assign gates to incoming aircraft using solutions from various algorithms and mathematical models.

This research is a continuation of my initial research, during the 2009 and 2010 academic year, and it explores a solution based on the popular Tabu Search Algorithm. It has been implemented in Java, using the Cyril E. King Airport, U.S. Virgin Islands as a model with three specific constraints. Each flight must be assigned to: 1) a general boarding gate, 2) the first available gate or, if none are available, the gate with the least waiting time, and 3) a gate large enough to accommodate it.

Presently, twenty experiments have been conducted using scheduled flight data from 2009 and 2010 timetables. The flight data includes 205 scenarios (the amount of hours of
In each experiment, it took [the program] an average of 25 milliseconds to assign the optimal gate to each flight with minimal to no delay on an Intel Core Duo U7300 (1.3GHz) CPU. The results continue to show that with the increase of the amount of flights, there will also be an increase in the program’s running time by n, or linearly.

In the future, I will implement a luggage distribution system that will determine which baggage belt handles a flight’s luggage and analyze the algorithm’s complexity using the big O notation. I will also examine its performance against a swarm intelligence implementation, as I expand and test the program with other (larger) airports. In addition, this will also assist me in calculating and predicting the amount of time it will take to assign s aircraft to k gates, with c constraints, where all three variables are any finite number. [This study was supported, in part, by NSF HBCU-UP grant number HRD 0506096.]

ECOLOGY, ENVIRONMENTAL & EARTH SCIENCES

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Effects of Entomopathogenic Fungi on the Behavior of Ixodes Scapularis Nymphs

Brian Bell, Fort Valley State University, GA
Thomas J. Daniels, Amy Tuininga, and Richard C. Falco, Fordham University, NY

Lyme disease is the most important vector-borne illness transmitted to humans. States in the northeast have the highest number of cases due to the prevalence of Ixodes scapularis, the blacklegged tick that vectors Borrelia burgdorferi, the bacterium that causes the disease. Environmental concerns about the application of chemicals have led to greater interest in biocontrol approaches, most notably the use of entomopathogenic fungi.

Previous studies have demonstrated the virulence of these fungi in the lab and in limited field trials but little is known about the effects they have on tick behavior prior to the vector dying from infection. Fungi collected from soil samples and ticks (nymphal stage) located on the grounds of the Calder Center were used in three bioassays testing the sublethal effects the fungi might have on the behavior of I. scapularis. Cultures of three entomopathogenic fungi, Metarhizium anisopliae, Penicillium soppii, and Hypocre a lixii, were used to create high and low concentrations of each species that could be applied to ticks.

The first assay tested the effect that each fungal culture would have on the morality rate of I. scapularis nymphs over a two week period. Application of M. anisopliae resulted in a 60% mortality rate and was the only fungal culture that was statistically different from the control group.

The second assay assessed how the fungal cultures would affect the host-seeking (questing) behavior of the nymphs. All treated nymphs showed a decline in host-seeking behavior compared to that of untreated controls.

The final assay focused on finding host-seeking rates diverged between treated and untreated ticks within a two week test period. By 12 days post-infection, both M. anisopliae and H. lixii-treated ticks showed significantly less host-seeking behavior than controls; even those species/concentration combinations of fungi that did not result in significant reductions in host-seeking by nymphs, compared to controls, did exhibit less host-seeking behavior. These data indicate that sub-lethal effects of infection occur in I. scapularis nymphs and that no nymph treated with these three species of fungi is immune from negative effects. [This research was supported, in part, by a grant from NSF HBCU-UP (#HRD-0625289) awarded to Sarwan Dhir, PhD, Director for the Center for Biotechnology, Fort Valley State University, Fort Valley, GA 31030.]

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The Black Long-spined Sea Urchin Diadema antillarum Expresses Preference for Bare Rock

Eugene Brooks Jr, University of the Virgin Islands, St Thomas VI

The black long-spined sea urchin, Diadema antillarum, is a herbivorous marine invertebrate which resides on coral reefs throughout the Caribbean Sea and Atlantic Ocean. This keystone herbivore holds a vital role in preserving a coral dominated reef. This was demonstrated when a massive die-off of this species, in the early 1980’s, resulted in a phase shift to algal dominated reefs. D. antillarum densities remain low and algal domination persists. Understanding what factors prevent flourishing numbers of D. antillarum requires knowledge of habitat preferences. The hypothesis was that adult Diadema antillarum prefer bare substrate, as opposed to substrate covered with the brown alga, Dictyota or crustose coralline red algae. A two-part study was developed. First, urchin densities were estimated at two areas of Brewers Bay, St. Thomas, US Virgin Islands. Forty 30 m transects were used, with 10 randomly chosen quadrats for each transect. Diadema had a clumped distribution and areas with high densities of urchins had little or no brown algae. And conversely, areas with high biomass of Dictyota had few or no urchins.

In the lab, preference experiments were performed in sea water tables. Bare rocks, rocks with crustose coralline algae, and rocks with Dictyota, were used to test urchin preference. Lab experiments revealed that D. antillarum has no preference in
substrate when given the choice between substrate covered in crustose coralline algae and bare rock, p=0.27 or substrate covered with Dictyota vs. crustose coralline algae, p = 0.06. However, D. antillarum showed a significant preference for bare rock when compared with Dictyota, p=0.001. This suggests Diadema may avoid areas of high algal cover in the field.

172 Establishing a Baseline of Water Quality in Response to the DWH Oil Spill
TeAirra M. Brown, Norfolk State University, VA

Deepwater Horizon (DWH) was an ultra-deepwater, semi-submersible, offshore drilling oil rig used for oil exploration and production purposes. The oil rig was owned by Transocean and was under contract to British Petroleum (BP). On April 20, 2010, the Deepwater Horizon had a wellhead blowout which caused an oil spill in the Gulf of Mexico. This incident caused a total of eleven deaths and injured seventeen of the workers. The Deepwater Horizon blowout is the largest oil spill in U. S. history.

The Deepwater Horizon was located north of the Gulf Stream Loop Current, which is a warm ocean current that begins its path within the Gulf of Mexico. The Loop Current flows northward between Cuba and the Yucatan Peninsula, eventually curving east and south along Florida’s coast and exiting through the Straits of Florida. The Gulf Stream then follows the coastlines of the United States and Newfoundland before crossing the Atlantic Ocean. These currents have the potential to bring oil from this spill to the Outer Banks of North Carolina.

This project sought to establish a baseline on a range of data correlating to water composition along the Outer Banks of North Carolina from Ocracoke Inlet to Corolla with concentrated sampling from Ocracoke Inlet to Cape Hatteras. Refined oil, which was used as a control, was added to a sample to illustrate that the conductivity readings drop considerably in the presence of oil. Results show that the spectral fluorescence data was the main indicator of determining the presence of crude oil in water samples and the origin of that oil. The tests results for this project did not reveal any unexpected readings. The data obtained predates any appearance of oil from the Deepwater Horizon oil spill on the outer banks of North Carolina.

Establishing scientific baselines in the face of impending changes in the environment is essential to the further monitoring, research, and recommendation of changes that can be made. To establish a stronger baseline, the sedimentary layers, as well as, the organisms and microorganisms present in the sample locations should also be tested. The compilation of data will allow researchers to analyze variations between the baseline and future data collected. [This research was funded under the National Science Foundation and the Office of Navy Research.]

173 Plant Regeneration and Genetic Transformation of Stevia rebudiana Using Particle Bombardment
Porscha N. Bumpus and Sarwan Dhir, Fort Valley State University, GA

Stevia rebudiana is a perennial shrub which originated in the forest of Brazil and Paraguay. Stevia is known to be a no calorie sweetener. It is 30 times sweeter than sugar and up to 300 times sweeter than sucrose. The objectives of this study were to introduce the GUS and or GFP as a reporter gene in Stevia to evaluate transient and stable expression over time after microprojectile bombardment.

Leaf segments and embryogenic calli were bombarded with 1.0 μM gold particle coated with a plasmid DNA vector containing GUS or GFP reporter gene fused to 355 constitutive gene promoter at various levels of acceleration pressure (450-1800 psi). An average of 10 to 12% leaf segments and young embryogenic callus tissue expressed transient GUS or GFP gene expression at 1100 psi with a 6 cm distance from stopping screen to target tissue using gold particles. Leaf and embryogenic tissues bombarded with GUS or GFP gene were sub-cultured on embryo induction medium. Embryos at various developmental stages (globular, heart and torpedo shaped) expressing GUS or GFP genes are being recovered.

The tissues were then placed on selection media: MS medium with B5 vitamins, 30 grams sucrose, 1.5 ml 2,4-D and 1.0 ml TDZ, and Selection antibiotic (Kanomycin 50: 1.0 ml/1000 ml, Spectinomycin 100: 1.0ml/1000ml & Spectinomycin 250: 3 ml/1000ml). Experiments on natural sensitivity and selection of transformed tissue under selective agents and PCR analysis of transgenic material will be presented.

As a result, we saw that we had stable and transient transformation of the PSU GUS gene in Stevia rebudiana. [This research was supported, in part, by a grant from the National Science Foundation (NSF GUS gene) awarded to Sarwan Dhir, Ph.D., Director for the Center for Biotechnology, Fort Valley State University, Fort Valley, GA 31030.]

174 Cloudiness and Water Vapor Trends over the Caribbean
Alma Cabral Reynoso, New York City College of Technology

Using the International Satellite Cloud Climatology Project (ISCCP) D2 datasets for the period of 1983-2008, the Cloud Amount and Water Vapor Content variables information was extracted. The information obtained was used to gain a better understanding of the changes in Water Vapor content and Cloudiness over the Caribbean region for the twenty-five year period. The monthly and yearly mean percentage Cloud
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Amounts and Water Vapor content were plotted. Trends in annual means and seasonal values were found.

Our aim is to help find trends in Cloudiness and Water vapor for the island of La Hispaniola, specifically for the region of the Enriquillo Lake, that may help explain the rapid growth of this lake in the last few years.

In addition to this, we might therefore be able to explain the growth of the Lake Saumatre (Azuei), located in Haiti, assuming that this is due to the same reason for both neighboring lakes. Based on the results obtained so far we could say that a relationship has not been found between cloudiness and water vapor to the growth of the lakes. However, since this is an ongoing research the results are preliminary and should for now be interpreted with caution since uncertainty exists about the used grid cells. Getting a higher resolution dataset in the near future will help us better determine if such relationship exists between the observed variables and the changes seen in the area of the Enriquillo Lake in the island of La Hispaniola. [This study is supported by the National Science Foundation under Grant No. ATM - 0755686.]

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Remediation of Hexavalent Chromium Using High Concentration of Molasses and Ethanol

Shanquette Chance, Paine College, GA
Priyanka Yarlagadda, Bibekananda Mohanty, C. P. Abubucker, and C. R. Nair, Paine College

Indiscriminate industrial disposal of Cr-VI has been identified as a serious threat for environmental health. Chromium toxicity is a function of its oxidation state and hexavalent chromium(Cr-VI) is known to be both carcinogenic and teratogenic while trivalent chromium is an essential trace element nutrient. Reduction of Cr-VI to Cr-III is an important strategy to mitigate chromium toxicity in the environment.

Although both biotic and abiotic factors influence the remediation of Cr-VI, there is insufficient amount of data on the biotic remediation Cr-VI by organic materials such as molasses and ethanol. Ethanol is known to act as a reducing agent to change the oxidation state of chromium during its disposal, contributing electrons for Cr-VI to reduce to Cr-III. It was hypothesized that newly formed ethanol during the fermentation of molasses over a period of time may function as a potential abiotic remediation agent for the Cr-VI contaminated water and soil.

This study focused on the comparative effects of molasses and ethanol on the remediation of Cr-VI in water. Two sets of experiments were conducted to assess the feasibility of such processes. The first set of experiments included the use of different levels of molasses in water (from 0.5g% to 1.2g %,w/v) in the remediation of contaminated water containing Cr-VI (0.20 mg%,w/v). The second set of experiments included varying amounts of ethanol (6.7g% to 67g %,w/v) on Cr-VI contaminated water (0.2mg%,w/v). The results of the study indicated that molasses in water (1.22g%, w/v) can reduce Cr-VI completely within 48 hours. It is not clear to what extent this process is facilitated by the de novo generation of ethanol from molasses by fermentation process contributing to the reduction of Cr-VI to Cr-III. The studies with ethanol indicated the time required for hexavalent chromium reduction was decreased by 50% due to faster redox processes with ethanol, accomplishing faster chromium remediation, compared to that found in molasses experiments. [This study was supported by a grant from D.O.E awarded to Paine College, Augusta, GA for bioremediation research on chromium.]

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Developing an In Situ Remediation Technique for Mercury Contaminated Soils

Janique Cheesman, Syracuse University, NY
Paul Kalb and Lawrence Milian, Brookhaven National Laboratory, NY

Historically, metal mercury (Hg) was widely used for multiple industrial applications, such as the mining of gold and silver and the production of chlorine. However, the negative and sometimes fatal health effects that resulted from exposure, e.g., chest pains, shortness of breath, impaired pulmonary and central nervous system functions, have caused the use of mercury in industry to be sharply reduced.

These effects have necessitated the remediation of mercury waste in soil. While Hg vapor pressure is relatively low because it is a liquid at room temperature, it is higher than most metals. It also reacts readily with sulfur to form mercuric sulfide which is its more stable form. These properties were used to adapt a potential treatment method for contaminated areas that could be done with limited disturbance to the soil.

To test the efficiency of mercury uptake by sulfur, an energy dispersive x-ray fluorescence instrument was used to analyze Hg sand samples that were taken from a closed 24.5 cm diameter x 24.5 cm length glass bell jar that initially contained a sulfur treatment rod in the middle of a homogenous mixture of Hg and sand. The extracted samples were taken at various points on the surface of the system and at different depths. After a few weeks, the sand closer to the treatment rod was higher in Hg than the outer region. An average of 209.4 counts per gram of Hg was present near the treatment rod versus 42.9 counts per gram of Hg near the jar wall. This suggests that the Hg was being drawn inward by the sulfur treatment rod.
However, after several months, when equilibrium was apparently reached, the sand closer to the treatment rod had the lowest Hg concentrations and the sand furthest from the treatment rod had the highest. An average of 29.4 cps/g was present near the treatment rod versus 133.3 cps/g near the bell jar wall, implying that sand further away from the treatment rod was not affected as significantly as sand closer to the treatment rod.

This project is part of an ongoing course of action to develop an in situ treatment technique for mercury in soil. Further work will be done to determine how other conditions such as temperature and distance would optimize uptake of mercury and to gauge the sphere of influence of the treatment rod. [Special thanks are given to Syracuse University, the United States Department of Energy, and Brookhaven National Lab for funding and coordinating the summer undergraduate laboratory internship program.]

177 Proteomics of the Euprymna Scolopes / Vibrio Fischeri Symbiosis

Shakeisha Coleman, Wiley College, TX

Terrestrial and aquatic animals all form symbioses with specific bacteria. The symbiosis between the Hawaiian Bobtail squid (Euprymna scolope) and its bacterial component (Vibrio fischeri) is studied to understand host/microbe interactions. E. scolopes provides V. fischeri with a protected environment promoting growth of the symbiont. V. fischeri is a Gram-negative, rod-shaped, bioluminescent bacterium that provides the host with a defense mechanism known as counter-illumination allowing the squid to camouflage itself while hunting at night. V. fischeri colonizes the host tissue known as a light organ within hours after hatching and remains for the host’s lifetime. During colonization, the host and symbiont must ensure specificity while excluding other non-symbiotic bacteria from the light organ. Preliminary data suggests that proteins expressed on the surface of V. fischeri may be involved in mediating this specificity.

This study attempted to characterize the surface proteome of V. fischeri to understand potential factors involved with ensuring host/symbiont specificity. Vibrio fischeri ES114 was grown in a Salt Water Tryptone (SWT) medium at 28°C. 1-4 L of SWT inoculated with V. fischeri was grown to an optical density (OD) of 0.7 to 1.0, in preparation of tryptic digest. Bacterial cells were harvested by centrifugation. One unit of trypsin was added to 2 x 10^7 cells. The digest was incubated at room temperature for 30 mins.

Through centrifugation the digested peptides were collected with 3 kD or 10 kD Amicon filters and protease inhibitor were added according to the protocol. Protein concentration was determined with a Bradford Assay. 80 to 100 µg of soluble protein in Laemmli sample buffer was loaded onto either a Criterion Mini Protein TGX 4-15% Gel or a Criterion PreCast TGX 12% Gel. Electrophoresis was completed with a Bio-Rad Criterion Cell or Bio-Rad Mini Protein Tetra Cell at 200 volts for 50 minutes or 30 minutes respectively. Proteins were visualized with Coomassie R250 staining. SDS-PAGE shows a variety of proteins isolated from the tryptic digest of the cell surface of Vibrio fischeri ES114. Results allowed for comparisons of surface proteins from the non-symbiotic bacterium Vibrio harveyi with ES114. In further studies, we will identify the different proteins present between the two using liquid chromatography-mass spectrometry. [Special thanks to the National Science Foundation Grant DBI #1005018, and the Schwenk Fund.]

178 Vanadium and Nickel in Deepwater Horizon Crude Oil

Daniel Duarte, University of New Orleans, LA

Amitava Roy and J. Bennett Johnston, Sr., Center for Advanced Microstructures and Devices, Louisiana State University

With the explosion on the Deepwater Horizon Rig on April 20, 2010 in the Gulf of Mexico, a huge oil spill started that lasted till August 15, 2010. Some 4.4 million barrels (185 million gallons) of crude oil gushed out of the Macondo 252 well.

Crude oil commonly contains heavy metals such as vanadium, nickel, chromium, cadmium, and lead. Vanadium and nickel are usually in highest concentrations. Concentrations as high as 1600 parts per million (ppm) have been recorded for vanadium in crude oil. The nickel concentration is generally less than that of vanadium. These metals are known to be toxic at certain concentrations. The toxicity of an element depends on the chemical form (speciation) of the element, however, rather than its total concentration. Are vanadium and nickel released to the atmosphere during the burning of crude oil? Will they leach out once the tar balls wash ashore? It is important to determine the speciation of these two elements in Deepwater Horizon crude oil.

Vanadium and nickel in crude oil samples from four locations were measured by synchrotron X-ray fluorescence spectrometry (XRF) and X-ray absorption spectroscopy (XAS). The samples were: a) fresh crude oil from the riser pipe; b) oil subjected to controlled burn; c) oil from near Venice, Louisiana; and d) emulsified oil.

Semi-quantitative X-ray fluorescence analysis of the oil samples suggested less than 50 ppm of vanadium and nickel in the oil samples. The speciation of nickel was that of porphyrin in all samples except that of the emulsified crude oil. Vanadium also showed a slight change in oxidation state upon emulsification. [The research was supported by LSU Ronald E. McNair Program.]
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Exploring the Utility of Two Plastid Markers for Determining Phylogenetic Relationships and Species Identification

Loubna Elhelu, University of the District of Columbia

Historically, dichotomous keys were the only tools available for species identification. These keys are often based on reproductive characters making identification of sterile specimens nearly impossible. Dichotomous keys are arduous and difficult for non-scientists to utilize. Molecular systematists are employing an alternative method for species identification. DNA barcoding is a technique used to characterize species using variable regions of the DNA. These sequences are very short, usually 100-500 base pairs, and can be obtained rapidly and at a reasonable cost.

The focus of this study is to ascertain the utility of two barcode regions in identifying the local campus flora. We hypothesize that using two plastid genes (1) ribulose-bisphosphate carboxylase gene (rbcL), and (2) psbA-trnH will delineate species on the campus of the University of the District of Columbia. The rbcL and psbA-trnH chloroplast genes are popular tools for plant population genetics and species level phylogenetics and have been proposed as suitable genes for DNA barcoding studies. DNA extractions were performed with the Qiagen Dneasy Plant Mini Kit and protocol after disrupting the leaf tissue.

The target genes were then amplified and purified. Cycle sequencing was performed using the Big Dye Terminator chemistry and products were run on an ABI 3130 automated sequencer (Applied Biosystems). Sequences were verified, and edited using Geneious (version 5.0). Alignments were done in BioEdit and imported into phylogenetic program Paup*. Preliminary results of the total evidence strict consensus analyses show that the two barcoding genes, rbcL and psbA-trnH have enough species-level variation to be used in species identification. Future research will include surveying all plants on the campus, including sterile specimens, to verify the utility of these two barcoding genes. [This study was supported by the University of the District of Columbia’s STEM program in providing stipend for the principal investigator and the actual research was funded by SI-BDG and fellowship grants.]

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Increasing Breeding Behaviors in a Captive Flock of American Flamingos

Jamelia L. Frink, Fort Valley State University, GA
J. Alan Clark, Fordham University, NY

In previous studies, acoustic enrichment proved successful in increasing reproductive success in small groups of both captive and wild flocks of colonial birds. The goal of this particular project was to increase reproductive success in a small, captive flock of American flamingos (Phoenicopterus ruber) at the Bronx Zoo in New York City.

We hypothesized that acoustic enrichment, in the form of nonspecific breeding call playbacks, would increase reproductive success in this flock, as measured by increased breeding behaviors, earlier egg-laying, and increased production of eggs. To test this hypothesis, we conducted a series of playback experiments using six sets of calls collected from sound libraries and from recordings of the Bronx Zoo American flamingo flock itself. Through review of the literature and personal observation, we developed a list of 11 breeding behaviors specific to American flamingos to track prior to and during each 30-minute playback. We then used the resulting data to create a unitary breeding behavior score using principle component analysis to compare behavioral responses to the different playback call types. Flamingos did increase breeding behaviors in response to playbacks, particularly at the beginning of the breeding season. Different call types produced different behavioral responses.

Although no chicks were produced in 2010, mean egg-laying date was more than 18 days earlier than in 2009, and one pair laid a second egg, a first for this flock. Earlier egg-laying dates and relying should increase the opportunity for successful reproduction in this young captive flock of American flamingos. [This research was supported, in part, by a grant from NSF HBCU-UP (#HRD-0625289) awarded to Sarwan Dhir PhD, Director for the Center for Biotechnology, Fort Valley State University, Fort Valley, GA 31030.]

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Use of GIS to Display Correlation of Soil Vegetation Types at Las Vegas Wildlife Refuge

Antonio S. Garcia, New Mexico Highlands University,
Mary Shaw and Mike Petronis, New Mexico Highlands University

Geographic Information Systems (GIS) is a method for analyzing and displaying spatial information. The strength of GIS is its ability to create a base map and combine layers of information and using it to meet the objectives of the practitioner or scientist. Currently, work is being performed as part of an NMHU Geology Department class, which is investigating a correlation between soil types and plant growth at the Las Vegas National Wildlife Refuge. It is recognized that soils play a major role in plant growth.

Results of current work indicate a need for a specific research project that would address the following question: Can GIS create a map of layers that could be used to show a correlation between soil types and plant types? A grid sampling soil method will be used in this research project. The control of this study will be information from NRCS Web Soil Survey. Results of this research are inconclusive and require additional data collection
and analysis, so no conclusion can be stated at this time. However future research will identify the utility of GIS in determining the correlation between soil types and plant growth. [This study was funded party by The New Mexico Forest and Watershed Restoration Institute, Dr. Andy Eagen, Director, New Mexico Highlands University, Las Vegas, NM 87701.]

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The Effects of Physical and Chemical Water Quality Parameters on the Distribution of Aquatic Invertebrates within the Carmans River on Long Island, New York

Vicky Lynn Giese, California Polytechnic University
Timothy M. Green, Brookhaven National Laboratory, NY

The Carmans River is one of the few freshwater ecosystems located within central Suffolk County of Long Island, New York. Flowing from north to south, the first eight miles of the river consists of fresh water. The last two miles, the river becomes an estuary leading into the Great South Bay. The Carmans River gets its fresh water directly from groundwater outflow.

Although it is a suitable habitat for a variety of species, roadside run-off, fertilizers, septic systems, and groundwater contaminants all threaten to degrade its condition. Sensitive populations such as invertebrate species serve as indicators of biological integrity and can be useful for identifying problems in water quality. The intention of this investigation was to conduct a comprehensive assessment of invertebrate biodiversity and correlate invertebrate distributions with water quality within the Carmans River.

A variety of techniques were used to obtain data for evaluating the ecological integrity of the river. Water quality, water chemistry, and invertebrate distributions were utilized for two consecutive years to determine the stability and health of the ecosystem in 2008 and 2009. The physical and chemical variations in water quality were compared for six different locations and among three habitat types selected along the Carmans River. Water samples taken at each location were then tested in areas of varying water velocities.

A Yellow Spring Instrument (YSI) 650 MDS electronic water quality meter was used to measure the real-time water data for temperature, pH, dissolved oxygen, conductivity, and turbidity. Water samples were analyzed using a HACH Company Digital Titrator and colorimeter. Using a Surber sampler, aquatic invertebrate samples were collected, preserved, and then sorted and identified using a compound light microscope and taxonomic keys. Rapid bioassessment, another technique used to assess invertebrate diversity provided supplementary data needed to create a more accurate biodiversity index.

By comparing the data collected from each site, invertebrate distributions were correlated with environmental parameters. Annual variations were determined through a comparison of results from 2008 and 2009 data sets. The biodiversity was calculated for each site and habitat using the Shannon Index.

The results from this experiment showed that with movement downstream, the diversity of invertebrates increases with increasing habitat complexity, from an average diversity index of 1.03 to 1.93. The results from an ANOVA test showed, with 90% confidence, that the diversity between 2008 and 2009 data samples yielded the same result. There was no significant variation in nitrate, nitrite, or nitrogen/ammonia between sampling locations and, therefore, these are not contributing factors to changes in diversity. Upstream locations had lower dissolved oxygen levels, higher pH, and higher turbidity, explaining why the diversity of invertebrates increased downstream.

From our data, it can be concluded that upstream locations are more affected by runoff and other sources of contaminants than downstream locations. Using data from this investigation of the Carmans River, areas of concern can be targeted for future projects to improve water condition. [This study was supported by the U.S. Department of Energy, Office of Science, and in part by the Foundation for Ecological Research in the Northeast. Louis Stokes Alliance for Minority Participation at Cal Poly partially funded my internship.] [Research partners not presenting: Glen P. Bornhoff, SUNY Oneonta, NY and Mellissa J. Winslow, Clarkson University, NY]

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Validation of pathogenic viruses PMMoV, Adenovirus, and Picobirnavirus as viral indicators of fecal pollution (water quality) in the San Diego River and/or Sewage Treated water

Bridget Guiza, University of California, San Diego

Human fecal matter contains high concentrations of human viruses, such as Pepper Mild Mottle Viruses (PMMoV), Adenoviruses (AV), and Picobirnaviruses (PBV). Concern for public health is due to the risk of fecal-oral transmission of these pathogenic viruses. Here we examined the presence of these viral pathogens in the San Diego River (SDR), and raw sewage samples from the San Elijo Water Reclamation Facility (SEWRF).

The raw sewage was used to check for dsDNA viruses in the Adenovirus family. The SDR viral particles were split prior to isolation of genomic material to obtain RNA and DNA viruses from all three groups of pathogenic viruses. We used PCR, nested PCR, RT-PCR and gel electrophoresis to detect conserved genes. It was hypothesized that the Adenovirus was to be detected in all samples because of its prevalence in the environment.

This project focused on the presence of all three viruses in the San Diego River, near Ocean Beach, a recreational segment of the river. The Adenovirus was detected in both samples and the
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PMoVo and PBV were not detected. This method of detection can be used to verify the presence of human fecal viral indicators. Further research includes cloning the amplified products for further verification and ecological analysis. If these viruses prove to be good viral indicators of fecal pollution, water quality programs can implement new strategies for determining the efficiency of treatment methods.

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Overgrowth Interaction of Dictyota Pinnatifida Algae on Live and Dead Porites Porites Corals

Akacia Halliday, University of the Virgin Islands
Melissa Mathias, Angela Dikou, and Tyler Smith, University of the Virgin Islands

Corals today face stressors, which vary from overfishing to diseases and global warming, and which have in concert led to their decline. This decline has become an issue of concern to many scientists. Throughout the Virgin Islands, as well as other regions of the world, coral reefs are seemingly being replaced by algal reefs, prompting the question: Does algae overgrowth live or dead corals?1

Using preliminary data from the Territorial Coral Reef Monitoring Program, we found out that Dictyota spp. interacted most often with corals among all algal species encountered. Also, we noted that the Dictyota species made up 60% of all the interactions between the reef-building coral Porites porites and algae. Thus, we initiated a controlled and replicated experiment in shallow waters (ca 2m depth) of Brewer’s Bay, St Thomas Island, to examine the overgrowth effects of the allelopathic algae Dictyota pinnatifida on live and dead nubbins of P. porites. We employed three treatments: i) live P. porites in contact with D. pinnatifida (n=10); ii) dead P. porites in contact with D. pinnatifida (n=10); iii) live and dead P. porites without contact with D. pinnatifida (control; n=5). We hypothesized that the defense mechanism of P. porites, i.e. the production of a thick film of mucus, will be effective at preventing algal overgrowth of D. pinnatifida while its absence will allow overgrowth to occur quicker on the dead coral nubbins.

If we find that D. pinnatifida does not overgrow the nubbins of live P. porites, but overgrows the nubbins of dead P. porites, it can be safely concluded that D. pinnatifida is unable to overgrow P. porites without the help of external disturbances, which kill corals. If this is the case, then we can further conclude that algal reefs occur in areas where corals have already been killed by an external disturbance. From this, we can go on to further narrow down exactly what is causing the wide spread death of corals. [This research is funded by a 2010 Vi-EPScoR Incubator Grant # 203053, NSF HBCU-UP grant # HHD0506096, and Vi-EPScoR grant # 0814417.] (References: 1 Aronson RB, Precht WF (2006) Conservation, precaution, and Caribbean reefs. Coral Reefs 25: 441-450; 2 McCook LJ et al.


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Comparing the Abundance and Diversity of Toxic Freshwater Cyanobacteria in two Central California Coastal Lakes

Kevin Johnson, California State University Monterey Bay

Freshwater cyanobacteria harmful algal blooms (CHABs) threaten humans and other organisms with an array of potent toxins. The hepatotoxic microcystins are some of the most pervasive cyanotoxins and have been identified in freshwater and estuarine systems of the Monterey Bay Area. The spatial and temporal extent of toxic cyanobacteria and the factors controlling bloom formation, gene expression, and toxin production need further study.

This project utilizes the polymerase chain reaction (PCR) and enzyme linked immunosorboent assay (ELISA) combined with microscopy to study the abundance, diversity and potential toxicity of cyanobacteria in Pinto Lake (Watsonville, CA) and Loch Lomond Reservoir (Santa Cruz, CA). We hypothesize that Pinto Lake, a eutrophic shallow lake set in a current and historically rich agriculture-dominated watershed, will demonstrate higher overall abundance of cyanobacteria cells, higher abundance of cyanobacteria containing toxin genes and higher toxin levels. In contrast Loch Lomond, an oligotrophic reservoir set in an undeveloped, forested watershed will demonstrate lower overall cyanobacteria abundance, lower abundance of cyanobacteria containing toxin genes, and lower toxin levels. Preliminary data analysis confirms higher overall abundance, toxin gene presence, and toxin levels in Pinto Lake than observed in Loch Lomond.

This baseline data will support further study of the environmental causal factors controlling the proliferation of toxic CHABs. [This research was supported in part, by a grant from the USDA awarded to Dr. Marc LosHuertos, Ph.D., Assistant Professor in the Division of Science & Environmental Policy, CSU Monterey Bay, Seaside, CA 93955.]

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Monitoring the Natural Variability of Panicum Virgatum (Switchgrass)

Justice Mason, Fort Valley State University, GA
Nicole Labbé and Lindsay Kline, University of Tennessee

With more than half of the nations’ oil supply being imported from foreign countries, the United States is generating new methods and techniques for the use of biomass to minimize the amount of oil being imported into the U.S. One such strategy is the development of biorefineries, a facility that integrates
biomass conversion processes and equipment to produce fuels, power, and chemicals.

The purpose of this study was to determine the natural chemical variability of a renewable feedstock- Panicum Virgatum—commonly known as switchgrass. The switchgrass was grown on 40 farms around the biorefinery in Vonroe, TN, and we randomly selected 19 samples. We analyzed these samples with the NREL’s standard protocol, specifically for ash content, lignin content, glucose content, and total sugar content. This data gives an approximation of the chemical composition of the incoming feedstock-switchgrass going to the biorefinery. [This research was supported, in part, by a grant from NSF HBCU-UP (#HRD-0625289) awarded to Dr. Sarwon Dhir* Ph.D., Director for the Center for Biotechnology, Fort Valley State University, Fort Valley, GA 31030.]

187 The Potential Role of Silicon Dioxide as an Oxidizing Surface in Strong Sunlight: Studies on Mercury Behavior
Amora Mayo-Perez, John Jay College - City University of New York, New York, NY
As part of an ongoing multi-year study at the Blackrock Research Forest in Cornwall, NY we have identified an atypical response of mercury deposited to pure silicon dioxide sand surfaces in strong sunlight. Pure laboratory sand was pre-cleaned by baking the surface to 300°C and then placed outdoors under a transparent Teflon roof to study the dry deposition of mercury to this surface. Typically, mercury from natural surfaces demonstrates increased emission to the atmosphere in strong sunlight, with the response trending toward deposition after sunset (Carpi & Lindberg, 1998). Over a thirty-day period during March and April 2007, our sand surface displayed ten days of irregular flux patterns.

The study shows consistent negative fluxes until mid afternoon and positive fluxes from approximately sundown until midnight. The process is not fully understood. Negative fluxes are attributed to greater mercury concentrations in the environment compared to the surface of the sand. Positive fluxes are representative of mercury emissions from the surface of the sand compared to the surrounding mercury concentrations. The irregular flux patterns occur on ten separate days with corresponding trends at the same times-of-day. Data from The International Research Institute of Climate and Society, which monitors atmospheric trends in the Blackrock Forest, is being used to determine the association between barometric pressure, precipitation, temperature fluctuations, sunlight, and uncharacteristic mercury fluxes. [Funding for this project comes from U.S. Department of Education, Program for Research Initiatives for Science Majors, Louis Stokes Alliance for Minority Participation, and New York State Department of Education Collegiate Science and Technology Entry Program.]

188 Perfluorocarbon Tracer Permeation Study on Silicon Rubber, Urethane Elastomers and Polyester Resin
Justin McDowell, Tougaloo College, MS
Perfluorocarbon Tracers (PFTs) are non-toxic, non-flammable, chemically inert, clear liquids that do not occur in nature, but can be detected at extremely low concentrations. PFTs have been utilized to detect oil leaks, follow air movements, trace the flow of pollutants, detect the possible effects of terrorist attacks, and also measure the effectiveness of ventilation systems as well as other applications. PFTs are released by permeation, evaporation, and directly from a gas cylinder containing PFTs. The PFT being used in our research is Perfluoroiso-propylcyclohexane (i-PPCH).

Our research will focus on the permeation method, where the PFT is encapsulated in a polymer matrix. The polymer will serve as a permeable membrane allowing the PFT to be released at a slow and constant rate. This project will determine the optimal polymers to encapsulate the PFT by evaluating a silicone rubber, polyurethane, and a thermoset polyester.

Our hypothesis is that our hand-made polymers will create a higher quality membrane for the PFTs that will make the current glass vial membrane obsolete. We synthesized polyurethane, silicone rubber, and polyester films by mixing part A and part B of the polymers and using a drawbar to spread thin films evenly onto Teflon sheets. These polymers were cured at room temperature, then post cured at 60°C and 90°C respectively. The encapsulation of PFTs into polymers was carried out in small polyethylene cups using a high speed stirrer. Parts A and B were added to the cup along with a surfactant and mixed thoroughly, and then i-PPCH was added and the mixture was stirred vigorously. The mixture was then cured at room temperature.

For the films, as well as the encapsulated polymers, a control was used for a feasible comparison. Samples were cut from each of the PFT encapsulated polymers, one that was kept at room temperature and the other kept at 90°C. Permeation of i-PPCH was greatest from the silicone rubber, less from the polyurethane, and least from the polyester.

Future work will involve determining the maximum amount of PFTs that can be encapsulated into polymers. [This study was supported, in part, by a grant from The United States Department of Energy, The Louis Stokes Alliance for Minority Participation (LSAMP) in conjunction with Jackson State University, Jackson, MS 39217 and Tougaloo College, Tougaloo, MS 39174 awarded to John Heiser, Department of]
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Environmental Sciences, Brookhaven National Laboratory, Upton, NY 11973]

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Integration of Indigenous and Western Scientific Knowledge Systems in Fishery Management

Kim Morishige, University of Hawaii at Hilo
Nakoa Goo, Eva Farah, and Makani Gregg, University of Hawaii at Hilo
Pelika Bertelmann, University of Hawaii at Hilo, Kehaloha Scholars STEM Program

Integrating indigenous and western scientific knowledge systems is becoming more prevalent as we move into an era supporting diversity. Utilizing both knowledge systems creates a firm foundation in truly understanding various ecological systems, which will contribute to the better protection of our natural environment.

Kiholo Bay, located on the Kona coast of the Big Island of Hawaii, is a unique marine ecosystem, distinguished by its rich cultural history and its considerable amount of underground freshwater input. In response to high human use and limited enforcement of fishing regulations, community members are seeking to take action and develop a management plan for the areas of highest human use at the northern end of the bay.

This project primarily focuses on integrating both traditional and western management approaches to develop a long-term plan that will protect the integrity of marine ecosystems and guide future management of Kiholo Bay. This project serves as a model for an interdisciplinary approach to STEM. Both quantitative and qualitative data were collected during February to April of 2010. Various measurements of water quality and fish abundance were taken within the bay as well as the lagoon and fishpond adjacent to the bay. Temperature, pH, dissolved oxygen, and salinity data were recorded from 15 permanent points distributed along a spatial gradient moving offshore. Samples were taken from surface, middle, and bottom depths at each sampling location.

Fish belt transect surveys were conducted to assess relative abundance and species presence in Kiholo Bay, in addition to a random coral health assessment. Literature research and interviews discussing the traditional use of the bay, the history of human use, and background pertinent to the historical ecology of the marine environment. Continued research will include monitoring the bay in the Fall season in order to understand the scope of seasonal changes specific to this bay. [This project is supported by the Kehaloha STEM Scholars Program funded by NSF/ T-CUP grant Principal Investigator Dr. Sonia Juvik, NSF/ LSAMP grant Principal Investigator Dr. Dan Brown, Department of Education Principal Investigator Joshua Ka’akua.]

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Isotopic Values of Small Mammal Diets: A Comparison Between Remnant and Restored Prairies

Asia Murphy, North Carolina State University

Less than one percent of the tallgrass prairie ecosystem exists intact in Minnesota (Samson and Knopf 1194). Although there have been attempts to restore tallgrass prairie, the restored prairies are quite dissimilar to the remnant prairies in terms of plant diversity and plant and animal species composition. Prairie voles (Microtus ochrogaster), which are a species of special concern in Minnesota, can be found only in remnant prairies, where its numbers are declining. The sympatric meadow vole (Microtus pennsylvanicus) can be found only in the restored prairies.

This study was conducted to determine whether the two species inhabit the same niche in two different plant communities. We hypothesized that M. pennsylvanicus and M. ochrogaster would inhabit the same niche. We trapped for two months (June and July of 2010) and took hair samples from animals we caught. We then used stable isotope analysis to find the average 15N and 13C values and compared these values between species. We found that prairie type had no significant effect on the isotopic values of the trapped species and that the isotopic values for M. pennsylvanicus and M. ochrogaster did not significantly differ. M. pennsylvanicus and M. ochrogaster seem to occupy the same niche, thus giving credence to the idea that they inhabit different habitats because they will compete for food (Krebs 1977, Lin and Batzli 2001, and Getz et al. 2005). [We would like to thank the NSF for Grant #1004817 which made this project possible.]

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The Effects of Chilling on Tomato Flavor

Mia L. Nash, Fort Valley State University, GA
Denise Tieman and Harry Klee, University of Florida

Tomato flavor can affect product quality. The tomato flavor is largely influenced by the interaction of sugars (glucose and fructose), acids (citric and malic), and multiple volatile compounds. There are over 400 aroma volatiles in a tomato, but 30 are most important for tomato flavor. Tomatoes are often chilled in the supermarket or during shipping to extend shelf life. Chilling is believed to be bad for tomato flavor.

The purpose of this research experiment is to observe the effects of chilling tomatoes on tomato flavor. Methods used for this experiment were to harvest tomatoes from field, tomato sterilization, taste panel for the day of harvest tomatoes, chilling tomatoes at 45°F and control stored at 65°F for five days, taste panel for chilled and stored tomatoes. The biochemical methods were total soluble solids (*Brix), sugars and acids assays, and
volutives. Chilling had a positive or a negative effect on different varieties of tomatoes. Chilling had a negative effect on Chadwick Cherry and Super Sweet 100 Hybrid. Different volatiles were affected by chilling and some were not. Further research has to be conducted to confirm tomato varieties that are not negatively affected by chilling. [This research was supported, in part, by a grant from NSF HBCU-UP (#HRD-0625289) awarded to Sarwan Dhir PhD, Director for the Center for Biotechnology, Fort Valley State University, Fort Valley, GA 31030.]

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Lidar Observation to Improve Air Quality Forecasting Models
Ogheniroro Okrokoto, City University of New York
Chuen Meei gan, City University of New York

The need to characterize in a robust way Planetary Boundary Layer (PBL) Heights is crucial in air quality forecast and transport models. Incorrect determination of PBL heights can severely distort the surface level PM2.5 predictions crucial in determining whether New York City is in compliance. Air quality models in particular illustrate the close connection between thermodynamically based mixing layer heights and optical scattering which are particularly easy to identify with lidar. Therefore, it is useful to explore automated robust methods for PBL height retrieval from lidar data.

This presentation will focus on the determination of PBL height by using combination of 2D edge detection, Laplacian Transform and Wavelet Transform to better extract the boundary layer. In particular, we find that Wavelet techniques are more robust then 2D edge detection filter. Moreover, based on long term PBL layer height measurements from our lidar, we will compare these result against those obtained from the Weather Research and forecasting Model (WRF). Moreover, we find significant correlations between the WRF predictions and lidar measurements but WRF tends to significantly underestimate the measured values. Finally, we will discuss other approaches to measuring mixing heights directly and discuss their potential.

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A Toxicological Study of the Effects of Water from the Anacostia River Watershed on Dugesia tigrina.

Gideon Olatuyi, University of the District of Columbia
Rosie Sneed, PhD, DVM, Carolyn Cousin, PhD, Stephanie Graves, and Edith Alvarez, University of the District of Columbia

The Anacostia River is currently one of the most polluted rivers in the eastern United States. Efforts to restore the Anacostia River watershed to health will require various methods to monitor water quality. Biologically-based systems using freshwater invertebrates have been used to monitor the health of the watershed on various levels such as the measurement of pollutants in animal tissues and changes in species populations. Planaria are common members of the invertebrate fauna of freshwater ponds, lakes and streams of North America and tend to favor areas of low pollution. These members of the Phylum Platyhelminthes are well known for their ability to both reproduce asexually by binary fission and regenerate body parts lost to injury.

We hypothesize that by measuring the ability of Dugesia tigrina, a North American species, to both survive and regenerate lost tissues while being exposed to water samples collected from various locations in the Anacostia River watershed will provide a means of monitoring the biological health of the various tributaries of the Anacostia River. An established culture of D. tigrina is the source of all animals used in this study. Specimens measuring a minimum of one centimeter in length are cultured in either control medium or watershed water for a period of two weeks to test survivability. Surviving animals are transected through the region just posterior to the pharynx and the rates of regeneration of lost tissues measured. In our initial studies, there was no significant difference in rates of mortality between Planaria cultured in control media and those cultured in water obtained from the Anacostia River watershed over the two week conditioning period.

These results indicate that the water itself is not directly toxic to uninjured D. tigrina. These animals are being used in the next phase of the investigation to test the effects of the water collected from the Anacostia watershed on the capacity of D. tigrina to regenerate new tissues.

The presence of different rates of tissue regeneration between control and experimental groups could indicate the potential of Planaria to serve as a model system for screening water quality conditions that may have impacts on aquatic animal life. [This work was supported by the University of the District of Columbia and by the USDA by way of the Agricultural Experiment Station at the University of the District of Columbia.]

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Testing the ForTraCC Model for Short Term Forecasting of Cloud Movement and Life Cycle
Xiaoqian Pan, Department of Civil Engineering, CCNY
Robert Rabin and Yang Hong, The University of Oklahoma
Shayesteh Mahani, Assistant Professor, Department of Civil Engineering, CCNY

The purpose of this study is to compare ForTraCC model forecasts to observations of convective cloud systems and learn if the forecast of the mesoscale convective system (MCS) can be improved by including time trends of environmental variables. The study of the ForTraCC model is significant, because many well-known forecasting models do not have a good short term forecast, but ForTraCC does. In addition, researchers have only tested ForTraCC model for the South America and the south
central United States, but not for the northeastern United States.

ForTraCC stands for Forecasting and Tracking of Cloud Cluster, which was developed by Daniel Vila and his colleagues. It is an algorithm for tracking and forecasting the physical characteristics of mesoscale convective systems through its whole life cycle using the thermal channel at 10.8 m from the GOES geostationary satellite. This cloud cluster detection method bases on a threshold temperature (235 K). The ForTraCC technique uses GOES 12 collected data, acquired in 30 min time spacing, to produce extrapolation up to 120 min for life cycles.

Initial findings show that there is a strong correlation with the ForTraCC model with real time observations but more data, both historical and future, is needed to make a more confident judgement on the physical properties inherit in making this model more robust in all study regions.

The future work is to compare the results from ForTraCC model with the results from the Storm Tracker Analysis Tool and Archive. [This study is supported by the National Science Foundation under Grant No. ATM - 0755686. Any opinions, findings, conclusions or recommendations expressed in this work are those of the authors and do not necessarily reflect the views of the National Science Foundation. The authors would also like to thank NOAA-CREST for providing the opportunity and the expertise needed to conduct the study.]

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Challenging the Scientific Research Paradigm: Treating Traditional Medicinal Knowledge as an Independent Knowledge System

Pohai Patterson, Keaholaloa Scholars Program, University of Hawaii at Hilo

Indigenous knowledge is a “hot” topic these days as we, as a society, are forced to examine the way we have been living on this Earth in the face of unprecedented global climate change. We recognize today that indigenous people have an immense database of knowledge of natural resources; how to best utilize as well as conserve them. However, the process of recording and applying indigenous knowledge has been controversial across various scientific fields especially in the pharmaceutical realm where traditional medicinal knowledge of indigenous peoples is often exploited and misinterpreted.

Upon the discovery of awa, Piper methysticum, for example, pharmaceutical companies produced medicinal supplements in pill form based on indigenous use of this plant while in the process disregarding the same indigenous knowledge of preparation and safe usage of awa. Indigenous preparation of awa has a specific protocol that allows for awa to be consumed safely. This process here in Hawaii involves straining water through chewed awa roots while leaves and stems of the awa plant are not used. Overlooking this process, on the part of the pharmaceutical companies, resulted in the death of many people who suffered from liver complications.

Our research involves working with a respected Hawaiian community elder to document the traditional ecological knowledge that was passed on to him through his mother and uncles who were kupa or natives of Kalapana, Hawaii Island, Hawaii. Research sessions, conducted in Hawaiian language, were held weekly over a period of three months in which many different aspects of lau lapaau or traditional Hawaiian medicine were recorded including cultural protocol, methods of preparation, and application.

Through a holistic approach to our research, we argue that traditional medicinal knowledge systems are stand alone systems, as Western medicinal systems are, each with their own protocol to achieve optimal healing results. Prayer, gathering medicine, methods of application, and of discarding used medicine are all important parts of lau lapaau that are disregarded in the research process conducted by pharmaceutical companies. In the process, the medicinal supplements they produce can and have proven to be potentially harmful.

The recognition of traditional medicinal knowledge of indigenous peoples as independent and valuable knowledge systems is necessary as scientists and indigenous peoples move forward into the future recording and applying indigenous traditional knowledge in science today. [This project is supported by the Keaholaloa STEM Scholars Program funded by the NSF/T-CUP grant - Principal Investigator Dr. Sonia Juvik, NSF/LSAMP grant - Principal Investigator Dr. Dan Brown, Department of Education grant - Principal Investigator Joshua Kaakua.]

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Overgrowth Interaction of Dickeya pinnatifida Algae with Live and Dead Porites asteroides Coral

Kianna Phillip, University of the Virgin Islands, St Thomas USVI Charnele Burton, Angela Dikou, and Tyler Smith, University of the Virgin Islands, St Thomas USVI

Presently in the Caribbean, corals have succumbed to the over abundance and replacement of corals by algae on reefs (Jompa and McCook 2003). Scientists have come to the assumption that macroalgae are able to out compete reef corals although they are very few studies testing the nature of the interaction (Nugues and Bak 2006).

In the past, coral reef systems have flourished in low nutrient levels. Over time, this characteristic has changed and nutrient levels have increased highly due to human-induced pollution. With the increase in nutrient levels and other human-induced stressors, such as the increase in seawater temperature and overfishing, algal species, which thrive upon high nutrient
content, have become dominant on reef systems and coral reefs seem to have lost their resilience. Such replacement of corals by algae could have occurred either from direct competitive interaction or the death of coral followed by an increase in algae abundance. Thus, one can inquisitively state: Do algae possess mechanisms that cause coral mortality in order to take over or does algae take advantage of other factors, which may cause coral mortality for its own blooming to occur?

A controlled and replicated field experiment was conducted in shallow water (ca 2 m depth) at the MacLean Marine Science Center, University of the Virgin Islands, focusing on the coral species Porites astreoides and the algal species Dicytota pinnatifida, in an effort to determine whether algae overgrows coral when coral is dead or alive. Three treatments were used (a control and both dead and live P.astreoides with D.pinnatifida in close proximity) and three hypotheses were formulated.

Hypothesis one stated that overgrowth should occur faster on live rather than dead P.astreoides. Hypothesis two stated that overgrowth should occur in dead P.astreoides only. The null hypothesis stated that there should be no difference in overgrowth of D.pinnatifida over dead and live P.astreoides. Expectations were geared towards D.pinnatifida overgrowing both live and dead P.astreoides. If overgrowth occurs on the live P.astreoides faster than on the dead P.astreoides, then it can be deduced that D.pinnatifida possess mechanisms that are able to kill coral and take over. If there is in fact a difference in the ability of D.pinnatifida to overgrow live or dead P.astreoides and overgrowth occurs solely in the dead treatment, it can be deduced that P.astreoides possess defense mechanisms that work effectively against overgrowth by D.pinnatifida.


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SuperNet Topology Reconstruction: A Numerical Experiment Using Ensemble Network Simulation (ENS)
Charlie Ponder, III, Fort Valley State University, GA
Jonathan Arnold and Heinz-Bernd Schüttler, University of Georgia

Chemical reaction network models provide a powerful framework to integrate and summarize the information obtained about complex biological systems from a wide range of diverse experimental sources. The ensemble network simulation (ENS) Monte Carlo (MC) method has been developed to deal with this problem of incompletely, poorly constrained biological systems.

In this project, we tested ENS as a computational tool for the reconstruction of gene regulation network topologies from RNA time series data in a simple hypothetical regulatory system of 3 genes: qa-1F, qa-1S, and ncu3643. Synthetic RNA data was generated by adding noise to the kinetic rate equation solution of a “true net” with 3 protein→gene transcription activation links. ENS was performed with these RNA data as input, on a “supernet” containing all possible 9 activation links. A supernet ENS, for each RNA data set, generates a random sample of over 1000 parameter sets Θ which fit the data. From the Θ-sample, we predicted the MC mean activation reaction flux (integrated reaction rate) for each of the 9 activation reaction links. The supernet ENS successfully fits all the synthetic RNA input data.

The supernet therefore fits the RNA data without systematic errors and the ENS has exhausted all information contained within the data. At low RNA noise levels (0.71% SD), ENS means of activation fluxes correctly predict the 3 links present in the true net. For each gene, almost 100% of its total activation flux is concentrated in only one link, with the link IDs 1, 6 and 7 for qa-1F, qa-1S and ncu3643, respectively. These are precisely the only 3 activation links present in the true net. The true net topology is thus correctly reconstructed from the RNA data by the supernet ENS. However, at 7.1%-SD noise level, the ENS reconstruction fails.

Supernet ENS can in principle reconstruct gene regulatory network topologies from RNA time series data at sufficiently low noise levels. However, at realistic RNA noise levels seen in real experiments, with >10% noise SDS, additional improvements will be required for reliable reconstructions. Improvements of the method by including data from multiple network perturbation experiments and/or additional inclusion of protein time series data are suggested. [This research was supported, in part, by a grant from NSF HBCU-UP (#HRD-0625289) awarded to Dr. Sarwan Dhir* Ph.D., Director for the Center for Biotechnology, Fort Valley State University, Fort Valley, GA 31030.]

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Waikiki: Assessing the ‘Spouting Waters’ and Studying Its Effect on Benthic Communities
Kanoelani Steward, Kapiolani Community College, HI
Mackenzie Manning, Kapiolani Community College

Present day Waikiki, filled with luxurious hotels and sky-scraping condominiums, hides the cultural and natural history of what used to be a flourishing ecosystem that provided natural resources to a once thriving traditional Hawaiian community.
Abstracts

Natural streams used to flow from the mountains to the ocean to help nourish the land and sea. As a result of the transformation of Waikiki into a world-class vacation destination, most of these streams have been filled in and diverted. However, there is anecdotal evidence that suggests some flow may reach the ocean via submarine groundwater discharge (SGD) along the shoreline of Waikiki’s beaches.

This study sets out to discover sources of SGD in Waikiki in an effort to characterize their influence on adjacent benthic habitats. We hypothesize that these flows could significantly affect the benthic community of marine organisms and coral reefs that inhabit areas adjacent to SGD outflow.

In order to locate SGD along the shoreline, we will measure fluctuations in the salinity and temperature of the seawater during low tides along the shoreline. Upon locating an area of SGD, the adjacent benthic community will be characterized using point-intercept transect snorkel surveys to assess the substrate, coral, and algal composition of the area. Salinity and temperature measurements will also be recorded along the transect to measure the size of the area these flows may influence.

These data will be compared against data collected at a near by control site in Waikiki that is not influenced by SGD. We predict the two sites will differ in community composition and suggest that the influence of SGD is a factor in those differences.

Future research will include deploying settlement tiles to qualify and quantify the recruitment of benthic organisms to areas influenced by SGD. We hypothesize that the influence of SGD affects the recruitment of organisms in that area and translates to the differences we observe in community structure.

This research is significant because it connects the history of Waikiki with the present-day effects of these ever-flowing streams. It addresses the influence of these “spouting waters” to determine if it has a valuable or damaging impact to adjacent benthic communities. [This study was supported, in part by, the National Science Foundation: Experimental Program to Stimulate Competitive Research (EPSCoR) and Tribal Colleges and Universities Program (TCUP).]

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The Purification of Lipid Biomarkers through RP-HPLC and Its Application to Paleoclimate Research

Kyle Thomas, Texas Southern University
Alyssa Atwood, Ines Muegler, and Julian Sachs, University of Washington

The Purification of Lipid Biomarkers through RP-HPLC and Its Application to Paleoclimate Research. This work was a contribution to the development of research concerning rainfall reconstructions from molecular and isotopic changes in tropical pacific lake, bog, and ocean sediments, specifically in the intertropical convergence zone (ITCZ). Biomarkers are indicators of biological processes and states, they are also referred to as biosignatures, and they need to be purified in order to be properly studied. Dinosterol is an exclusive biomarker produced by dinoflagellate algae that has the potential to track changes in the salinity of the water that’s used by dinoflagellates living in the water during its biosynthesis. I used HPLC (High Performance Liquid Chromatography) to purify compounds (lipids), while separating samples into fractions containing portions of the peak of the compound. Studies show that fractionation, which is the variation in equilibrium distribution in isotopes, takes place during Normal Phase HPLC2.

In my research I determined how much isotopic fractionation of cholesterol occurs across a RP-HPLC purified peak. What are the implications, or aspects of the process that can impact results, associated with using RP-HPLC. The isotopic fractionation across a cholesterol RP-HPLC peak has a range of 580 therefore small losses can lead to large isotopic biases. RP-HPLC may induce large isotopic bias even when the entire measurable peak is recombined.

Clipperton Island lies about 1,100 km SW of Mexico at the northern edge of the present ITCZ. Temperature and rainfall there are controlled by the seasonal migration of the ITCZ. By contributing isotope measurements of dinosterol to an existing Clipperton Island sediment record I was able to determine the dD values of RP-HPLC purified dinosterol with depth in a Clipperton Island sediment core, and how reproducible the dD values of RP-HPLC purified dinosterol of the Clipperton Island samples were. Clipperton Island dinosterol dD data show isotopically enriched values prior to 1850AD, and therefore suggest significant hydrological changes and potentially higher salinities during that time period. Also, the results show that the data is reproducible. In the future, I will continue to test the dD of different sediment core depths within time periods of interest so that we can determine the shifts in climate more precisely.

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rRNA Gene Copy Number of Marine Bacteria Utilizing Different Substrates

Jolie Wax, Lincoln University, PA
Matt Cottrel and David Kirchman, Ocean and Environment, University of Delaware

The importance of bacteria in marine food webs has been recognized over the past twenty years; they consume about half of the carbon fixed by phytoplankton and transfer it to higher trophic levels. Because of this, there is widespread interest in the role of marine bacteria in carbon cycling.
The purpose of this study was to investigate bacterial growth rates on different carbon substrates and to correlate these rates with the number of 16S rRNA genes in the bacterial cells.

Surface water samples were taken from the Delaware Bay, size fractioned to remove grazers and inculated with amino acids or acetate. The growth rate was calculated from direct counts over 72 hours using fluorescence microscopy. The 16S rRNA content was assayed by quantitative PCR using general primers. Cells utilizing amino acids had a growth rate of 2.3 day⁻¹ and cells utilizing acetate, 1.7 day⁻¹. Both rates were higher than the control, 1.5 day⁻¹. 16S gene copy number per cell increased from 1 copy to five. Peak growth rates did not correlate directly with the increase in 16S gene copies; cells with multiple copies of 16S genes utilizing acetate experienced a two-day lag time.

Due to the change in community structure, it is unclear whether the cells with larger 16S gene copy numbers were growing rapidly on acetate the whole time. Future research could focus on examining bacterial growth on other compounds and correlating growth rates with 16S gene copy numbers.

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Using Native Phreatophytes to Decrease Movement of a Ground Water Uranium Plume at Shiprock, New Mexico, Navajo Nation

Rita White, Diné College, Shiprock, NM
W. Jody Waugh, U.S. Department of Energy Environmental Sciences Laboratory
Marnie K. Carroll, Executive Director, Diné Environmental Institute

The U.S. Department of Energy Office of Legacy Management (DOE) is responsible for long-term, post-closure protection of human health and the environment at the uranium mill tailings site on a terrace above the San Juan River on the Navajo Nation. The Shiprock, New Mexico mill processed uranium-vanadium ore hauled from other mines located on Navajo land as well as outside the reservation. Ore was crushed and then leached in a bath of sulfuric acid and oxidant to solubilize uranium and vanadium. Precipitation of uranium from the solution was accomplished by increasing the acidity and boiling to expel carbonate, followed by neutralization with magnesia. Mill tailings were enclosed in a disposal cell designed to limit radon escape to the atmosphere and percolation of rainwater. However, groundwater, contaminated when the mill was operating, has migrated from the terrace to the San Juan River floodplain and into the river. The contaminants of concern are ammonia, manganese, nitrate, selenium, strontium, sulfate, and uranium.

In 2003, DOE began pumping groundwater from the terrace and floodplain areas into an evaporation pond, but by 2004, pumping had produced only about half the expected amount. In 2006, DOE and Diné College began a pilot study to evaluate the feasibility of using phytoremediation as a more sustainable remedy. The concept was to use deep-rooted native plants (black greasewood, Sarcobatus vermiculatus; and four-wing saltbush, Atriplex canescens) to enhance evapotranspiration in an area south of the disposal cell where nitrate levels are elevated in alluvial sediments, and on the terrace between the disposal cell and an escarpment above the San Juan River floodplain where a uranium plume enters the floodplain. The goal of phytoremediation in these areas is hydraulic control, to limit the spread of contaminants in groundwater.

The objectives of the pilot studies are to: 1.) Establish native phreatophytes by transplanting seedlings started in a greenhouse and then irrigating transplants until roots have accessed plume groundwater; 2.) Once plant roots have accessed groundwater, evaluate the human health and ecological risks associated with uptake of groundwater constituents and accumulation in above-ground plant tissue; and 3.) Evaluate the potential beneficial effects of phytoremediation on plume water volume, plume migration, and flow in existing contaminated seeps at the base of the escarpment and in floodplain groundwater.

Diné College students helped (1) set up two test plots in 2006 and two in 2007, (2) install drip irrigation systems, (3) measure plant growth, and (4) sample plant tissue to evaluate bio-uptake of contaminants. Students measured plant canopy dimensions in all plots in October 2007, 2008, and 2010. Overall, plants in the terrace plots had grown considerably more than plants overlying the nitrate plume. Inconsistent growth patterns may be attributable to insufficient irrigation in 2008.

The study reveals that four-wing saltbush (Atriplex canescens, Diwózhii_beii in Navajo) is a better candidate than Black Greasewood (Sarcobatus Vermiculatus, Diwózhíshíihn in Navajo) for phytoremediation at Shiprock. Contaminant levels in plant tissue from the test plots are not significantly different than from background locations; hence, bio-uptake does not pose an adverse risk to human health at the environment. [This study was supported, in part, by the U.S. Department of Energy Environmental Sciences Laboratory (DOE Contract No. DE-AM01-07LM00060) and USDA Tribal Equity funds awarded to the Diné Environmental Institute (Marnie K. Carroll, Executive Director), Diné College Shiprock, New Mexico.]

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Formation of Gas and Particulate Pollutants from Ozone Reactions in Ventilation Systems

Regina Williams, Alabama A&M University
Lara Gundel and Meera Sidheswaran, Lawrence Berkeley National Laboratory, CA

Compounds released from biogenic and anthropogenic sources can react on the surfaces of Heating Ventilation and Air Condition (HVAC) filters with ozone in ambient air to form
pollutants that can be released in indoor environments. The goal of this research was to identify the key organic constituents of particles deposited on three different types of used HVAC filters obtained from two different locations and to also study the impact of surface reactions of VOCs with ozone on these filters.

Filter samples were extracted using solvent extraction techniques and analyzed using gas chromatography-mass spectroscopy. To study the impact of surface reactions, experiments were conducted in a Teflon plug-flow reactor (TPFR) enabled with a filter holder, using clean and used filters spiked with known concentrations of terpineol and exposed to ozone. Initial results showed possible sources of organics on the particulate matter captured by these filters. Terpineol ozonolysis further sheds light on the formation of ultrafine particulate matter and organics due to surface reactions. [This research has been supported by U.S. Department of Energy and NSF grant #HRD 0928904.]

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**Hexavalent Chromium Reduction in a Liquid Suspension Culture of Bacillus Sphaericus.**

Priyanka Yarlagadda, Paine College, GA  
Shanquette Chance, Bibekananda Mohanty, C.P. Abubucker, and C. R. Nair, Paine College

The U.S. Environmental Protection Agency and Department of Energy have identified chromium as priority pollutant in the environment. The trivalent (Cr-III) and hexavalent (Cr-VI) forms of chromium are of biological significance. The Cr-III is non-toxic, non-mobilizable micronutrient and used by the biological system.

However, the Cr-VI is water soluble, highly toxic and is known to be both carcinogenic and mutagenic to living organisms. The present study was undertaken to examine the potential of Bacillus sphaericus (a soil bacterium) in the reduction of hexavalent chromium in a liquid suspension culture. B. sphaericus 2362 cells were grown successfully in a liquid fermentation medium containing sodium acetate, yeast extract, magnesium chloride, and calcium chloride. When the fermentation medium was inoculated with the seed culture-2, containing bacteria, there was a lag period of cell growth for 4 hours, after which time the cells grew rapidly in a linear fashion up to 12 hours of growth.

Thereafter, the growth rate slowed down and the cells attained stationary phase between 32 to 48 hours of growth. The biomass of cells did not seem to decrease as compared to control (no Cr-VI) when either 5-ppm or 10-ppm Cr-VI was added to the cultures. B. sphaericus cells reduced Cr-VI in an increasing order 5-ppm > 10-ppm during 48 hours of growth. When the reduction of Cr-VI was monitored during 48 hours of growth, it was found that the bacteria could reduce higher amounts of Cr-VI (25, 30 ppm) if the amount is provided at successive intervals during growth.

The results of this study indicated that higher density of cells is associated with rapid reduction of Cr-VI. Currently, the bioremediation potential of B. sphaericus on Cr-VI reduction is studied in soil columns using molasses as the source of carbon for bacterial growth. [This study was supported by a grant from D.O.E awarded to Paine College, Augusta, GA for bioremediation research on chromium.]

**MATHEMATICS & STATISTICS**

**204**

**Conquering The Amazing Patterns and Close Relationships Between The Fibonacci and Lucas Numbers Using The Tool Of Principle Of Mathematical Induction**

Jorrus Alford, Savannah State University, GA

The Fibonacci numbers are sequences of numbers of the form: 0,1,1,2,3,5,8,13,.... In mathematical terms, it is defined by the following recurrence relation: The first number of the sequence is 0, the second number is 1, and each subsequent number is equal to the sum of the previous two numbers of the sequence itself. The Lucas numbers are sequences of numbers of the form: 2, 1, 3, 4, 7, 11, 18, 29, 47, 76, 123, ...

In mathematical terms, it is defined by the following mathematical recurrence relation : L0=2; L1=1 ; L = L+L for n 1.

Each subsequent number is equal to the sum of the previous two numbers of the sequence itself. Observe that the Lucas numbers have a slight variation of the Fibonacci numbers with different initial conditions and the two sequences are intimately related to each other as we will see later.

The Fibonacci and Lucas sequences are the shining stars in the vast array of integer sequences. The sequences have a long history and special importance in mathematics, with many beautiful and intriguing properties and patterns. These numbers are also famous for possessing wonderful and amazing close relationships between them. Mathematicians have been fascinated for centuries by the properties, patterns, and close relationships between Fibonacci and Lucas numbers. Among numerical sequences, these number sequences have achieved a kind of celebrity status.

We examine some of the interesting similar patterns and close relationships between the Fibonacci and Lucas numbers. Some important results dealing with patterns and the close relationships between the two numbers will be proved mostly using the principle of mathematical induction (our own proofs).

No number theory concepts are used in the proofs and any sophomore students with no background in number theory can read and understand this paper. In the paper, we investigated some important similar patterns close relationships between the
Fibonacci and Lucas numbers. We strongly believe that the Fibonacci and Lucas numbers have many more mathematical patterns and close relationships that are worthy of exploration and more investigations.

This paper gives us lots of hints and suggestions which can be good resources and tools for deeply studying similar patterns and close relationship between these fascinating and mysterious numbers in the future. [We would like to thank our mentor Dr. Lemma for his guidance and excellent advice. We also thank Drs. Chetty, Jay, Lambright and Mustafa for their great encouragement and support. Finally we thank the PRISM Program at Savannah State University for providing us with this golden opportunity of mathematical research experience which is extremely helpful for our higher education. We strongly believe this research experience can be a ticket for our success in graduate school.]

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Non-Negative Polynomials on the Real Line and Plane

Carlos Anglas, State University of New York at New Paltz
Dwayne Woolard and Lawrence A. Fialkow, State University of New York at New Paltz

The use of non-negative polynomials in one or more variables is essential in several areas of mathematics, including optimization and algebraic geometry.

The present study derives a “weighted sums of squares” description for non-negative polynomials on the real line, half-line, and the interval [0, 1]. For example, non-negative polynomials on the interval [0, 1] can be represented in the form \( f^2 + g^2 + x(1-x)(h^2 + k^2) \) for certain polynomials \( f, g, h, \) and \( k \).

The classical treatment of this subject in Pólya and Szegő is based on complex function theory. We develop a treatment based on the factorization theorem for real polynomials and on basic algebra, and we illustrate this treatment with examples implemented in Mathematica. In two variables, using the Motzkin polynomial, we see that not every non-negative polynomial of degree six can be represented as a sum of squares, but we study a method for identifying examples of sums of squares. [This project was sponsored by SUNY/NSF Alliance for Minority Participation at SUNY New Paltz.]

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Sea Surface Temperature and Effects on North Atlantic Tropical Cyclones

Kelvon Barkley, North Carolina Agricultural and Technical State University

The purpose of this research is to study the effects of the sea surface temperature (SST) on North Atlantic tropical cyclone genesis, track and intensity. We implemented two main experiments. The first experiment focused on the correlation of Sea Surface Temperature and tropical storms from years 1982 to 2008 in the months of July, August and September. We counted the number of tropical storms, number of hurricanes, number of major hurricanes (category 3 to 5), the number of hurricanes that hit United States land, and the number of hurricanes that began in the Genesis window, Longitude -50 -30 and Latitude 10 20. The planned correlation goal was 80% to 90%. The highest correlation found was 51% between the number of tropical storms and the Genesis window. The next highest correlation found was 48% between the window with Longitude -60 -40 and Latitude 10 20 and the number of United States landfall hurricanes.

The next experiment focused on Ophelia (2005) using North American Regional Reanalysis meteorological data, to investigate which qualities influenced Ophelia’s track and intensity. We focused on the days of September 6th to September 17th. These are the days that Ophelia was a tropical storm or hurricane. We plotted Sea Surface Temperature, pressure, and wind vector to evaluate the effects they may have had on Ophelia’s track. We conclude wind speed, direction, and barometric pressure had the most influence on Ophelia’s track. Further studies include examining other variables that influenced Ophelia’s track and determining which variable had the most influence. [I acknowledge National Science Foundation, HBCU-UP/TALENT-21 Program, and North Carolina A&T State University.]

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Biomarker Analysis for Early Signs of Cancer Treatment Response

Ndubisi Chikwem, Lincoln University, PA
Alex Sawyer, Carey Alexander Stuart and Brian J. Smith, University of Iowa

Chronic lymphocytic leukemia (CLL) is the most common leukemia in the western world. Leukemia is cancer of white blood cells, and CLL is a type of leukemia that affects lymphocytic white blood cells and tends to progress relatively slowly. CLL has several effects on cellular and humoral immunity. There have been no associations observed with environmental risk factors, but whites have been observed to be more likely to develop the disease. Tumor response rates for current treatments of CLL range from 15 - 51%, although toxicity has been a concern.

An early phase clinical trial was conducted jointly at the University of Iowa and Mayo Clinic to examine the use of a class of synthetic oligodeoxynucleotides (Cpg 7907) for the treatment of CLL. The goal of our study is to analyze biomarkers, collected in the clinical trial, for early evidence of treatment efficacy. Specifically, we used statistical clustering methods to describe
relationships between lymphocyte cell surface proteins. Using principal components, we condensed the large number of markers to a smaller set of eigenmarkers. Then, linear regression was used to estimate changes in eigenmarkers over time and compare changes across different doses and treatment modalities.

208 Improving Student Learning through Supplemental Instruction

Monique E. Davis, North Carolina Agricultural and Technical State University

Supplemental Instruction (SI) is a program used in schools to assist students in higher academic excellence and better retention in various courses. SI utilizes students with high academic performance to become SI leaders for these courses. One of the most important things about supplemental instruction is that it is not tutoring. Tutors sometimes teach their students how to solve problems, but an SI leader encourages his/her students to learn how to solve the problems themselves and gain better understanding. In this presentation, I will share what Supplemental Instruction is, my experience as an SI leader and the lessons learned.

209 Mathematical Induction is a Technique for Proving a Statement

Aboubakar Diakite, New York City University

Mathematical induction is a technique for proving a statement -- a theorem, or a formula -- that is asserted about every natural number. (The natural numbers are the counting numbers: 1, 2, 3, 4, etc.) In this work we consider an special statement that is asserted about every natural number and prove it using Geometry instead of using principle of mathematical induction.

We show the answer for sum of n integer numbers k(k+1)(k+2) by using geometry and area of rectangles. Further Questions: Using geometrical principle, we want to prove more statements asserted about every natural numbers. In our further work we want to identify such statements and describe their proof using geometry. [Acknowledgment: This research was supported by LSAMP program.]

210 Effect of Parent Hostility on Young Adult Child’s Perception of Parental Support a Decade Later

Millicent Grant, Spelman College, GA / Iowa State University

Most studies of parent-adult child relations focus on parents, rely on retrospective recall of past experiences, and rely on self-report rather than observed behaviors. This prospective panel study examines the effects of parents’ observed behavior when the child was an adolescent on their perceptions of their parent’s support a decade later, both directly and indirectly through patterns of parent-child exchanges.

The data are from a panel of 484 couples and single mothers and their adolescent “target” child between 1991 and 1994, when the children were adolescents, and 2001. The parents’ hostility and support between 1991 and 1994 are based on observer ratings. The parents’ provision of support to the target child in 2001 is based the adult child report. In addition, the pattern of exchanges between parents and young adult children is based on children’s reports of hostility toward parents and parents’ hostility toward them in 1997 and 1999.

For mothers’, the observed behaviors between 1991 and 1994 had both direct and indirect effects on their children’s report of social provisions in 2001. In addition, the gender of the child had an effect on how he or she reported social provisions for his or her mother. For fathers, the observed behaviors between 1991 and 1994 had both direct and indirect effects on their children’s report of social provisions in 2001, although the effects were weaker than for mothers. Unlike for mothers, gender of the child did not effect how he or she reported social provisions.

Considerable past research has focused on the care provided to elderly parents by their adult children. This study focuses on the young adult child, and demonstrates continuity in the way children were treated as adolescents and how they interpret their parents’ behavior a decade later. Young adult children who, as adolescents, were treated harshly and with contempt were less likely to say their parents provide them with support. Instead, the children of harsh and hostile parents reported higher levels of negative interactions over the years, as measured in both 1997 and 1999, and these negative interactions lead to lower perceptions of support. These results add to the body of literature that demonstrate long-term effects of harsh and hostile parenting are carried forward into parent-adult child relations, which in turn have consequences for both parents and adult children’s health and well-being.

211 The Existence of Mild Solutions to Semilinear Fractional Diffusion Equations

Cherre Jefferson, Morgan State University, MD

This research is devoted to developing conditions under which a mild solution for some semilinear fractional diffusion equation could be found. We use an appropriate definition of a mild solution due to El-Borai. The results are obtained using the Banach’s Fixed Point Theorem. They generalize a recent work by G. Mophou.
212
Chord Recognition through Wavelet Analysis
Ashley Moore, Johnson C. Smith University, NC

Wavelet analysis is a technique used in signal processing. Many factories implement the use of wavelet analysis in identifying machine malfunctions. The notification of a machine malfunction is linked to a specific signal. The purpose of this project was to develop an algorithm to distinguish differences in signal pitch. We modeled this concept by using guitar chords (B minor, E minor and F minor) and decomposed each chord using Matlab. We discovered that our algorithm found the most probable chord which had the least amount of error. Future research would include developing an algorithm that recognizes overtones.

213
Generative Models Using Random Walks with Intensities
Mohammad H. Mustafa, University of the Virgin Islands, St. Thomas USVI

Scientists have utilized fluorescence microscope images which show protein shape, as well as capture protein motion in order to better understand the cell. Various means have been used to describe protein shape and location, which enhances the understanding of protein function.

Using gray-level co-occurrence matrices and applying the mathematical theory of random walks, we will build a generative model of a protein image with a cell. This model will generate protein images that resemble the original set of the protein images. Gray-level co-occurrence matrix is a numerical representation of the distribution of intensity over an image. Creating an image using gray-level co-occurrence matrices involves collecting information on gray-level co-occurrence matrix, modeling the gray-level co-occurrence matrix, and using that information to generate an image that has similar properties of the original image. A random walk will be utilized in the image generation. The two dimensional random walk will follow a path, that also varies with intensity, based on probabilistic information from the gray-level co-occurrence matrix.

There are results that the morphological and texture features of the generated proteins images and the actual protein images are comparable. Based on visual inspection, the generated protein images are similar to the actual protein images. In conclusion, the experiment shows promise that using gray-level co-occurrence matrices and random walks can produce a generative model for protein images. Future research will entail modifying the parameters of the random walk. [Funding Source: NSF, UVI HBCU-UP Grant # 0506096.]

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Asymptotic Entanglement in One-dimensional Quantum Walks Subject to Decoherence on the Coin Degree of Freedom
Stephen Pegram, Bowie State University, MD
Chaobin Liu, Bowie State University

A discrete-time quantum walk on a $SN$-cycle applied a projective measurement at every time step to the degree of freedom of the coin with certain probability, forms a model of a two-state quantum system subject to a decoherence during the quantum system evolution. The effects of decoherence in this type of quantum walk have been studied mainly by investigating the position probability distribution in the long-time limit and possibilities for tuning quantum walks to improve their algorithmic properties.

In this paper, we provide a different point of view on the role of decoherence in quantum walks. We prove that the von Neumann entropy of the total density operator of this type of two-state quantum system converges to its maximum value. This implies that the mutual information between the two subsystems, as an indicator of the level of the entanglement between them, will eventually must diminish to zero under the imposing of the decoherence.

The destiny of the evolution of this dynamic quantum system may serve to an annotation for one of the quantum mechanical principles: a decoherence destroys interference effects and the 'quantum nature' of quantum systems. [This study was supported, in part, by the NSF-funded HBCU-UP/BETTER Project at Bowie State University.]

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Mathematical Model of the Wnt Pathway
Monica Sullivan, Fort Valley State University, GA
Christopher Cai, Namita Gupta, Robert Karp, and Jeremy Gunawardena, Harvard Medical School, MA

The Wnt pathway is a cell signaling pathway which regulates the level of Beta-catenin, which in turn controls controls the expression of over 100 genes. The Wnt pathway is important in determining cell proliferation, cell polarity and cell fate during embryonic development and adult tissue homeostasis. The pathway is studied in Drosophila (flies), Xenopus (frogs), mouse and humans, especially cancer cell lines. Each species in the Wnt pathway is carefully mapped out and labeled. The destruction cycle of the pathway requires the amount of Beta-catenin in the cytosol. Mutations in the Wnt pathway have been linked to colon cancer, coronary heart disease, osteoporosis and type II diabetes.

We created a mathematical model based on differential equations for the Wnt pathway, to better understand how the signaling works. Our main interests were to investigate cellular
response under complex stimuli, which the cells would encounter under normal or pathological physiological conditions. A mathematica code was designed where each reaction and reversible binding steps was accounted for.

The reactions included in this model were protein synthesis/degradation, protein phosphorylation and dephosphorylation and the assembly/disassembly of protein complexes. We took binding, dissociation and catalytic rates from the literature, and did the same thing for initial concentrations. Our model recapitulates the known experimental facts of the Wnt pathway under traditional stimulation, and will serve as the basis for future experiments with complex stimuli; like pulses in a microfluidic torture chamber.

Our new model simulates the full Wnt pathway, as opposed to the original 2003 model. Setting up a model was the first step in this direction. The more the Wnt pathway is understood the closer science comes to curing cancer and other related illnesses. [This research was supported, in part, by a grant from NSF HBCU-UP (#HRD-0625289) awarded to Sarwan Dhir PhD, Director for the Center for Biotechnology, Fort Valley State University, Fort Valley, GA 31030.]

216
A Bayesian Time Series Attack on Video Digital Watermarks

Kevin Velado, California State University, Bakersfield

Digital watermarking is a process where information is embedded into digital media. This process is used to help clarify identification of source, creator, owner, distributor, or authorized consumer of a digital media. For the film industry, a digital watermark acts as a source of identification. In the case that a film should leak out illegally, the copyright owner is able to identify the watermark and trace it back to the source of the leak. In this project, we are using both a collusion attack and a Bayesian time series attack to minimize the evidence of digital watermarks without destroying the fidelity of the film.

NANOSCIENCE

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Bio-Inspired Synthesis of Noble Nanoparticles and Non-toxic Chemical Method

Biliesha Belvitt, Spelman College, GA

In past research, biological synthesis of nanoparticles has been proved to be possible through plant leaves and fungi. This data is of great interest because it is an efficient process that is less harmful to the environment. Therefore, using these biological materials will be better for the environment in the future considering there is a constant demand for smaller, more efficient technology. This particular study was done to test the hypothesis that Magnolia grandiflora leaves and Fusarium oxysporum both prove to be efficient ways to synthesize the noble nanoparticles, silver and gold, using silver nitrate and gold chlorite.

The experiment applied various amounts of silver nitrate and gold chlorite to the leaves and fungi solutions. Through the use of UV-Visible and fluorescence spectra analysis, the presence of nanoparticles and the rate at which they began to aggregate was determined. The chemical method can also be used with a non-toxic chemical safe to the environment. Sodium citrate is a harmless chemical that synthesizes gold and silver and may also be considered as an alternative to toxic and flammable chemicals used in synthesizing nanoparticles.

The results proved that Magnolia grandiflora leaves were more efficient in producing nanoparticles indicated by the peaks in the 400nm to 500nm range when taking fluorescence spectrophotometer readings. This data indicated that the Magnolia grandiflora leaves should be researched to a further extent to increase its productivity of noble nanoparticles. [This study was funded by a grant from National Science Foundation through the Research Experience for Undergraduates Program held at Alabama A and M University.]

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Evaluating Refractive Index and Size of AuNP into Fabricated PDMS Films

Shawn Cherry, Norfolk State University, VA

Separating butanol from biomass using a process called pervaporation is used to allow butanol to vaporize and diffuse through a permeable membrane, PDMS. In order for butanol to vaporize, the overall feed must be approximately 70°C. To gain thermal energy, gold nanoparticles can be applied to PDMS films and electromagnetic radiation will generate plasmonic heating. Plasmonic heating is where light is absorbed by the nanoparticles at its intensified or resonant wavelength.

The light produces localized surface plasmon resonance (LSPR), which is an oscillation of conduction electrons, and the oscillating electrons interact with phonons to create thermal energy. Increasing thermal energy from electromagnetic radiation by applying gold nanoparticles either in or on PDMS films can produce a reduction in energy use and operation cost in the process of separating butanol from biomass.

Different approaches of applying gold nanoparticles (AuNPs) to polydimethylsiloxane (PDMS) are taken to evaluate a refractive index, size of nanoparticles formed, and dispersion of AuNPs. The apparent effective refractive index exhibited by PDMS was found to be between 1.405 and 1.43 by comparing Mie simulations with spectra from films with 10 nm radius NPs
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Plasmas Modeling and Nano-composite Formation

Yawo Ezunkpe, San Jose State University
Jacques Richard, Texas A&M University

Voltage and current variations have been investigated in the basic principle of plasma enhanced chemical vapor deposition (PECVD) using simple parallel plates in dielectric barrier discharge (DBD). A parallel experiment has been done to validate the simulation outcome. We computed the electric and velocity fields using a multi-species Lattice Boltzmann Model for the flow field and central differences for the Poisson solver for the electric field.

The key experimental results are as follows. If the electrode plates are not exactly parallel, the discharges occur at the corner of the plates. It appears that increasing potential results in increasing current therefore accounting for the power augmentation. Also, the gap between the electrode plates has a major impact on the discharges in that the electrons’ density is larger in smaller gaps. Also the charged species are the major elements in the PECVD as more electrons are driven by the higher voltage electric fields and a denser field of electrons is observed nearer the positive plate. Similar trends were observed in the simulations.

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Towards Reduction of Optical Losses in Transition Metals Based Nanomaterials

Casey Gonder, Norfolk State University, VA
Alexander V. Gavrilenko and Doyle Baker, Norfolk State University

Electron energy structure and optical absorption of Ag1-xCdx, Ag1-xInx, Au1-xCdx, and Au1-xInx, solid alloys have been studied from the first principles within the Density Functional Theory (DFT) using ab initio pseudopotentials. Equilibrium geometries are obtained by total energy minimization method using the Local Density Approximation (LDA) and Generalized Gradient Approximation (GGA) methods.

Optical functions are calculated within the independent particles picture. The light excitations of plasmons are described by the Drude model. Changes of the optical absorption spectra caused by the variations of the alloy contents are studied in the range of x-values varying up to 6 percent. Parts of the optical absorption spectra of the alloys corresponding to the plasmon and band-to-band transitions show opposite trends in spectral shifts caused by the variation of the impurity content. With increase of the impurity concentration, the electronic energies of band-to-band transitions associated with optical excitations of d electrons indicates well pronounced red shifts.

On the other hand, the optical absorption peak located in the near infrared spectral region and associated with excitations of the d-p hybrid electronic states shows clear blue shift with increase of x. The predicted variations of optical absorption spectra of the transition metals alloys studied qualitatively agree with experimental data. Theoretical results are discussed in comparison with available experimental data. [This work is supported by NSF PREM DRM-0611430, NSF NCN EEC-0228390, and by AFOSR FA9550-09-1-0456.]

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Gold Nanoparticle Inkjet Printing for Security and Biological Applications

Heather Hill, Fort Valley State University, GA
Vince Rotello, University of Massachusetts

Inkjet printing is a versatile, cost efficient, and mature technology that has shown to be able to print biomolecules and inorganic nanoparticles on various substrates. Our project goals were focused on two distinctive methodologies: DNA delivery and security applications. DNA/RNA delivery is a promising new technique for the treatment of diseased cells in biomedical applications. However, patterning substrates with viable strands that can easily enter the cell is a challenging prospect as most current methods are substrate dependant or destroy the DNA during printing. Gold nanoparticles (AuNPs) have not only been shown to increase DNA transfection into the cell when complexed with DNA, but pack the DNA which potentially may protect it from damage during printing. LDI Mass Spectrometry was used to test the printed nanoparticle pattern. The pattern was UMASS and different ligands were used for each letter. Each letter registers a different color on the spectrum, which would give us a pattern with four different colors.

The two best seen results were with the U and M. TTMA (R = CH3) was the ligand for the U and R = (CH2)9CH3 was the ligand for the M. We were able to create the DNA, nanoparticle, and
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ligand complex and print it out of an inkjet printer. From there, the printed complex was collected and we were able to determine the length of the DNA.

It was shown that more DNA was recovered when using the complex, than when printed by itself and DNA/NP complexes are more stable than naked strands, making it an attractive new means for DNA inkjet printing. In the world today, security applications are being demanded more and more. Nanoparticles can be easily seen by mass spectrometry; therefore, patterns that are created by the nanoparticles on surfaces can then create invisible images that are only detected by mass spectrometry. This can assist in many security applications in the future, such as counterfeit money detection. [This research was supported, in part, by a grant from NSF HBCU-UP (#HRD-0625289) awarded to Sarwan Dhir, PhD, Director for the Center for Biotechnology, Fort Valley State University, Fort Valley, GA 31030.]

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Photo-induced Selforganized Pattern Formation and Photothermal Lensing in Nanofluids

Anita Johnson, Alabama A&M University

Nanofabrication, by methods using self-organization, has attracted much attention owing to the fact that it enables mass production without the use of expensive lithographical tools, such as an electron beam exposure system. The optical method of investigating nanofluids allows non-contact monitoring of the kinetic movement of nanocluster formation and evolution. We have observed a dynamic self-organization of laser scattering from the biosynthesized nanofluids with silver and gold nanoparticles.

Various procedures for nanofluid synthesis suitable for different applications are under constant investigation. In our present research the green biosynthesis process has been used for noble nanoparticles production. The aqueous solution of Magnolia grandiflora leaves has been used as a reductant for silver and gold nanofluids.

We have studied the nonlinear properties of nanofluids with silver and gold nanoparticles prepared using green technology. We have applied the UV-visible spectroscopy method to control reaction process, fluorescent spectroscopy and nonlinear interferometric imaging experiments for characterization of nanofluids. From the number of laser-induced photothermal interferometric fringes it is possible to estimate the nonlinear refractive index coefficient changes. The kinetics observed in the pump-probe experiments with blue and red CW laser allowed us to estimate a timescale (∼ 1s) of photothermal lens formation and dissipation.

Moreover, we have observed the very exciting and unusual phenomena of self-organization of the laser scattering reflected from the fluid’s surface. The diverse regular diffraction patterns (hexagons, rolls, squares etc), resembling diffraction of X-rays on crystal structures, were self-organized in biosynthesized solutions of nanoparticles.

From the angular size of the observed hexagonal diffraction patterns it was possible to estimate the diameter of diffracting microclusters as 18 microns for silver and gold nanofluids and 9 microns for the Magnolia broth. The kinetics of the hexagonal scattering shows a quasiperiodic pattern, with a period of about 12 seconds with the slow build-up and sharp disappearance of scattering. The future research will be focused on more detailed understanding of observed phenomenon, and application to develop biofunctionalized materials. [This research has been supported by NSF grant #HRD 0928904.]

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SiC Nanowire Growth

Mallory Lambert, Howard University

Silicon carbide is a favorable material due to its ability to operate at high temperatures and in other extreme environments, making it an ideal material for high power devices. When applied to nanotechnology, wires about 2000 times smaller than the average hair strand can be grown to develop smaller electronic devices and circuits. SiC nanowires are usually found to be grown by using a catalyst.

However, our research has shown that a catalyst is not needed to successfully grow SiC nanowires. Wires were grown on a Si substrate using a cold-wall Chemical Vapor Deposition (CVD) reactor at a temperature of 1050°C or 1150°C. Substrates were either sandblasted or coated with a catalyst of nickel, aluminum, or gold. Substantial wire growth did occur on sandblasted substrates and on substrates coated with Ni or Au. However, the wires were found to be denser and smaller when the Si substrate was coated with a Ni or Au catalyst.

Despite successful wire growth, future research is still needed to improve consistency. With research continuing to expand in the area of nanowire growth, smaller and more efficient electronic devices could be in the near future. [I would like to thank J.B. Halpern, J. Griffin, K. Moore, S. Adams and all other personnel at the Howard Nanoscale Science and Engineering Facility. I would also like to extend my gratitude to both the Partnership for Research and Education in Materials, HUSEM, and the National Science Foundation for funding this research project.]
224
Luminescent Biocompatible Silicon Quantum Dots For Imaging Applications

Jasmine L. May, University at Buffalo, NY
Folarin Erogbogbo, University at Buffalo

Quantum dots (QDs) have size-dependent optical properties that make them uniquely advantageous for in vivo targeted fluorescence imaging, traceable delivery, and therapy. The use of group II-VI (e.g. CdSe) QDs for these applications is advancing rapidly. However, group II-VI QDs contain toxic heavy metals that may limit their in vivo applications. Thus, replacing these with QDs of a biocompatible semiconductor, such as silicon (Si), is desirable.

This study was done to test the hypothesis that drug delivery methods can be used for delivering biocompatible quantum dots made from silicon in vivo for bioimaging purposes. This work reported here evaluates 5 water soluble biocompatible silicon quantum dot nanoformulations, for imaging applications.

The formulations include (1) lysine modified, (2) chitosan coated, (3) DSPE-PEG encapsulated, (4) pluronic block copolymer modified, and (5) mPEG PLA modified silicon quantum dots. The benefits and disadvantages of each formulation are evaluated at physiological conditions.

Temperature and pH stability tests are carried out and all of the formulations used maintained above 50%, ranging from 79-96%, of the initial photoluminescence but only the pluronic, DSPE-PEG, and the chitosan formulations maintained over 50% of the initial photoluminescence of the quantum dots after encapsulation, pluronic showing no decrease in photoluminescence intensity. Overall, the formulations are demonstrated to be useful for targeted cancer cell imaging and some in vivo cancer imaging applications.

Based upon these demonstrations, we anticipate that Si QDs can play an important role in more sophisticated in vivo models, by alleviating QD toxicity concerns while maintaining the key advantages of QD-based imaging methods.

[This study was supported by the Honors College Research and Creative Activities Fund awarded to Jasmine L. May, and grants from the NCI RO1CA119397 awarded to Paras Prasad PhD, Executive Director of the Institute for Lasers, Photonics, and Biophotonics, SUNY at Buffalo, Buffalo, NY.]

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Preparation and Analysis of PAN and PLA Electrospun Nanofibers for Drug Delivery

Ro-Jay Reid, Oakwood University, AL
Crystal Lewis, Oakwood University

The preferred and most efficient technique used to prepare nanofibers from polymers is electrospinning. Preparation and characterizations of two separate precursor solutions were conducted. Solutions of two polymers, Polyacrylonitrile (PAN) and Polylactic acid (PLA) were made and used to prepare the nanofibers.

The polymers were also mixed with nanoparticles before spinning and their diameter, smoothness, and the uniformity of their surface were evaluated. By altering the concentration, voltage, flow rate, and distance between the needle tip and collector plate of the precursor solutions, favorable nanofibers were obtained. PLA which is biodegradable was electrospun to fabricate fibers of different morphologies to aid in drug delivery. PLA forms a structural coagulant with properties that resemble the extracellular matrix (ECM). Electrospinning nanofibers with nanoparticles provides an ideal method for delivery of drugs to target cells. Drugs are then able to be released to target cells controllably which decreases side effects.

The main focus of this research is to prepare nanofibers that are smooth and uniform which range in diameter from 70 : 100 nm that will be applicable for drug delivery. [This research was funded by a HBCU-UP grant from the National Science Foundation.]

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Mechanical Properties of Carbon Nanotube/Glassy Polymeric Carbon Composite

Samuel Uba, Alabama A&M University
Stefon Lewis, Alabama A&M University
Bopha Chay, Center for Irradiation of Materials

GPC (Glassy Polymeric Carbon) is widely used as an electrode material in electrochemistry, high temperature crucibles and a component of some prosthetic devices because of its biocompatibility, low density, low electrical resistance, high temperature properties and inertness.

Recently, many CNT-related studies have been reported in several applications such as nano-electronics, nano-devices, etc. CNT is a unique material that presents excellent mechanical, electrical and chemical properties. We introduce 3wt%, 10wt%, and 20wt% carbon nanotubes (CNT) in the GPC procedure to compare the mechanical properties such as the young modulus (stiffness), strain of the composites to nano material concentration, and to obtain a homogeneous final product without kiling faults to void in it.

We use different processes to prepare the precursor GPC/CNT composite and show their impacts in the dispersion of CNT in the gelled phenolic resin. Composites with pumped resin produced better results as compared to composites without
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Pumped resin. Composites was cured at a high temperature furnace and pyrolyzed in argon from room temperature to 1000°C.

The preliminary results indicate that young modulus increases with the concentration of CNT in GPC matrix, also GPC composites withstand much more strain before fracture with added nano-powder. [This research is supported in part by NSF grant #HRD 0928904.]

PHYSICS

227 Determination of the Sun's Heating Mechanism Through the Examination of Light Curves in Coronal Loops

Brittany Bazzle, Alabama A&M University
Roderick Gray and RaQuetta Howard, Alabama A&M University

The solar corona is a region surrounding the sun approximately one million kilometers above the sun’s surface. The solar corona can reach temperatures of more than one million degrees Celsius. Within the sun’s corona there are coronal loops. Active regions on the solar surface, which are regions of strong magnetic field, take up small areas but produce the majority of activity and are often the source of flares and Coronal Mass Ejections due to the intense magnetic field present.

When studying the solar corona one question is constantly attempted to be answered throughout the astrophysics community: How is the solar corona being heated when the surface of the sun is so much cooler than the corona? In this research, we are analyzing individual corona’s loops at different temperatures and at different days by using an XRT(x-ray telescope). We find the intensity of coronal loops as a function of time and then determine the temperature using Linux operating systems.

As theorized, the thicker the filter where the loop is observed, the higher temperature the loop will be. We obtained an intensity curve that was in direct correlation with temperature curves of the same coronal loops. From this information, in addition to a statistical study of the bulk motions in EUV loops we plan to further the understanding of the sun’s heating mechanism. [This research has been supported by NSF grant #AGS 0645544 and HBCU-UP grant #HRD 0928904.]

228 Polypeptide Chirality Influences Multilayer Nanofilm Growth and Structure

Zephra Bell, Southern University and A&M College, LA

Polypeptide multilayer thin films are being developed for a variety of practical applications. These include coatings for implant devices and systems for drug delivery in the biomedical sciences, and electrode coatings, optical coatings, and filtration membranes in other areas technology development. The film fabrication methodology, called electrostatic layer-by-layer self-assembly, is scalable and therefore suitable for industrialization. Successive polymer adsorption steps involve polymers of opposite polarity.

In this project, the polymers were poly(L-glutamic acid), its right-handed counterpart, poly(D-glutamic acid), and poly(L-lysine, tyrosine). The first two are negatively charged at neutral pH, the third is positively charged. Consequences of switching polypeptide chirality on film growth and structure have been determined experimentally. Poly(L-lysine, tyrosine)/poly(L-glutamic acid) films and poly(L-lysine, tyrosine)/poly(D-glutamic acid) films were fabricated on 1 mm-thick quartz plates. Films were grown to as many as 34 layers. The UV absorption spectrum was taken after each layer deposited to determine the rate of polymer self-assembly. Circular dichroism spectroscopy showed that poly(L-lysine, tyrosine)/poly(L-glutamic acid) films contain a large amount of * sheet. Because poly(L-lysine, tyrosine) cannot form a * sheet with poly(D-glutamic acid), the spectroscopy data imply that * sheet formation plays a role in determining the rate of film buildup.

In separate experiments, UV spectra were taken of films cooled or heated in the range 4-65°C. The data have revealed that although the films undergo significant structural changes on a change of temperature, the changes are reversible. The results of this work could influence the development of multilayer film fabrication processes in the indicated industries. Future work will include temperature and dye studies. [This work was supported by NSF REU program, award No DMR-1004873.]

229 Hyperbolic Dispersion in Curved and Flat Silver-Filled Alumina Membranes

Paulo J. Black, Norfolk State University, VA

Hyperbolic dispersion, a consequence of extreme anisotropy of dielectric permittivities, with one component being negative, has previously been shown to exist in silver filled alumina membranes and exploration of other predicted properties of hyperbolic metamaterials is a subject of great interest.

Topics investigated include: 1.) growing silver nanowires in a properly curved structure for hyperlens - a lens capable of imaging subwavelength structures; 2.) dye lifetime on top of a hyperbolic structure; and 3.) a range of other properties which could lead to other major applications such as stealth technology.
Several aspects of acquiring a curved anisotropic structure were tested, such as radial pore geometries, deformation techniques, and AC electroplating to grow silver nanowires. We were able to successfully grow nanowires in a curved structure, and have shown the decreased lifetime of dye on top of hyperbolic structures due to increased photonic density of states. New properties of hyperbolic dispersion will continue to be probed, and testing curved silver filled structures for anisotropy of permittivity is underway. [Acknowledgements: NSF PREM grant # DMR 0611430.]

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Danny Burl, II, University of Arkansas of Pine Bluff
James McClendon and Shadawna Perkins, University of Arkansas at Little Rock
Jessica Simpson, Southern University, LA
Ranjith John and Ajay P. Malshe, PhD, University of Arkansas, Fayetteville

A new type of Nanomaterial has made its way into the scientific field. This nanomaterial is known as Carbon Nanotubes. A hexagonally shaped arrangement of carbon atoms that have been rolled into tubes. The importance of this advancement in Nanotechnology is that carbon nanotubes not only have extraordinary strength, but also poses unique electrical properties and are efficient conductors of heat. These abilities and attributes seem to excite the scientific world because of all the applications that carbon nanotubes may be used for. We attempted to integrate this new technology with epoxy matrix in order to create a stronger adhesive for underfill applications in electronics. [Funding Source: National Science Foundation and The Office of Naval Research.]

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Experimental Study of Interfacial Traveling Waves Induced by Chemical Reactions
Ruben Diaz, University of California at Santa Barbara
Rouslan Krechetnikov and Hans Mayer, University of California at Santa Barbara

Complex interfaces in fluid dynamics bring new questions and challenges. Of particular interest is their relevance to the fundamental mechanisms in biological motors and other self-sustained motions, when chemical energy is transferred directly into mechanical energy. This project is concerned with studying these motions experimentally using a high-speed camera and quantifying the observations.

As a case study, we discuss experiments on traveling waves induced by a chemical reaction at the interface of two stratified fluids in annular containers consisting of two concentric glass cylinders. The chemicals used are Octadecyltrimethyl Ammonium Chloride (OTAC) with water and nitrobenzene with iodine of concentrations 10-4 to 10-1 M (molar). With the help of two control parameters, a chemical reaction rate and the diameter of the annular container, we develop a parametric study, which quantifies the transformation of chemical energy into mechanical motion, and report a rich dynamic behavior of this system.

Among the physical mechanisms governing the behavior of the traveling waves are dynamic wetting of the container wall and Marangoni instability of the interface. This study provides a basis for a quantitative modeling, which is a necessary step towards creating artificial biological motors. [This study was supported, in part, by the LSAMP program of the National Science Foundation under Award no. DMR-0611539 and by the MRSEC Program of the National Science Foundation under Award No. DMR05-20415.]

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Tunnel Detection Using Cross-Well Radar
Roderick Gray, Alabama A&M University
C. Rappaport and J. Martinez, The Bernard M. Gordon Center for Subsurface Sensing and Imaging Systems (Northeastern University), Boston, MA

The objective of this research was to evaluate the feasibility of detection of shallow tunnels and moving objects through them, using radar-based subsurface testing techniques. CWR (cross-well radar), is a non-invasive technique that has proven to be a reliable technology for detection of objects in soils under water saturated conditions.

In addition to CWR, ground penetrating radar (GPR), is another method that uses radar pulses to image the subsurface and is a non-destructive method that uses electromagnetic radiation in the microwave band (UHF/ VHF frequencies) of the radio spectrum to detect reflected signals from subsurface structures. We implemented CWR by creating an actual model that would resemble a more convenient and efficient use of radar detection as opposed to other alternatives.

In our model we connected PVC pipes in a way such that an object may be placed in and would allow its position to be altered. The PVC pipes and object are placed among a transmitter and receivers which are located at different depths. We were then able to measure and record the depths as well as the output data from the transmitter and receivers. In conclusion the Normalized Maximum Field Intensity is most receptive among the T-0 Depth, which is the midpoint for the transmitter and receivers. [This research has been supported by NSF grant #HRD 0928904.]
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Synthesis of Yb3+/Er3+ Co-doped LaF3 Nano-Particles with Green Up-Conversion Fluorescence in DMSO

Leopold N. Green Jr., Hampton University, VA
Kesete Ghebreysuss, Uwe Hümmerich, and Ei Ei Brown, Hampton University

The synthesis and photoluminescence of rare earth doped up-converting nano-particles (UCNPs) have been widely studied, because of their potential applications in biological imaging. The UCNPs are generally prepared in a mixture of ethanol and water by a co-precipitation method using rare-earth salts in combination with NaF or NH4F as the precipitator and fluoride materials as hosts (e.g.,LaF3), and several types of long chain surfactants as size-regulating agents. In addition, in these synthetic approaches the selection of a proper coordinating ligand has been found to be as one of the key factors in controlling and mediating a proper particle growth.

This study was undertaken to explore the synthesis of Yb3+/Er3+ co-doped LaF3 nano-crystals for up-conversion fluorescence using dimethyl sulfoxide (DMSO) as a solvent and ligand, and evaluate the their optical properties. DMSO is a commonly used polar solvent which is known to dissolve many organic compounds, and serve as a ligand for many metals ions. It is also highly miscible with water, and has the ability to penetrate cell membranes at various concentrations.

Hence, our hypothesis is that these unique properties of DMSO could provide an alternative approach for the synthesis of up-converting nano-particles with potential applications in fluorescent imaging. The up-conversion fluorescence property of the nano-particles was analyzed by laser spectroscopy. Under 980 nm excitation, the as synthesized LaF3:Yb3+/Er3+ nano-crystals display intense green and low intensity red emission in the 530-550 nm, and 640-660 nm regions, respectively. The green and red emissions observed could be attributed to 2H11/2 \rightarrow 4I15/2, 4S3/2 \rightarrow 4I15/2 and 4F9/2 \rightarrow 4I15/2 transitions of Er3+, respectively.

These results indicate that DMSO can be used as a solvent, stabilizer, and as a ligand for the synthesis of rare-earth doped up-converting nano-particles. Also, the results of this synthetic approach are compared to the conventionally used method involving oleic acid as ligand and stabilizer. [This work was supported by the CREST Center for Laser Science and Spectroscopy (HRD#0630372).]

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The Effects of Oxygen Concentration on the Direct Current Magnetization of High Quality, Single-Crystal Bismuth Strontium Copper Oxide Superconductors Grown by the Floating-Zone Technique

Mario Johnson, Southern University and A&M College, LA

Ever-increasing US energy demands will eventually far outpace the capacity of the current power grid infrastructure due to the inefficient delivery of electricity. A major source of inefficiency is due to resistive losses associated with the use of copper transmission cables. One solution for enhancing overall system efficiency is to replace existing copper transmission cables with high, critical temperature (TC) superconducting materials which exhibit essentially zero resistive losses below a TC.

It is generally argued that for high-temperature superconductors to be cost-effective in power grid applications, the TC must be at or above the boiling point of liquid nitrogen, 77 K. As a result, despite their demonstrated technical feasibility, the very high cost of refrigeration has kept many superconducting materials off the market for years. High quality, single crystals of BSCO were investigated to better identify the elusive mechanism of superconductivity in copper oxide superconductors.

This material was grown from a single crystal seed of BSCO using the floating-zone technique. The effect of growth conditions and nominal composition of the feed rod on the magnetic properties were investigated using the Superconducting Quantum Interference Device. The temperature dependence of the direct current magnetization on oxygen concentration was studied using as-grown and underdoped (oxygen-deficient) samples. Underdoped crystals were achieved by annealing as-grown BSCO in evacuated quartz tubes and flowing argon. The magnitude of the superconducting signal was found to increase nearly an order of magnitude with annealing in flowing argon at 450°C for 24 hours. However, the TC was only slightly increased from a value of 7 K for as-grown samples to 10 K for samples annealed at 450°C for 24 - 36 hours in flowing argon. The TC was found to vary with annealing temperature according to an exponential curve which plateaued around 24 hours.

These results indicate that annealing in flowing argon is only a slightly more effective method for enhancing TC of as-grown BSCO. Further work is needed to better understand the mechanism of superconductivity in high-TC copper oxide superconductors.

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Critical Current Density Studies in Pb-doped Bi2Sr2Ca2Cu3O11-d Superconductors

Rodolfo Lopez, Jr., California State University, Stanislaus
Steven Lee, Gregorio Franco, Jr., Josh Casara, and Dr. Lu Zhang, California State University, Stanislaus

In recent times, substantial progress has been reported for high temperature superconducting (HTS) materials in thin film and wire forms of magnets, and fast-switch, narrow-band detectors. These applications will lead to major changes in communication, computer, and medical diagnostic technologies.
However, the industrial applications of superconducting materials are often limited by the suppression of superconductivity at large currents or large magnetic fields. A key requirement for commercial application is for HTS materials to have high critical current density at practical operating temperatures and magnetic fields. Obtaining a useful, high critical current density requires the materials to have strong flux pinning centers; unfortunately one major problem with HTS materials is that flux pinning is not always effective.

In contrast to conventional low temperature superconducting (LTS) materials, there is a large area above what is known as the irreversibility line where HTS materials do not exhibit flux pinning nor do their critical current densities survive. In LTS materials, macroscopic defects such as crystal grain boundaries and dislocations will work as strong flux pinning centers.

Unfortunately, these defects do not serve as effective pinning centers in HTS materials, one main reason being that London penetration depths of HTS materials are orders-of-magnitude longer. The internal magnetic field in the vortex lattice is almost uniform, thus the pinning force due to the magnetic interaction is weak. Equally significant is that HTS materials are among those with a short coherence length, leading to extremely small vortex core size. The most effective defect size for flux pinning is the one compatible with the coherence length. Therefore, the flux pinning in HTS materials is strongly correlated with its material defect structure, as well as the chemical doping. For this reason we have systematically studied the critical current density of the superconducting Bi(2)Sr(2)Ca(2)Cu(3)O(11-d) compound by Pb doping.

It has been found that doping a specific amount of lead into Bi (2)Sr(2)Ca(2)Cu(3)O(11-d) does not alter the structure of the material, but raises the critical current density by four times. Further studies will include the analysis of the impact of Pb doping on other superconducting properties such as the irreversibility line, critical fields and magnetic relaxation. This may consequently result in an outline to the effects of chemical doping on other superconducting systems such as YBCO and TBCCO. [We thank Jane Bruner and Rita Glynn from LSAMP for their support. Our research is funded by the CSU Stanislaus RSCA grant.]

to verify the existence of a significant semi-diurnal component which may have been introduced by specific rainfall events.

The study analyzed the effects of significant precipitation events on the circumference of six sweetgum trees in a forested urban location. Exponential function fits to tree responses to the largest precipitation event found that water drained out of Tree 3 according to the following diffusion equation: \( y = 64.79 \exp(-0.0005998 t) \), where \( y \) is tree circumference, \( t \) represents time in hours and 0.0005989 is the slope of the fitting function in units of inches per hour. The diffusion equation for tree 4 was found to be \( \exp(-0.0005457 t) \). The difference in diffusion rates may be caused by the location of Tree 4 in the riparian zone of a stream and the location of Tree 3 above the zone. Greater drainage could be expected from Tree 3 on this basis.

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Initial Studies of Turbulent Driven Flows Using a 15 cm Diameter Magnetized Helicon Plasma Source

Victor Ruiz, University of California, San Diego

Magnetized plasmas are studied because of their use in magnetic confinement fusion devices such as tokamaks. Experiments done in small scale cylindrical lab devices (radius \( r \) ~ few cm) provide evidence for the formation of ordered or spatially coherent shear flows from small scale turbulent fluctuations. The study of organized shear flows in linear magnetized plasmas is critical for realizing efficient fusion energy production since it plays a crucial role in limiting heat losses from the hot central plasma. Helicon plasma sources are useful for fundamental research in nuclear fusion because of their ability to produce high density plasmas in a wide range of external control parameters.

Theory suggests that as the system size increases, shear flow should develop a dipolar-nature, characterized by counter streaming shear flow [Diamond PPCF 47 (2005) R35;R161]. Evidence for such flows has been seen in larger fusion experiments [Fujisawa 2009 NF 49, 013001]. To test this prediction a larger HPS featuring a 15 cm OD glass bell jar was designed for use in physics studies of turbulence in larger and denser magnetized argon plasmas.

The temperature difference between the plasma and the environment produces a thermal gradient that creates stress in the glass. For thick glass, the thermal gradient would lead to fracture of the bell jar. To ascertain the required wall thickness for the larger bell jar, one dimensional heat transfer and pressure vessel models were used. Temperature readings of the bell jar’s exterior surface were taken at varying power inputs and magnetic field strengths to verify estimates of the bell jar’s inner surface temperature that were derived from the heat transfer model.

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Response of a Sweetgum Tree to Diurnal and Precipitation Forcing

Henry Patterson, Clark Atlanta University, GA

For the project, Response of a Sweetgum Tree to Diurnal and Precipitation Forcing, I will be measuring the hourly changes in bole circumference for six SweetGum trees, by using the DFT
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Results revealed lower temperatures than expected (170°C), indicating that high temperature mechanical failure is less likely to occur. Consequently, a bell jar with thicker glass (3.5 mm) can be utilized resulting in added safety. To further reduce the bell jar’s exterior surface temperatures, cooling lines, blowing compressed air onto the bell jar surface, were added to the new source. Cooling will allow a transition to lighter elements which require more power input due to the increasing ionization energy. Initial results will be reported comparing the shear flow in the larger source obtained from high speed digital imaging studies, with older results from a smaller source (r ~10 cm).

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Fabrication of SiC:Ge:Fe Waveguide Optical Sensors by Pulse Laser Deposition Technique

Simeon Wilson, Dillard University, New Orleans, LA
Dr. Abdalla Darwish, Joshua McCollum, and Ebene Pierce, Dillard University

A nano second pulse laser was used to fabricate a waveguide of SiC:Ge:Fe by PLD technique and in situ RHEED analysis. The waveguide was used as an optical sensor to detect the sound wave disturbance under water.

The research focused on three main objectives. The first objective was the fabrication of a wave guide using the PLD technique and to investigate the inclusion of particulates in thin film, typically 0.1-5.0nm in size during the PLD process. The second was the testing of the non linear optical response and the stability of the waveguide under laser application (VIS-IR) and under harsh environments under water to monitor wave and sound disturbance. The third objective was to use the waveguide as an optical modulator, and wavelength differentiator in the IR region.

The origin of particulates are due to protruding surfaces, craters, micro-cracks in the target that are mechanically dislodged due to laser induced thermal or mechanical shock, and rapid expulsion of trapped gas bubbles beneath the target surface. Diffraction rings were observed with different wavelengths.

It also was observed that the HeNe laser drives the optical sensor to produce multiple diffraction rings, which are affected by the sound wave disturbance to produce unique cluster of rings with elongated shape pointing away from the source of the acoustic waves. The interface of the rings produces either constructive or deconstructive patterns which produced the elongated waves. The thermal effect and the stress effect due to the thermal expansion were responsible for multi-cluster diffraction rings. External electric field was used to enhance the diffraction rings. The dynamic grating intensity can be electrically controlled at specific magnetic field wave lengths to optimize the number of the diffraction rings. [This project is supported by LS-LAMP and DOD AFOSR granted funded to Dr. Abdalla Darwish through DURIP in 2009.]

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The Effects of Gender and Family History of Hypertension on Cardiovascular Reactivity to Stress

Christina M. Crawford, Virginia State University
Kourtney M. Rayford and Vernessa R. Clark, PhD, Virginia State University

The highest prevalence of hypertension in the United States is among African Americans (Barksdale & Metiko, 2010). Family history of hypertension is one of the primary risk factors for hypertension (Wright, O’Donnell, Brydona, Wardle, & Steptoe, 2007). The purpose of this study was to examine the effects of gender and family history of hypertension on cardiovascular reactivity to stress.

One hundred and four African American college students between the ages of 18 - 27 participated in this study. A Hypertension Diagnostics Cardiovascular Profiling Instrument was used to measure cardiovascular activity as the participants viewed a stressful scene on videotape. The scene depicted the horrific conditions that Africans endured as they were transported to America for slavery.

Cardiovascular measures were taken before the scene (pre-stressor period), during the scene (stressor period), and after the scene (recovery period). Each period lasted three minutes and measurements were taken 20 seconds into the period. It was hypothesized that women would have greater cardiovascular reactivity to the stressor than men.

It was also hypothesized that participants with a family history of hypertension would have greater cardiovascular reactivity to the stressor, compared to those with no family history of hypertension. A multivariate analysis of variance was used to examine the effects of gender (men, women) and family history of hypertension (no history, maternal history, paternal history, both maternal and paternal history) on cardiovascular reactivity to stress.

The results revealed that gender had a significant effect on systolic blood pressure during the pre-stressor [F(1) = 4.825, p = .031]; heart rate during the stressor period [F(1) = 6.413, p = .013] and the recovery period [F(1) = 5.688, p = .019]; and stroke volume during the pre-stressor period [F(1) = 7.824, p = .006] and the recovery period [F(1) = 8.312, p = .005]. Contrary to the hypothesis, men were more aroused by the stressors than women.
The results also revealed that family history of hypertension had a significant effect in stroke volume during the stressor period [F (3) = 3.681, p = .015]. In support of the hypothesis, those participants with a hypertensive father had the lowest stroke volume level, which indicates they were more stressed during the scene. These results of the present study are consistent with earlier findings that showed that family history of hypertension is a risk factor for cardiovascular disease. [Future research should investigate the degree to which the hypertensive father mediates this relationship.]

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The Effects of Waist Circumference on Cardiovascular Reactivity in African American College Women

Desmond J. Crawley, Virginia State University
Jasmine E. Clark and Vernessa R. Clark, PhD, Virginia State University

While body mass index has become the standard measurement for measuring obesity, research has revealed that waist circumference is a better predictor of health outcomes than BMI.

For example, Yusif et al. (2005), demonstrated with large data sets, the direct link between waist circumference and risk of cardiovascular disease. While African American women have the highest prevalence of obesity, few studies have examined the effects of waist circumference on cardiovascular disease in this group.

To this end, the purpose of the present study was to examine the effects of waist circumference on cardiovascular reactivity in African American college women. It was hypothesized that women with the greatest waist circumferences would have greater cardiovascular reactivity than their counterparts.

A Hypertension Diagnostics Pulsewave CR 2000 cardiovascular profiling instrument was used to non-invasively assess stroke volume, cardiac output, heart rate, and systolic and diastolic blood pressure responses. Cardiovascular measures were taken before the scene (pre-stressor period), during the scene (stressor period), and after the scene (recovery period).

Measurements were taken as the participants viewed a scene depicting the horrific conditions that Africans experienced during their transportation to America for slavery. Waist circumference was measured with a standard tape. A waist circumference of below 80 cm was classified as normal risk of cardiovascular disease, a waist circumference of 80 cm-87cm was classified as an increased risk of cardiovascular disease and a waist circumference of 88 cm or above was classified as a substantial risk for cardiovascular disease.

The results revealed that waist circumference had a significant effect on stroke volume during the pre-stressor period, F (2,77) = 7.65, p = .001, stressor period, F (2,75) = 5.42, p = .006, and recovery period, F (2,74) = 8.43, p = .001. Waist circumference also had a significant effect on cardiac output during the pre-stressor period F (2,77) = 22.84, p = .000, stressor period F (2,75) = 16.39, p = .000, and recovery period F (2,74) = 14.38, p = .000.

These findings indicate that women with smaller waist circumferences were more stressed by the scene than their counterparts. These findings are similar to those of Clark and Hill (2009) who reported that underweight women had greater cardiovascular reactivity to stress compared to their obese counterparts. Future research should examine the effects of body mass index and waist circumference on cardiovascular reactivity to stress in African American women.

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Tracking, Predicting, and Profiling Domestic Terroristic Events Based On Prior and Present Terroristic Activities

Rachel Green, Wiley College, TX
Majontay Murray, Ray Roberts, and Tracy Andrus, Wiley College

Understanding the multi-faceted patterns of terrorists will assist law enforcement agencies with security with securing the homeland. Since 1980, domestic terrorism has risen to an all time high. In the last (3) three decades approximately 3,200 Americans have been killed as a direct result of terrorism on America soil. Americans have been incapable of tracking, profiling and predicting terrorist activities in the United States. American intelligence, although superior in its capabilities, has lacked in the areas of tracking, profiling, and predicting terrorist who strike on American soil.

This research attempts to collect, analysis, and interpret data on domestic terrorism to assist city, state, and federal law enforcement agencies with tracking, profiling, and predicting domestic terrorism. The variables examined in this research includes the name of the terrorist, citizenship, place of residence of time of attack, location of the incidents, age, gender, race, religious affiliation, types of weapons used, socioeconomic status, the number of victims killed and injured, most targeted areas, and the rational for carrying out these attacks. Methods used in the study include chi square and Pearson’s correlational coefficients.

This research further examines the abnormalities associated with tracking, profiling, and predicting domestic terrorism in the U.S., which has been referred to as the number one problem in our country by the Secretary of the Department of Homeland Security, Janet Napolitano.

Based on the preliminary findings of this research, researchers highly recommend establishing a center of study for the
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tracking, predicting, and profiling of domestic terrorists. The establishment of this center will greatly improve the intelligence needed to protect the American homeland.

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Sex, Stress, and Inflammation in a Murine Model of Ulcerative Colitis

Derell N. Hampton, Tuskegee University, AL

Perhaps one of the most compelling sources of stress is the desire of animals to procreate. The sex/mating ritual is an aggressive, sometimes violent act that causes stress in mice, as characterized by a number of behavioral and physical symptoms. IL-10 is an interleukin that inhibits inflammatory cytokine production by macrophages. IL-10 knock-out (KO) mice are unable to cope with stressors, are hypersensitive to inflammation and may exhibit altered responses to sex-related stressors.

Six week (young) to 6 month-old (old) male and female 129 SvEv wild-type mice were reared in shoebox cages. Half of the animals had previously been used in mating pairs (experienced) and the other half were naive (virgin) mice. We then introduced the singly housed mice to singly-housed mice of the other sex. The experimental design included mice that were confined so that the other mouse of the opposite sex could see, smell and touch but not copulate with the mouse and included cage pairs that were freely able to mate (wild-type controls).

Mice were calm and resting before being introduced to the mouse of the opposite sex. After the introduction, the mating pairs were observed for one hour. Data collected included number of attempts at mating, number of copulations, and behavioral and physical changes, comparing treated mice to wild-type controls.

In conclusion, the old experienced male mice were more aggressive than the young male mice. [Acknowledgment: The project described was supported by grants from NSF (HBCU-UP#8RD-0938273 and IBS-REU#0852049), NIH (MARC#5T34GM087254 & RCM# 2G12RR03059 Programs), the CVMNAH, Tuskegee University and the GWC Agricultural Experimental Station, Tuskegee University.]

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False Memories: Fonts and Serial Positions

Dana A. Miller, Lehman College of the City University of New York

Memory illusions, or memories for events that never happened, have often been studied using word lists and recognition and recall tasks. Participants are presented with a list of semantically related words ordered from highly associated words to weakly associated words, and then asked to either recall as many words as they can or distinguish them in a recognition task. Most often, participants claim that a critical item, a word related to those on the list, but that never appeared, was on the list. In some studies, participants assigned serial positions to the critical items. The location in which participants assigned the critical item is believed to be where participants realized that the words in the list were related.

This research questions whether manipulating fonts affects false memories for the serial position and font assignment of the critical items. Seventy-two undergraduate student participants were presented with four twelve-word lists; the first three words of each list appeared in Times New Roman, the next six appeared in a novel font (Blaze), and the last three appeared in Times New Roman. Participants completed recognition booklets after each list with the half the critical items presented in Times New Roman and others presented in the Blaze font.

Results showed that font used during recognition tasks had no effect on serial positions and font assignments. However, results suggested that participants used the structure of the list and fonts in making their serial position and font assignments. Specifically, they related the critical lures to the highly associated words at the beginning of the lists. Consistent with prior research, encoding effects were stronger than retrieval effects. [Acknowledgments: Dr. Vincent Prohaska, LSAMP, and Psi Chi/APS Summer Research Grant.]

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Challenges Associated with Recruitment and Enrollment of Lung Cancer Patients and Their Family Members in a Behavioral Health Pilot Study

Sandra E. Morones, University of Massachusetts Boston
Mary E. Cooley and Kristin Roper, Dana-Farber Cancer Institute, Boston, MA
Cailin Donahue, Boston Medical Center, Boston, MA
Hermine Poghosyan, Ling Shi, and Laura L. Hayman, University of Massachusetts Boston

Racial disparities in lung cancer demonstrate that African-Americans (AA) experience higher incidence and mortality as compared with European-Americans (EA). Cancer diagnosis may present an opportunity to promote health-enhancing behaviors among patients and family members. With this in mind, a pilot study was designed to inform the development of a health-promotion intervention for AA and EA lung cancer patients who were smokers or recent-quitters and their family members. This presentation will examine the challenges that were associated with the ongoing recruitment and enrollment of lung cancer patients and their family members in a behavioral health pilot study. If any obstacles to recruitment and enrollment do
occurs, I believe that they will likely occur because patients will be too ill to participate due to their lung cancer diagnosis or quit smoking more than one year prior to screening for the study (and thus making them ineligible for consideration).

Patients from Dana-Farber-Cancer-Institute (DFCI) and Boston-Medical-Center (BMC) were screened for the study from June 2009 to the present. Target enrollment was twenty dyads from each site. A log describing eligibility and recruitment barriers was maintained and analyzed using content analysis and descriptive statistics.

The following results were obtained under the study guidelines: 144 LC patients were screened at BMC; 50 (35%) were eligible, 6 dyads were enrolled, 17 out of 50 declined (34%), 27 out of 50 were ineligible (54%), and 0 were pending as of August 2010. At DFCI, 1502 lung cancer patients were screened; 196 (13%) were eligible, 26 dyads were enrolled, 71 out of 196 declined (36%), 48 out of 196 were ineligible (24%), and 51 were pending. At submission for ERN the study was ongoing.

Despite multifaceted evidence-based strategies designed to recruit and enroll participants, including culturally sensitive approaches, numerous challenges were encountered to recruitment and enrollment. At press, the recruitment and enrollment phase of the study was still in the process of being completed at DFCI. Therefore, a final analysis to the overall challenges to the study’s recruitment and enrollment phase could not be completed with all supporting rationales and data.

Nonetheless, an initial review of the data for challenges to recruitment and enrollment indicate the following: patient ineligibility due to study parameters (especially for quitting smoking more than one year previously), strict parameters for definition of family member in the study leading to ineligibility, requirement of one year or less smoking status to be eligible, and patient refusal due fatigue factor or other lifestyle obstacles, and problems related to capturing an overwhelmingly infirm patient population. Racial disparities that impact recruitment should also be considered in future studies that involve patient communities with differing socioeconomic profiles, although it may not cause as much of an obstacle as originally surmised based on the preliminary data.

The final analysis of patient profiles at the study conclusion may provide further insight on the reasons for the challenges behind patient recruitment and enrollment. Strategies for lung cancer patient recruitment in future studies should consider their performance-status, inclusion-criteria, and socioeconomic-demographic profile of the population. Additional research is needed to inform optimal approaches to recruitment and enrollment of vulnerable lung cancer patients in clinical research.

[Acknowledgments: I would like to thank the University of Massachusetts, Boston, Dana-Farber Cancer Institute, and Boston Medical Center for providing work space, project materials, and team support throughout the study process. Financial support for this collaboration was provided by the UMass Boston-DF/HCC Comprehensive Cancer Partnership Program, under grant U56-CA118653 from the National Institutes of Health. Additional funding was provided by the Initiative for Maximizing Student Diversity (IMSD) program at the University of Massachusetts, Boston, funded under grant 1 R25 GM076321-01A1, from the National Institutes of Health.]

245 Characterization of Progesterone Levels in Adrenalectomized Male Rats

Lucia Reyes Diaz, Onondaga Community College, Syracuse, NY
Cara M. Hueston and Terrence Deak, Binghamton University, NY

In response to stressor exposure, the anti-inflammatory hormones corticosterone and progesterone are released from the adrenal gland. Although corticosterone is typically believed to be the significant inhibitor of stress-induced inflammation, progesterone could also be playing this role. The current set of studies were aimed to examine the levels of progesterone released in response to stress, and to determine which injection amounts/timepoints would produce serum levels equivalent to those seen following stressor exposure. Adult male Sprague-Dawley rats were adrenalectomized and injected with one of 8 doses of progesterone. Blood samples were collected for the measurement of progesterone using EIA.

246 Communication Measures Across U.S. Counties: Demographics, Metropolitanness, Race, and Language Barrier

Janae Roberts, Tougaloo College & Johns Hopkins University

The CDC defines emergency risk communication as, the attempt by science or public health professionals to provide information that allows an individual, stakeholder, or an entire community to make the best possible decisions about their well-being.

Before, during, and after disasters, the ability to receive and send information is important and the CDC has begun efforts at all levels of government to engage the poor, the less educated, those without personal transportation, those of minority races or Hispanic ethnicity, and those whose primary language isn’t English. Social determinants, such as education level, are related to preparedness communication outcomes such as accessing and understanding evacuation information. Existing communication resources will shape the ability of a community...
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to obtain disaster and resource information, and to enhance survival or coping behaviors.

The goal of this study is to examine relationships between community specific communication resources, population characteristics, and vulnerabilities through an analysis that identifies potential factors in the application to public health emergencies occurring in U.S. counties (N=3,139). County-level measures included metropolitan area (yes/no), education, poverty, race, employment, median income, native born, native language.

We examined 5 available communication sources: cable programming, radio stations, individual and household access to the internet, and information industry employment. Correlational analysis shows that communication sources are not participated in equally across county subpopulations.

Though we would like to know about more disaster-related preparedness communication sources, among those examined here findings suggest that county socioeconomic, demographic, urbanization, and language indicators are differentially associated with specific media.

County-level measures were obtained from several sources. These sources include the United States Census Bureau’s American Community Survey [State & County FIPS code, Percent Population Who Speak Language Other than English], Small Area Estimates Branch [Median Household Income, Information Industry Employment, Percent High Poverty (All)], the Current Population Survey [Individual/Household Internet accesses], U.S. Department of Agriculture- Economic Service Research [Metro (yes/no), Low Education, Low Employment], and past accumulated databases. The counties included in this study were those located within the continental United States (US) and with measures for all variables (N= 3,139 counties). Counties are identified by state and local FIPS (Federal Information Processing Standard) code.

County-level indicators included metropolitan area (yes/no), percent of the population with low education, high poverty, black or minority race, no employment, native born, native language other than English, and median income. Communication indicators available for these analyses included number of cable programs per 100,000 populations, radio stations, individual and household access to the internet (percent), and information industry employment (percent). Table 1 shows the measures of community well being, mean, standard deviation, and the statistical significance of a test of differences. We categorized each factor into a binary variable: 1/ (yes) = counties above or equal to the median and 0/ (no) = counties below the median. Analysis of variance (ANOVA) assessed group differences. Data was analyzed using STATA Version 11.0 software.

Correlational analysis shows that communication sources are not participated in equally across county subpopulations.

Though we would like to know more about disaster-related preparedness communication sources, among those examined here, findings suggest that county socioeconomic, demographic, urbanization, and language indicators are differentially associated with specific media. All emergencies are unique in that each affected community has different social, economic, and health backgrounds.

Communication is one way to mitigate misinformed risk perceptions and inappropriate behavioral responses to public health and medical emergency threats. In order for a community to have up-to-date information, communication by local and state officials need to be detailed, understandable, and in place well in advance of community-wide public health emergencies. Information preceding and following a public health emergency must be well-researched and culturally appropriate in advance for the public’s need. Racial/ethnic minority and low socioeconomic status groups will have more difficulty accessing effective and usable information during a public health emergency.

Our findings reinforce the importance of social determinants, particularly socioeconomic position, in influencing reception to emergency communications. We would recommend that well-researched and culturally appropriate health messages be developed in advance of the communities needs.

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247 Fireworms Hermodice Carunculata are Not Chemically Attracted to Food Smell but may be Attracted to Smells of Conspecific Feeding

Anne Tagini, University of the Virgin Islands, St. Thomas, VI

The fireworm Hermodice carunculata is a scavenger and a predator of coral and anemones. Some studies have concluded that H. carunculata does not use olfactory senses to find food, but rather only senses food via direct contact. However, we have personally observed that when a dead prey item is introduced, searching behavior begins and leads H. carunculata to the food source. We conducted y-maze experiments to test our hypothesis that H. carunculata could chemically detect the presence of dead prey.

One side of the maze contained the smell from a large chunk of dead fish while the other contained no prey smell. Fireworms
were placed in the end of the maze and observed for up to 24 hours, and in some cases videotaped. A binomial test indicated that *H. carunculata* were not significantly attracted to the odors of dead fish (7 of 15 trials, p=0.69). Video replay showed that the worms explored both sides of the maze extensively.

In a second set of experiments the y-maze was used to test whether the scents emitted by conspecifics during feeding, perhaps along with the food scent, attracts *H. carunculata*. One side of the maze contained dead fish and several conspecifics, while the other side did not. During these trials a second y-maze was constructed. A binomial test suggested that there was no attraction to the conspecifics feeding (10 of 15 trials, p = 0.15). However we noted that results were dramatically different in the second maze versus in the original maze. All 8 replicates conducted in the original maze resulted in fireworms choosing the side with the food and conspecifics (p=0.003). Worms in the second maze tended to go to the left side of the maze whether prey/conspecifics were present or not, implying we had some sort of structural problem in the second maze.

Based on these varied results it was determined that there may be an attraction to conspecific feeding, however further replication would help confirm this. This study is potentially significant as feeding behavior in *H. carunculata* is largely unknown. Possible future work would be to determine range of detection, specific mechanisms of detection, and determining possible differences in ability to detect different prey items.

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**TECHNOLOGY & ENGINEERING**

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**Development of Neural Networks Based Adaptive Filter System for Noisy ECG Signals**

Paul Ajetunmobi, University of the District of Columbia, Washington, DC
Nian Zhang, University of the District of Columbia

Studies shows that Electrocardiogram (ECG) computer programs perform at least equally well as human observers in ECG measurement and coding, and can replace the cardiologist in epidemiological studies and clinical trials. However, in order to also replace the cardiologist in clinical settings, such as for outpatients, better systems are required in order to reduce ambient noise while maintaining signal sensitivity.

The principal technical issue in interpreting ECG waveforms arise from the existence of ambient or background ‘noise’ emanating from signals generated by the systems of the body, and signals generated by sources external to the body, i.e. electronic equipment. Therefore, the objective of this proposed work is to develop an adaptive filter system to remove the contaminating signals in order to better obtain and interpret the electrocardiogram (ECG) data.

This project proposes a fault-tolerant adaptive filter system for noise cancellation of ECG signals. We combine a tapped delay lines to a tapped delay line with an ADALINE neural network to create an adaptive filter. The adaptive filter weights are updated by using the Least Mean Square algorithm, which is an iterative technique for minimizing the mean square error (MSE) between the primary input and the reference signal. The constructed filter is proved and demonstrated with a single frequency noise source.

In addition, to achieve reliability, the real-time computing systems must be fault-tolerant. We design a fault-tolerant adaptive filter and demonstrate its improved reliability. A parallel construction is adopted for the fault-tolerant adaptive filter, whose performance and reliability is compared with that of the non-fault-tolerant adaptive filter model. In the first experiment, the input signal is a white random signal (uncorrelated from one time step to the next), which is uniformly distributed between the values -0.2 and +0.2, the noise source (60-Hz sine wave sampled at 180Hz). A non-fault-tolerant adaptive filter is used. In the second experiment, MIT-BIH Arrhythmia Database data is used as the input with a non-fault tolerant adaptive filter. In the third experiment, the same MIT-BIH Arrhythmia Database data is used as the input, but with a fault tolerant adaptive filter.

The experimental results shows that the fault-tolerant adaptive filter can successfully extract the ECG signals, and is highly reliable after a permanent fault occurs when compared with the non-fault-tolerant model. The proposed fault tolerant adaptive filter approach can be applied to readily remove 60Hz artifact noise to recover the true ECG signals. The filter does not need any computation for voting and error detection. As a result, it requires very little computational power or memory while still maintaining the ability to handle complex signal processing.

*This work was supported, in part, by a grant from Historically Black Colleges and Universities Undergraduate Program (HBCU-UP), University of the District of Columbia, Washington, DC 20008.*

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**Effect of Compacting Pressure and Sintering Temperature on Copper Powder Metallurgy**

Earnest Armstrong, Virginia State University

Powder metallurgy (PM) is a process by which fine powdered materials are blended, pressed into desired shape and then heated to achieve desired properties. Powder metallurgy has become competitive with processes such as casting, forging, and machining. Parts made by this process have high dimensional accuracy with relatively complex geometry.
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This study provides correlation between the strength of the final PM product to the pressure during compacting process and setting temperature through sintering process. To find such correlations, special tools are designed and fabricated for manufacturing a powder metallurgy part with simple shape suitable for strength measurement. Several PM samples were manufactured using pure copper powders under different compression pressures and sintering temperature. Mechanical tests were performed on the parts to find correlations between the manufacturing parameters and mechanical properties of the products. Curve fitting techniques were used to find equations to express strength of final products as a function of pressure and temperature.

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Validation of AMSR-E SWE Data Using In-Situ NCDC Snow Depth Records Over the North America
Phillip Bacon, City College of New York

Validation process is critically needed to better understand the accuracy for retrieving Snow Water Equivalent (SWE) using microwave remote sensing data. The accuracy of remotely sensed SWE values has always been a concern for water resources management, flood forecasting and effects on climate.

This study presents the validation of the Advanced Microwave Scanning Radiometer-Earth Observing System (AMSR-E) using AMSR-E Daily Level 3 SWE data. The ground-based measurements of the snow depth from National Climate Data Center (NCDC) have been used as a standard map to validate the accuracy of the AMSR-E data for 2008-2009. The study areas include northern parts of US and Canada. The AMSR-E global SWE data which are stored in Hierarchical Data Format Earth Observing System (HDF-EOS) is ordered from National snow and Ice Data Center (NSIDC). Files stored in HDF are converted into binary format to perform time series analysis and station-wide comparison.

Acquisition of AMSR-E SWE data and NCDC snow depth achieves for the 2007-2008 two year periods was successful. The latitude and longitude data grids for AMSR-E SWE were obtained successfully as well. AMSR-E data stored in HDF files were converted to binary format using MATLAB programming. Several codes have been written to complete the "Station-wide comparison and validation" steps but none of them is perfect enough to give results that would allow me to draw conclusions. Future works are to perform a statistical comparison between the AMSR-E snow water equivalent and the corresponding NCDC observing stations.

Results will be analyzed to determine the accuracy of the AMSR-E snow product. Vegetation, snow density, snow grain size, and metamorphism snow could produce inaccurate results. Therefore, regional studies are important to lower the errors caused by forests and mountain region, for improvement of accurate SWE calculations.

[This study was supported and monitored by the National Oceanic and Atmospheric Administration (NOAA) under Grant No. ATM-0755686. AMSR-E/Aqua L3 global SWE EASE-Grids were provided by the National Snow and Ice Data Center in Boulder, Colorado. Great thanks to my mentors, Christen Chen, Nasim Nourozi and Tarendra Lakhankar for suggestions and help throughout the Summer Crest-REU program at The City College of New York.]

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Using Meteorological Data from NOAA Geostationary Satellites to remove water contamination for Earth Defense Satellite Observations
Gary Bouton, City College of New York
Barry Gross and Crae Sosa, City College of New York

Early warning of threats such as missiles or fires requires accurate observation of the earth in the infrared. Unfortunately, in the spectral bands of interest, water vapor contamination obscures the signal making it hard to evaluate the strength of the thermal source. Current approaches attempt to estimate the water vapor contamination based on historical climate data but such an approach is clearly prone to errors. A better approach would be to use the Meteorological data that could be obtained from GOES observations to provide the data needed for correction. To this end, in conjunction with Northrop Grumman, we have been working on a project to develop a neural network that will be fed certain parameters from the GOES Satellite such as temperature and pressure profiles and estimates other variables such as Aerosol Optical Depth to the highest possible accuracy, over a very large region. Using the neural network (NN) will allow the correction to be done in near-real time.

To train the neural network, we need to provide realistic water vapor and temperature profiles at the pressure levels that mimic the NOAA water vapor and temperature retrieval products. Full profile data were obtained from radiosonde from HYSPLIT available for download on the NOAA Air Resources Laboratory Website (NOAA ARL).

Conclusions from preliminary research is using only total water column information is not sufficient to estimate the effective optical depth needed to correct IR images. The training of a NN using three temperature and three water column inputs consistent with GOES retrievals resulted in much better estimates of the effective optical depth. The NN was extended to work at any observation angle by varying the angle of observation randomly during the testing phase.
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Behavior of a Passive Scalar in a Grid Generated Turbulence

Gabriela Bran, University of California Los Angeles, Los Angeles (UCLA)

A passive scalar is a contaminant that diffuses in a flow without having any dynamic effect on the fluid motion. An example of a passive scalar is a small temperature change on a fluid. The temperature change can be easily introduced into a turbulent flow by heating several fine wires placed in the turbulent flow. A thermal wake is created by this procedure, and then it diffuses in the flow. One of the most important contributions of the passive scalar studies has been mixing of pollution, since pollution can be analyzed as a passive scalar.

The goal of this experiment is to study the mixing of the heated wake in a grid-generated turbulence generated in a wind tunnel to understand the behavior of a passive scalar that is diffusing. To gain this understanding, the profiles of the mean temperature and the centerline mean temperature are obtained and analyzed, as well as the temperature PDFs of the centerline. The centerline mean temperature decreases as the flow moves downstream. The behavior of the temperature change obtained when a turbulent grid-generator is used was very similar to the change observed in a turbulence created by a cylinder. The temperature PDFs plots show the progression of the mixing of the heated air with the ambient air. It is concluded that the air mixes as it goes downstream. In further studies, a relationship could be found that predicts the location in which diffusion begins and some general diffusive characteristics.

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Aligning Stem Cells Using Polybutylene Terephthalate Scaffolds

Chelsea E. Brown, University of Arizona
John A. Szivek and David Gonzales, University of Arizona

A potential option for large focal defect repair and osteoarthritis treatment is cartilage regeneration using adult stem cells. Stem cells must be oriented in specific directions to regenerate strong hyaline cartilage. The focus of this study was to use polybutylene terephthalate scaffolds to align Adipose Derived Stem Cells (ADSC) along the patterned surface of the scaffold. Scaffolds were 11 mm in diameter, with 0.24 mm pores. They were cleaned in 100% ethanol, rinsed with DCF-PBS, and placed in Hank’s Balanced Salt Solution (HBSS). ADSCs were isolated from human peripatellar fat. Blood vessels and connective tissue were removed and the fat was minced and rinsed with PBS.

After digesting with a 1:1 ratio of 0.1% collagenase for one hour, samples were centrifuged and the fatty supernatant was removed. The resulting mixture was filtered through a metal and a 37mm nylon mesh and centrifuged. The supernatant was aspirated. The cell pellet was resuspended in Stem Cell Expansion Media (SCEM). SCEM contained Dulbecco’s Modified Eagle Medium, with 10% Fetal Bovine Serum, 2.5ng/mL Transforming Growth Factor Beta-3, 2.5 ng/mL Epidermal Growth Factor, and 5 ng/mL of Bovine Fibroblast Growth Factor. Cells were trypsinized and counted. Twelve scaffolds were seeded; six at a density of 57,500 cells/scaffold and six at a density of 28,750 cells/scaffold. SCEM was used to fill wells which also contained agarose and was changed daily.

A second experiment was performed with densities of 118,500 cells/scaffold and 59,250 cells/scaffold. At three, five, and seven days, the scaffolds were removed from the wells, fixed, dehydrated, critically point dried, and sputter coated for viewing with a scanning electron microscope. The first experiment showed no cells. The second showed cells attached to the scaffold, but contaminants were also present.

Results suggested that ethanol was inadequate to properly sterilize scaffolds prior to seeding. This allowed bacteria to grow and prevented cell attachment. Experiment two was done with higher densities of ADSCs and some cell attachment was noted, however cells were not aligned. Contamination may have affected both attachment and alignment. Additional experiments are underway with properly sterilized scaffolds. In addition, a control scaffold without cells will be utilized to monitor potential contamination. [This study was supported in part by NSF grant CMMI 0855493 and by a student support grant through LSAMP/WAESO.]

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Synthesis and Characterization of Advanced Novel Composite Materials

Lawrence Bustos, University of New Mexico
Ben Rael and Tariq Khrashi, University of New Mexico

The purpose of this lab is to research and understand material properties and process parameters of pure Zinc (99.9%) and Zinc/Alumina (Zn 10 wt % Al2O3) composites using Powder Metallurgy (PM) methods. In this test, the Zinc and Zinc/Alumina composites are compacted at 150 MPa and 300 MPa to understand how different compaction pressures affect Vickers-Micro Hardness (HV) and density of test samples. The importance of understanding compaction pressure and its relation to density of powder compacts is to optimize efficiency in producing solid materials for manufacturing. The relationship
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between compaction pressure and hardness is related to a material deformability.

It is hypothesized that under higher pressures the Zinc and Zinc/Alumina powder compacts achieve higher densities and HV values. By adding a reinforcement particle, such as Alumina to Zinc, HV values should also increase. Zinc and Zinc/Alumina tablets are formed using cold compression techniques. After compressing the Zinc and Zinc/Alumina samples at the two prescribed pressures, HV tests are applied to measure the diagonal distance of the imprint left by the diamond tipped indenter.

During the Vickers testing a 50 gram load is applied to the tablet for 10 seconds which leaves an impression on the surface of the specimen in a diamond shape. After removing the load, the diagonals of the indentation d1 and d2 are measured. The average of those diagonals, d, is used to calculate the hardness. The Vickers hardness number (HV) is calculated by the following equation:

\[ HV = \frac{2000 P \sin(\alpha/2)}{d^2} = \frac{1854.4 P}{d^2} \]

Test results revealed an increase of hardness of composites compared to pure Zinc compacts. This occurred because the particles of alumina are much harder than the Zinc particles, and act to impede dislocation movement. The increase in pressure from 150 MPa to 300 MPa also increased the hardness of both the composite and pure zinc compacts as stated in the hypothesis. The high compaction pressures forced the particles to be closer, thus decreasing the porosity and increasing the overall strength of the powder compacts. [Research project was supported by a grant from the Western Alliance to Expand Student Opportunities/NSF awarded to Undergraduate Lawrence Bustos., Mechanical Engineering Student, University of New Mexico, Albuquerque, NM 87106.]

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Semi-centrifugal Casting and Quality of the Product

Naseer Conway, Virginia State University

Solidification process (metal casting) is a common process to manufacture parts with complex geometry with different metals. There are numerous possibilities for things to go wrong in a casting operation, resulting in quality defects in final product. This paper concentrates on using semi-centrifugal casting to improve quality of the products manufactured by solidification process.

In this study, semi-centrifugal casting was performed by using a pre designed and fabricated permanent mold which can be rotated with a variable speed motor. The speed was controlled to get G-factor up to 10 at the edge of the mold. Products with different rotational speed are produced and went through metallurgical studies to spot casting defects such as cavity. The products also prepared to be studied for mechanical properties such as tensile strength and hardness.

The study showed that quality of casting and mechanical properties of the products remain practically constant above the G-factor of 5. Further study is required to investigate the pouring temperature on quality of casting.

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DeNovo: An Innovative Hardware Design for Parallel Computing

Eric Corbett, Savannah State University, GA

Shared memory is complex process. With current shared memory models, it is difficult to design large parallel hardware that is scalable and energy efficient at reasonable costs. Current design is not software-aware and does not lend itself well to parallelism. As a result, the performance enhancements made possible by parallelism cannot be achieved.

The objective of this project was to develop a new multicores memory hierarchy that takes advantage of disciplined parallel programming. This new design will make shared memory much less complex resulting in more scalability, energy efficiency, and greater performance. Multicore computers are necessary to continue to realize the performance increases promised by Moore’s Law. This can only be achieved by parallel processing. Scalability will be of paramount importance. Shared memory must become simplified. A complete system simulation was used, consisting of a memory timing simulator (GEMS) and a full system (OS) simulator (Simics). Four applications are used: FFT, LU, Blascholes, and Swaptions. The applications are run on the current protocol (MESI) with varying numbers of processors. The main focus was overall cycles, with the actual cycles broken into compute, memory, and synchronization. The applications stats are analyzed to determine opportunities for improvement on Denovo.

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The Design of a Low Noise Amplifier for Radio Frequency Applications

Elba Coronado, California State University, Chico
Matthew Guidry and Professor Patrick Yue, University of California, Santa Barbara

A low noise amplifier (LNA) is critical in providing us the capability of reading small signals from various sources. For systems where the signal is transmitted along large distances, the signal power degrades; and thus in radar systems when the signal bounces off an object and back to the receiver, it is quite small. Therefore, a well designed low noise amplifier is needed
at the receiver so that signal can be recovered and read clearly to extract the data.

The main objective of this project was to gain experience in radio frequency amplifier design and to learn the concepts and tools to achieve a successful design. Using the Advanced Design Systems (ADS) Design kit, we picked a Gallium Arsenide Hetero-junction field effect transistor from California Eastern Laboratories that has a typical Noise of 0.35dB and Gain of 13.5dB at a frequency of 12GHz. We determined the bias point for a power supply voltage of 3.0V at a frequency of 14 GHz that would provide low noise with a reasonable high gain.

We designed an input matching network for low noise and output matching network for high gain for both the first and second stage amplifiers. After we cascaded them, we achieved a low noise of less than 2dB, a forward gain of 17dB, and an output return loss less than -40dB. This design will be helpful in producing low noise amplifiers to be used in many applications including part of a modular system for an adaptive automobile cruise control system. Our next step in the adaptive cruise control system would be to design a power amplifier. [This work was supported by the MRSEC Program of the National Science Foundation under Award No. DMR05-20415.]

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Assessment of Environmental Benefits Provided by Use of Green roofs for Baltimore, Maryland

Christopher Courtney, Morgan State University, MD

The Chesapeake Bay is in a critical condition due to its poor water quality. Metropolitan areas such as Washington DC, Virginia and Baltimore produces large volume of storm water runoff due to excessive amounts impervious surface. As result, nutrients such as nitrogen and phosphorus empty into smaller rivers, which ultimately empties into the Chesapeake Bay.

There are several ways to reduce the amounts of storm water runoff and one way to do that is through green roof technology. Green roofs are conventional roofs that are covered and layered with vegetation. Through several studies and experiments green roofs not only reduce the amount of water run off, but it provides insulation, a habitat for wildlife, and it helps reduces temperatures in an effort to prevent the heat island effect.

In this study, green roofs are analyzed in Baltimore City. By using screening models: Long Term Hydrologic Impact Model (L-Thia) and L-Thia Lid, results show that increasing the percentage of green roofs through out the city of Baltimore will result in 1.7 billion gallons of runoff reduction which is a 24.8% reduction of storm water every year. As a result increasing the amount of green roofs in Baltimore city will decrease the amount of storm water runoff and pollution the Chesapeake Bay would receive.

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Fabrication and Flying a Payload to the Edge of Space as Part of The “PACER” Program at Dillard University

Benson Dabney, Dillard University, LA
Renée Benjamin, Abdalla Darwish, and Bernard Singleton, Dillard University, New Orleans

Through the “The Physics and Aerospace Catalyst Experiences in Research (PACER) Program for Minority Institutions” which is supported by the National Science Foundation we are involved in designing, building, assembling, programming, and testing a small balloon science experiment, and the flight of this payload to the very edge of space.

The main goal of this project is to design a research program which will attract/retain students into STEM by providing them with a systemic mentored research experience during the academic year. This program will build skills, techniques and methodologies applicable throughout their science career, establish a core of expertise at Dillard University around which a local sustainable student research experience program can be developed. And a partnership with other minority institutions as they implement their local student research experience program.

The first Dillard University team consists of two faculty and three students. During the Fall 2010 semester research experience, we used established course materials from LSU. The experience was designed to build skills in electronics, real-time programming, design and management which we applied to the design, fabrication and operation of a small science experiment (~ 1.1 pounds). This was carried to the edge of space (~100,000 feet) by a helium filled sounding balloon. Fabricating the balloon involved many aspects of payload thermal tissue calculations to insure the proper selection of the materials, designing, building techniques, programming and testing.

This poster will layout the blue print of the payload experiment, flying the sounding balloon, the video, and the data collected during the flight then compare this data to NOAA data for the same day and time of the flight. In addition, the poster will explain how to establish such a research program at other minority institutions. In conclusion, even with all the challenges to build the needed broad-skills to carry out such a complex project and establish such a program at Dillard University, the project was a success and it demonstrated that such a major project can be established. Also a collaboration with other HBCU/MI’s can be achieved through systemic mentoring and collaboration. [This project was supported by NSF through LS-LAMP and TESSE (Transforming Earth Science system Education) program.]
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Smaller the Bigger: MEMS Resonators and AFM

Robert Dextre, Binghamton University, Binghamton, NY

Micro-Electromechanical Systems (MEMS) can be described as devices that enable the technology of smart products. This research focuses on MEMS resonators and this presentation will be discussing the controllers available for its performance. Mathematical models and assimilation will be displayed to show the responses of a linear vibrating mass-spring system similar to the responses of the MEMS devices. There are also methods to stabilize these devices from environmental factors.

Furthermore, we will see the basics of the operation of Atomic Force Microscopes (AFM) which will be seen as an example of a commercialized MEMS resonator. This research has been conducted using computational mathematical methods that involve MATLAB; and the result displays the behavior of a MEMS Resonator in a displacement versus driving frequency graph.

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Evaluation of FDM extruded Polybutylene Terephthalate scaffolds for cartilage tissue regeneration

Nicklaus Diggins, University of Arizona
Greg Heden and John A. Szivek, University of Arizona

Scaffolds are vital for engineering large segments of cartilage tissue. The alignment of cartilage cells and corresponding extracellular matrix are critical to achieve appropriate cartilage material properties. Scaffolds can facilitate cell alignment; however the quality of the cartilage varies with the type of material used in the fabrication process, the process itself, and the design. Polybutylene Terephthalate (PBT) is a biocompatible material providing a long-lasting support structure for bone growth and has been shown to facilitate bone and cartilage cell adherence when coated with hydroxyapatite. Chondrogenesis (cartilage cell proliferation) is noted on the surface of PBT when appropriate growth factors are used. Fused deposition modeling offers a reproducible method of building scaffolds with appropriate interconnected pores.

This study involved the design of a medial condyle surface (inner surface) for the femur (thigh bone) of a large animal model (canine). We hypothesized that PBT scaffolds will be mechanically stable and support bone ingrowth and cartilage tissue regeneration. Scaffolds were designed with Solidworks and saved as .stl files.

These files were adjusted with Quickslice and built with an FDM1650 rapid prototyping machine. Scaffolds were tested with a servo-hydraulic materials testing system (MTS). 16 Scaffolds were loaded to 5kg in shear and 21 scaffolds were loaded to 30kg in axial compression (14.85 and 25.73 MPa respectively). In comparison, the compressive yield stress for PBT is 57-97 MPa, the bending yield stress is 85-125 MPa, and the yield stress of trabecular bone is approximately 12 MPa. A finite element model (FEM) was made of the design using Abaqus 6.5. In this analysis a pressure of 35 MPa was applied to the scaffold, exceeding the load of 40kg applied to the scaffold during mechanical testing. The highest principle stress in the model was 14 MPa; which indicated that the scaffold will be safe within the knee. This scaffold has been implanted in-vivo, and results demonstrate bone and cartilage growth. No scaffold degradation has been noted. Future research will involve mechanical testing of scaffolds in a Daro Foam mold of the Medial Condyle. [This study was supported in part by NSF grant CMMI 0855493 by a student support grant through Western Alliance to Expand Student Opportunities (LSAMP/WAEOS).]

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Satellite Remote Sensing Application for Drought and Agricultural Monitoring: Study African Countries

Gilbert Fahnbulleh, Hunter College, New York NY

Using satellite data derived from Advanced Microwave Scanning Radiometer-Earth Observing Satellite (AMSR-EOS) and CMorph precipitation estimates to study Soil Moisture and monitor Droughts in Africa. Most countries in Africa have erratic pattern of dryness and wetness as a result of seasonal changes. Due to extreme evapotranspiration, the water cycle of the earth surface is impacted on a regular basis.

The study focused on the level of water depth in the soil necessary to grow crops and the continuity to absorb water while preventing flash floods and runoffs. The data provided an analysis of soil moisture for six consecutive years (2004-2009). Further, statistical analysis of Agricultural land, Arable land, Crop Production Index and the Agriculture value added per worker from the World Bank data files provide a thorough understanding of soil moisture as it relates to crop cultivation.

The Agriculture land area is the total land available for cultivation with a complete disregard to combining factors that foresee the possibility of farming. These factors include: soil, tools, water systems, infrastructures, transportation, farmers, etc.

The Arable land is land that is nurtured with necessary elements such as water and soil nutrients for the possibility of crop growing. It is a dependent variable based on the total amount of land availability. The Crop Production Index shows the agricultural production for each year as it relates to the base period. Agriculture value added per worker measures the nominal agricultural production as an output of the agricultural sector based on GDP per capita.
The purpose of this research is to understand the impacts of poor soil on the economy and agriculture. The analysis indicates a quality results that draw the conclusion to the effect of droughts on economies in Africa. Finally, poor soil moisture and droughts have an impact on a country’s GDP and because it directly affects the agricultural sector and as a result limiting the agricultural growth.

Thus, this study further provides the fundamental cause of the economical disadvantages experienced by some countries in Africa. For future work, rain, precipitation and NDVI patterns will be analyzed to reduce errors in the analysis of satellite data from ground based data for droughts examinations. [This study was produced by the City College of New York (CCNY) in coordination with the Research Experience for Undergraduate (REU), funded by the National Science foundation Grant No. ATM-0755686 (NSF) under the supervision of the National Oceanic and Atmospheric Administrative-Cooperation Remote Sciences and Technology Crest (NOAA-CREST).]

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Integrating Measures of Travel Time Reliability and Related Carbon Monoxide Impact

Flor Favela, San Jose State University, CA
Hana Kim and Ashlee Youngpeters, University of Cincinnati

Measures of travel time reliability not only represent a commuter's travel experience, but also better reflect the efficiency of transportation systems in the concerned area. Delay, which is usually caused due to congestions, is a critical contributing factor to the travel time reliability. The measures of delays and estimates of travel time reliability will be useful to drivers if the information could be available on the real-time basis, so as to increase the chance for the drivers to timely plan their routes and schedules with attempt to avoid congestion. As a result, waste of excess fuel could also be avoided or reduced.

This poster presents results of a NSF REU project in which the method for integrating measures of travel time reliability and CO (Carbon Monoxide) concentration levels is explored. The delay was measured using the data obtained from vehicles equipped with Global Positioning System (GPS) data loggers along a selected route during morning, evening, and non-peak hours of typical week days. Traffic on freeway at a designated study site is videotaped and the traffic volume and vehicle trajectory data are extracted from these videos using the software VEVID. Meanwhile, CO levels at a selected location along the route are monitored using a T-15 sensor.

Data analysis and calculations result in travel time index, buffer, index, planning time index, and estimates of vehicle specific power (VSP). Finally, the relationship between CO level and traffic volume and CO vs. VSP are also analyzed. The results bring a number of implications that are helpful to our better understanding of travel characteristics at varying times of a day within the studied area. Preliminary modeling of relationship between CO concentration levels and VSP is successfully resulted from the above analyses. Although the small sample size limits its value to real-world applications, the method is tested and validated feasible for further effort in the future research. [This study was done as a part of the University of Cincinnati 2010 Summer NSF REU Program, and was funded by NSF Type 1 STEP Grant, ID No.: DUE-0756921, which was granted to Dr. Anant Kukreti, Professor and Associate Dean for Engineering Education, College of Engineering and Applied Science, and Dr. Heng Wei, Associate Professor at University of Cincinnati.]

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Reducing transmission Errors in Wireless Communication Systems

Eric Glover, Virginia State University

Wireless communication systems play an important role in our daily life. Cell phones, satellite TV, and GPS are just a few examples of such systems. While traveling through harsh communication channels, the wireless signals will be mixed up with interfering signals. At the receiver end, the resulting received signals are weakened and contain data errors. These errors are changes in the bit pattern caused by interference, noise, or equipment malfunctions. Such errors will cause incorrect data to be received. The larger the amount noise present, the greater the number of bit errors.

Error detection and correction are techniques that enable reliable delivery of digital data overrun noise communication channels. Error detection techniques enable detecting such errors, while error correction enables reconstruction of the original data. Just imagine a cell phone service that did not provide error detection and correction for their customers. All the noise and interference would result in the received signals being very noisy, thus make customers very unhappy. It might also affect various other things such as billing and call management.

Therefore, reducing errors during transmission has great practical importance in maintaining data integrity across noisy channels and less-than-reliable storage media. There are many error correction methods. The simplest error correcting method is to encode signals with redundancy bits before transmitting the signals, so that receivers can check consistency of the delivered signals and recover data that contains errors in order to improve the performance of a system, which provides a method for dealing with the unknown noise. Thus, this method is widely used in many digital systems.

However, this method also has several costs and trade-offs. Apart from needing an extra encoder and decoder, signals encoded with redundancy bits must transmit more data for the
same amount of information, which requires more time to transmit the same amount of information using a fixed bandwidth.

Also, increasing the number of redundancy bits decreases the errors, but increases the time required to transmit and increases the time required to process. Important reasons to use coding are: dependable data storage in the face of minor data corruption/loss, and providing high precision input and output even on noisy transmission lines such as cellular phones, error coding decouples message precision from analog noise level.

The paper presents the results of simulated wireless communication systems. A text signal is encoded with redundancy bits, and then transmitted through very noisy channels. The relationships between the number of redundancy bits, bit error rate, and transmission time are studied and presented.

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Position Control of a Magnetically Levitated Ball Using PID Control and Infrared-Hall-Effect Sensors

Lourdes Gutierrez, Eastern New Mexico University
Hamid Allamehzadeh, Eastern New Mexico University

This project is a continuation of the last spring magnetic levitation project. In this project students use the developed Magnetic Levitation System (MLS) assembly to collect data on the parameters of the MLS. The collected data would be used to derive and verify the nonlinear model that was developed last year. Using MATLAB software, students develop a few linear models around some specified operating points. Linear control theory and MATLAB are used to design PID and other linear controllers that can levitate the ball at a few specified positions.

MATLAB software will be used to simulate the composite system and evaluate its overall performance. The designed controller will be implemented in the lab using analog electronic components. Hall-Effect sensors are used to identify and measure the position of the ball at any time. The sensors’ output voltages are employed to update the control action. Magnetic suspensions are receiving increasing attention as a means of eliminating Coulombs friction due to mechanical contact. Magnetic levitation systems are widely used in various fields, such as frictionless bearings, high-speed trains, levitation of wind tunnel models etc.

High-speed train suspension in Japan and Germany, magnetic bearings, rocket-guiding projects, and superconductor rotor suspension are some of numerous examples of industrial applications of magnetic levitation theory [6]-[9]. By participating in this project, students will learn how to develop the mathematical model of a physical system using collected data from the laboratory. Sensors are indispensable parts of the industrial world and the students need to learn about their functions and applications.

Overall, by working on this project, students obtain valuable experience in application of control theory in industry. Data are collected in the laboratory using a magnetic levitation system and a ball. The collected data are analyzed and fitted into a polynomial model using MATLAB numerical techniques.

In this project all linear controllers are designed using MATLAB control Toolbox. Hall-Effect sensors are tested in the lab to compare the manufacturer provided data with the experimental data. The collected data are incorporated into the overall design of controllers. The performance of the overall feedback control system is also evaluated through MATLAB simulation and laboratory implementation.

[This study was supported by Western Alliance to Expand Student Opportunities (WAESO) Arizona State University and monitored by Hamid Allamehzadeh, PhD, Eastern New Mexico University, Portales, New Mexico, 88130.]

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Precision Control of a Surgical Robot

Juan Hernandez, University of California, Los Angeles

The research conducted was to investigate digital motion control of a robotic manipulator for manipulation of a surgical instrument. Surgical eye procedures, such as a vitrectomy, are instrumental in improving the vision of individuals suffering from various conditions. Certain surgical tasks require complex procedures by the surgeon, while others are hampered by the surgeon’s susceptibility to fatigue and distraction or limitations of manual surgical instrument manipulation.

The hypothesis being tested is that feedback control will be able to generate instrument motion that eliminates the tremor caused by human hand manipulation. Performance of the controller will be based on vibrations measured by accelerometers. In order to design a digital controller, a mathematical representation of the system being controlled is needed. To obtain the system’s model a sine sweep test was conducted on the robot, which records the system’s amplitude and delay to a series of sine waves.

The data collected was used to obtain a representation of the robot and to select the type of controller. A lead compensator was selected, because it could keep the system stable and follow the reference input rather well. Next, the natural nodes of the system and the frequency of hand tremor needed to be filtered out via the controller. The current controller filters the natural frequency of the system. In application of this controller it is noted that as the vibration of the robot is reduced there is
an increase in the phase between the reference and output signals.

The next step of the project is to filter the frequency of hand tremor. Upon completion of the filter, the controller must be optimized in order to find an acceptable trade-off between vibration and delay. [This study was funded by a grant from NIH NIGMS 55052.]

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Isolated and Non-Isolated Bi-Directional DC/DC Converters for Formula Hybrid Racing ElectricVehicle

Marcus Howard, Fort Valley State University, GA
Ali Emadi and Alireza Khaligh, Illinois Institute of Technology

The SAE International Formula Hybrid competition challenges undergraduates and graduates to design, build, and race high-performance hybrid vehicles. The goal is to better the overall efficiency in comparison to the standard ICE vehicles. From this research, an evaluation of two different isolated uni-directional DC/DC converter topologies, a phase-shifted full-bridge ZVS PWM converter, and a duty-cycle shifted half-bridge ZVS PWM converter, will be examined.

The objective is to determine which inverter minimizes losses and is the most efficient. The configuration will consist of 30 individual cells in series and 8 strings in parallel giving a nominal system voltage of 110V and a capacity of 48Ahr. The powertrain configuration will be four independent electric drive utilizing four outboard hub mounted motors. A permanent magnet DC motor will be coupled with an internal combustion engine to form a genset. The approximate value of the horsepower outputted by the motors was 120hp. The genset will output at least 1.6kW.

Also, isolated buck converters will enable operation of the electric clutch, motor controllers, microcontrollers, lights, relay coils, back-up battery pack, and the DAQ. MATLAB was the software used to conduct simulations of the proposed circuits. With the use of the SimPower Systems library, unidirectional and bidirectional DC/DC converters were designed and simulated.

Although, there are overall loses, the designed system has dynamic efficiency readings. The efficiency for buck mode operation during conventional PWM switching was 96.95% and for synchronous rectification PWM it was 98.13%. The efficiency for boost mode operation during conventional PWM was 98.6% and for synchronous rectification PWM it was 99%. The bidirectional DC/DC converter successfully responded to the changes.

The duty-cycle shifted PWM controlled half-bridge DC/DC converter has identical voltage-second values and magnetizing B -H of the transformer and matching voltage and current stresses in the primary side and secondary side. The duty-cycle shifted PWM ZVS half-bridge DC/DC converter in comparison to the conventional ZVS PWM half-bridge DC/DC converter is more efficient. [This research was supported, in part, by NSF Grant number 0852013 and a grant from NSF HBCU-UP (#HRED-0625289) awarded to Sarwan Dhir, PhD, Director for the Center for Biotechnology, Fort Valley State University, Fort Valley, GA 31030.]

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Exploration of Co-varying Oceanic Parameters in Vicinity of Coral Bleaching Events

Gena Israel, Hunter College, NY

Coral reefs are vital marine organisms that help maintain the biological productivity of the oceans. Coral reefs not only provide ecological services but provide a significant amount of economic value in the form of tourism and fishing. They also happen to be extremely sensitive to changes in their environment. Coral reefs can experience stress in the form of bleaching as a result of anthropogenic and natural disturbances. Anthropogenic climate change, specifically global warming may be one of the factors causing coral reefs stress. It is known that a change in sea surface temperature (SST) as small as one degree from the average (specific to that region and time of year) can have the potential to cause bleaching of the corals, and in worst case scenarios: their mortality.

Thus, a method of identification coral reef bleaching events has already been implemented by NOAA’s Coral Reef Watch Program. In this approach, SSTs were the main variable monitored for their correlation with coral reef bleaching, with strong correlations being observed between temperature rise and bleaching events.

The work being pursued here seeks to explore additional correlations that may exist between other observable ocean parameters and SSTs and coral bleaching. These parameters include chlorophyll concentration [Chl] and fluorescence, both of which are readily derivable from satellite observations.

Once such correlations, if any, have been determined, they may then be amenable to the application of statistical classifier techniques to improve identification or prediction of bleaching events. In the initial work we have used MODIS Aqua data, processed using SeaDAS, to determine the [Chl] timeline in the vicinity of a recent bleaching event that occurred in March 2010 near an island south of Australia, called Lord Howe Island. Examination of the variation of [Chl], SST and coral bleaching is underway. [This research was made possible by the funding provided by the National Science Foundation.]
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Carbon Dioxide Sequestration Using Gas Absorption in a Packed Tower: Design and Analysis

Jonathan Jeffries, North Carolina Agricultural and Technical State University

Carbon dioxide has been named as a Greenhouse Gas (GHG) and has also been identified as a suspected participant, with CH4 and N2O, in global warming phenomena on the planet. The capturing, or sequestration, of CO2 gas has been proposed as one of many solutions to the potential problems posed by increasing GHG concentrations in the Earth’s atmosphere. Carbon dioxide has significant applications in the food & beverage industries, synthetic fuels & oil recovery technologies and in the production of various materials & pharmaceuticals. The use of gas absorption packed towers for sequestration CO2 would provide a well-established industry-accepted secondary treatment technology for the collection of carbon dioxide from flue gas streams for possible reuse in numerous process applications.

In this project, a gas absorption system in the Chemical Engineering Unit Operations Laboratory at North Carolina Agricultural and Technical State University will be retrofitted for CO2 capture in a flowing H2O stream. The phase equilibria of the CO2-H2O system will be modeled based upon thermophysical properties and compared with reported literature data. The existing scrubber system will be optimized using fundamental transport phenomena theory. The effects of feed stream composition, temperature, pressure, flow rates, and packing materials on CO2 separation and any subsequent CO2-based reactions of will be determined. [Talent 21-funding.]

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Towards a Humanoid Robot Speech Pathologist for Pediatric Fluency Speech Disorder

Chanel Johnson, Spelman College

The purpose of this research is to investigate the feasibility of humanoid robots to act as speech pathologists for fluency disorder in children. Fluency disorder is a speech disorder in which the normal flow of speech is disrupted by frequent repetitions or prolongations of speech sounds, syllables, or words or by an individual’s inability to start a word.

The speech disruptions may be accompanied by rapid eye blinks, tremors of the lips and/or jaw or other struggle behaviors that a person who stutters may use in an attempt to speak. Certain situations, such as speaking before a large group of people or talking on the telephone, tend to make stuttering more severe, whereas other situations, such as singing or speaking alone, often improve stuttering. This disorder frequently happens in young children between the ages of two and six who are developing language skills. We investigate the feasibility of robots to be used as a qualified speech-language pathologist that can clearly articulate sentences and words to children.

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Mechanical Properties of Zinc and Zinc/Alumina Powder Compacts

Kisa King, The University of New Mexico

The Powder Metallurgy (PM) route is an attractive fabrication technique for the mass production of materials at a more economical cost. PM is also a convenient fabrication route widely employed for producing composite materials. The purpose of this experiment was to test the difference in hardness and density of 99.99% pure Zinc and Zinc/Alumina (Zn10wt%Al2O3) powder compacts by utilizing the PM techniques.

Samples of both pure Zinc and the composite powder were separately compressed at 150 MPa and 300 MPa. After which a Vickers Micro-Hardness (HV) test was conducted. Zinc and Zinc/Alumina tablets were compressed using an Instron Hydraulic Press, with a load capacity of 20,000 lbs at pressures of 150 MPa and 300 MPa. However, the Zinc and Alumina had to be mixed in a planetary ball mill prior to its weighing out, this was to ensure a homogeneous mixture.

HV tests were conducted, during which a 50 gram load was applied to the tablet for 10 seconds, on the smoothest area of the tablet possible. After the load was then removed, a pyramidal indentation was left on the surface of the sample, from these pyramidal indentations we calculated HV. This was repeated five times for each sample. Density measurements were also taken using standard techniques in order to obtain values at each pressure.

According to the data collected, it was indicated that the samples which received the higher pressure of compaction (300MPa), exhibited larger HV values. In addition, the Zinc/Alumina composites were also found to have higher HV values than the pure Zinc, at both compaction pressures. This may be due to the fact that the Alumina particles are harder and much smaller than the Zinc particles, and therefore fill in the microscopic gaps between Zinc particles, therefore strengthening the metal material. Both Zinc and Zinc/Alumina compacts exhibited greater densities as compaction pressure increases. This is due to powder particles increasing their packing efficiency during the compaction process. As the density values increased there was also an increase in HV values (strength of tablet), this is due to a decrease in porosity.

Future research may include investigating average particle size (APS) and the effects of particle size on the material properties of powder compacts. In addition, we intend to compare the
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material properties of Zinc and Zinc/Alumina composites to that of Zinc/SiC composite. [This project was funded by the Western Alliance to Expand Student Opportunities (WAESO).]

272 Retention of Underrepresented Students in Engineering

Martha Rhea Lusk, Purdue University

This study is to qualitatively investigate the factors that contribute to retention of underrepresented undergraduates in engineering and compare those factors which have been identified for retention in undergraduate engineering in general. Through exploratory methods such as interviews of a limited sample size of five students will be audio taped and transcribed. This data will undergo a thematic analysis which will be used to narrow the factors in several general themes. The findings from the study have the potential to improve retention rate of minority populations in engineering. Additionally, students who volunteer to participate in the study may have the opportunity to reflect on those factors that had an impact on their retention or leaving engineering. [Special Thanks to LSAMP, Purdue and Dr. Zoltowski for there resourcing and funding.]

273 The Design of Experimental Anaerobic Digester for Organic Waste Processing

Cisse Mademba, University of the District of Columbia
Ismael Djibril and Charles Ogu, University of the District of Columbia

The ever growing demand for energy world-wide can only be met by considering the possible range of energy solutions, and the technology to produce emerging sources of energy, to reduce our dependence on oil, a non renewable fossil fuel. Renewable energy such as solar, wind, geothermal, biomass and alternative fuels are promising clean energy resources of the future, which are environmentally friendly and which sources replenish itself or cannot be exhausted. Biomass energy is derived from waste of various human and natural activities, including, municipal solid waste, manufacturing waste, agricultural crops waste, livestock manure etc., which are abundant anywhere and everywhere, at any time. Any of these sources can be used to fuel biomass energy production with the design of an efficient digester or processing plant to harness the energy from the biological mass.

Biogas is produced when organic matter is degraded in the absence of oxygen. The process, from degradation to gas production is called anaerobic digestion. This anaerobic digestion occurs naturally in wetland, lake bottom, and deep landfills. An experimental digester was built that converts cow manure and agricultural waste into methane-rich biogas that can be used as alternate energy resources to generate electricity or thermal energy.

The research in this study focuses on the feasibility of the design of an operational digester, the Thermodynamics analysis and calculation of the energy contents of the methane gas, system simulation of the dynamic behavior of the anaerobic digester process, and the detailed engineering design of the Digester tank. The study also examined the enthalpy change of formation of the elements involved in the reaction of combustion of methane and the heat exchanged during the reaction, in order to determine the conversion efficiency of the digester and the quantity of fuel that can be generated per day.

The economic viability of this technology, advantages, and the production cost compared to other renewable energy resources are also compared.

274 Cellular Microenvironment Modulates Cell Morphology and Gene Transfer to Mouse Mesenchymal Stem Cells

Maricela Maldonado, University of California, Los Angeles (UCLA)
Tatiana Segura and Anandika Dhalival, UCLA

Non-viral gene delivery is a promising field of study that has widespread applications in gene therapy and regenerative medicine. While non-viral gene delivery has the advantage of being safer and less immunogenic as compared to viral systems, it is limited by its efficiency. To enhance the efficiency of non-viral gene transfer the physical (size and charge of the nanoparticles) and chemical (chemical structure of the polymers) properties of the vectors have been extensively studied while the cell and its microenvironment have not. A previous study in the Segura laboratory has shown that when cells were plated on different extracellular matrix (ECM) proteins the efficiency of gene delivery changed.

Specifically, fibronectin was shown to enhance gene delivery, whereas collagen was shown to inhibit gene delivery in mouse mesenchymal stem cells (mMSCs). In order to understand the influence of the ECM on gene delivery, the cell morphology and the role of cell cytoskeleton was studied using fluorescence microscopy and cytoskeletal inhibitors such as nocodazole (inhibits microtubule polymerization), BDM (inhibits actin-myosin interactions) and cytochalasin D (interferes in actin polymerization).

We found that coating affects the cell morphology, with cells plated on fibronectin resulting in more spread cells than those on collagen I. Cytochalasin D treatment resulted in drastic decrease of cellular actin and complete dissociation of the stress fibers, while nocodazole treatment did not result in a significant change. Our results indicate that the cell cytoskeleton plays a
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role in mediating the influence exerted of the ECM on non-viral gene delivery. Such an understanding of how the cellular microenvironment affects the efficiency of non-viral gene transfer to mMSCs can aid in the design of effective strategies to genetically modify these cells and achieve their therapeutic potential.

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Wireless Sensor Networks for Lighting Automation in Commercial Buildings

Aime Mbakop, University of the District of Columbia, Washington, DC
Kamau Evison, University of the District of Columbia

It has been well documented that more than one third of primary energy generated in the United States is consumed in commercial buildings, and lighting alone accounts for approximately 30% of the energy used. Most traditional lighting systems in commercial buildings are totally dependent on occupants where lights must be manually switched ON and OFF. In these systems, light monitoring proves to be a very difficult task. Attempts at energy efficiency implementation are for the most part reduced to daylight usage and low power consumption fluorescent light bulbs. While solutions that enable the automatic switching of lights exist, these solutions are mostly wired, and because of their retrofitting and maintenance costs, they are not utilized in most commercial buildings. Lighting automation using wireless sensor networks (WSNs) presents an alternative approach which circumvents the high cost of wiring and maintenance.

In this paper, we first investigate the lighting systems presently used in the buildings at the University of the District of Columbia (UDC). Second, we survey the current automated lighting systems that employ WSNs, focusing on their power consumption and their range of communication. Finally, we investigate how ZigBee technology, a low-cost, low-power wireless communication technology, can be employed to design low power WSNs for lighting automation. [This study is supported, in part, by a grant from NSF/AAAS awarded to Freddie M. Dixon, Professor, Department of Biology, Director for the Center of Biotechnology and Biomedical Sciences, HBCU-University of the District of Columbia, Washington, DC, 20008.]

When it is necessary to follow a rapidly-varying x-ray intensity, a conventional ionization chamber (IC) may not be adequate, since it is sensitive to both electron and ion currents. The ion’s slower drift introduces a long time-constant into the chamber response, smearing out the high-frequency components of the signal. This is becoming a problem in recent so-called Quick-Extended X-Ray Absorption Fine Structure (EXAFS) experiment, where frequency components in the region of 100 kHz may be observed.

In order to overcome this problem, a Frisch grid was placed between the cathode and the anode of a conventional IC to shield the output signal from the slowly moving ionized gas positive ions and register only the faster velocity drifted electrons’ signal. We used a commercial high transparency steel mesh measuring 10 cm x 10 cm as a Frisch grid, sandwiched between a cathode and anode made from two copper coated Printed Circuit Boards (PCB). Two plexiglass spacers with the same rectangular dimensions as the Frisch grid and a height of 15 mm and 3 mm with reference to the grid constitute the reaction and the collections regions respectively. All the parts are tightly held together using O-rings and screws. The IC is filled with flowing Argon and has two small windows located in opposite sides of the reaction region plexiglass spacer to allow the x-ray beam to pass through in a direction perpendicular to the electric field of the IC.

The oscilloscope results show that the theory we proposed was true. The picture shows that the signal is purely due to the electrons and that the ions contribution has been completely shielded by the Frisch Grid. The conventional IC picture on the other hand, reflects mostly a slow decaying signal due to the slowly moving ions. We can conclude that the Frisch grid IC in fact can respond to fast changes in the synchrotron radiation beam as the electrons have very fast rising time. Results obtained are significant in a variety of fields; electrochemical, photochemical, catalysis, materials and environmental sciences among them, were time changing processes are involved. [This study was supported by Brookhaven National Lab and Louis Stokes Louisiana Alliance for Minorities (LS LAMP).]

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Glass Analysis, Characterization and Industrial Comparison for Improved Processing and Recovery of Cathode Ray Tube Glass

Julia R. Mueller, Ohio State University

Cathode ray tube (CRT) glass is a significant segment of the environmentally hazardous electronic waste being recycled. CRT glass lacks the option for direct reuse owing to the reduced production of CRTs and large number of oxides present that eliminates its use in industrial applications that require specific formula control. Academic researchers have preliminarily investigated the characterization of cathode ray tube glass to aid in the development and determination of viable recycled
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glass products. Of the glass analysis research to date, the historic trends of the CRT glass production industries have been largely ignored or simplified. Previous studies extensively characterized small segments of the CRT glasses available for recycle. Quality standards for industrial reuse requires recycled glass to have reliable batch consistency.

This study was undertaken to analyze and characterize the lead oxide content present in statistically significant CRT glass types in the recycle stream of a large-scale (>20 tons per day) electrics recycling facility and to establish historic formulation trends by manufacturer and year against published, range specific academic analysis to test the hypothesis that the lead oxide content of CRT glass has stabilized and stratified into distinct categories dependent upon time and manufacturer. The average size and age distribution parameters of recycled CRT products were estimated using recycling plant operations data and inventory intake declarations. The glass formulas of samples were established using x-ray fluorescence, XRF. The average size and age distribution parameters were determined to be 17-inch computer monitors produced between 1993 and 2002.

The stratification values were determined to be pre and post 1995 manufacturing by all manufacturers excluding Corning, Asahi Video and RCA, followed by Corning and Asahi Video post 1998. XRF analysis revealed that leaded CRT panel glass comprised approximately 10% of the recycled product stream. XRF analysis revealed that leaded CRT panel glass and black and white CRT glass could be combined for most industrial reuse purposes investigated and demonstrated that the segregation of black and white CRTs was unnecessary based on glass formula.

These data indicate that CRT glass formulas have predictable diversity with age and manufacturer given a large, representative sample of the products available for recycle and provides evidence to support the hypothesis that the lead oxide content of CRT glass has stabilized and stratified into distinct categories dependent upon time and manufacturer. Future research is proposed for the development of an automated glass sorting operation. [This study was supported, in part, by a grant from the US EPA Pollution Prevention Program awarded to the Hamilton County Solid Waste District of Ohio.]

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A Retrospective Analysis of Spinal Motion Restriction at the Richmond Ambulance Authority: A Plight to C-Spine Clearance in the Field

Samuel Nettey, Virginia Union University

For years, spinal immobilization of conscious patients; suffering from trauma due to falls, assaults, motor vehicle accidents, gunshot wounds to the chest, and blunt force trauma has been the standard intervention. This intervention requires that the patient have a neck brace applied, placed on a rigid backboard that extends from head to feet, and strapped in place.

The goal of this intervention is to protect the spinal column and minimize further damage to the spine. While spinal immobilization does help to protect patients from further spinal injury, it has several drawbacks and complications. Spinal immobilization of a patient requires time and resources, which can delay transport to the Emergency Department (ED). Once the patient is transported to the ED, a battery of test have to be conducted by the ED physician in order to remove (or clear) a patient from the spinal immobilizing backboard, neck brace, and straps.

It is during this prolonged period where other complications can occur. These complications include unnecessary pain and discomfort, airway and breathing difficulty, and even skin breakdown. In an effort to minimize these drawbacks and complications, and to aid in reducing ED waiting times, several studies have been conducted to determine if spinal clearance can be done successfully in the field by the EMS provider.

Thus, the purpose of this study was to investigate the possibility of spinal clearance in the field based on a seven criteria neurological assessment. It was hypothesized that patients who pass all seven neurological criteria will have no neurological deficits as a result of their injury. Data for this study was compiled from the Richmond Ambulance Authority (RAA) ePCR database system and comprised of all EMS calls placed from January 1, 2009 to December 31, 2009, with a call disposition for falls, motor vehicle accidents, gunshot wound-stabbing, traumatic injuries, and assaults that had a clinical intervention of spinal motion restriction (SMR). Outcome information was collect on 110 patients who were identified as having been spinal immobilized by RAA paramedics in the field and transported to a local area hospital. A categorical response of YES or NO was required to answer whether or not the patient suffered any spinal related neurological deficits.

The analysis revealed that, based on the seven criteria neurological assessment, all 110 patients did not suffer any neurological deficits related to their respective injury. In this litigious world, the decision to not spinal immobilize someone after a traumatic injury can be a costly one. Although the outcome information for 110 patients that were subjected to spinal immobilization over a one year period is not a significant sample to represent the tens of thousands of cases in which people are spinal immobilized as a result of a traumatic injury, it does however, lend credence to a programmatic approach to further investigate the need for selective spinal clearance in the field. Thus, further research should be conducted involving multiple EMS systems and hospitals, over multiple years, where hundreds of thousands of cases are evaluated to ensure that spinal clearance in the field by paramedics is a procedure of choice by EMS professionals. [This study was funded by the Richmond Ambulance Authority in conjunction with the Virginia Nebraska Alliance.]
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**Acid Diffusion in Chemically Amplified Resists under Sub-millisecond Post Exposure Bakes**

Florencia Paredes, Cornell University, NY  
Byungki Jung, Jing Sha, Christopher K. Ober, and Michael O. Thompson, Cornell University  
Manish Chandok and Todd R. Younkin, Intel Corporation, Hillsboro, OR

As suggested by Moore in 1965, the density of transistors in integrated circuits (ICs) has been doubling every eighteen months for over 40 years. Key to this trend has been continued advances in photolithography, and particularly in the development of chemically amplified resists (CARs) which are used today to pattern devices with features less than 50 nm. To remain on Moore’s Law, the resolution of photolithography must continue to be improved and, as lithography pushes into the sub-30 nm regimes, the ability to control photoacid diffusion during post-exposure bake (PEB) of CARs has become critical for controlling resolution and minimizing line edge roughness.

CARs generally contain a polymer resist backbone system with dissolved photoacid generators (PAGs). Exposed to UV light, PAG molecules decompose to create an initial concentration of photo-generated acids (protons). The chemical amplification scheme utilizes these generated acids to cleave protecting groups from the polymer backbone in a thermally activated post-exposure bake, typically performed at 90-150°C for 30-120 seconds on a hot plate. In this work, we explore the possibility of replacing the conventional hot plate PEB with a laser-based PEB (I-PEB) process operating at substantially higher temperatures of 150-250°C but for dramatically reduced times of 300-900 μs using a scanned laser source.

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**Fabrication of Dye-sensitized Solar Cells**

Rufus Peterson, Howard University, Washington, DC

The objective of the dye-sensitized solar cells research was to minimize the amount of energy needed, using dye, to transport energy from a solar cell to an outside source. Six grams Titanium Dioxide (TiO2) were measured and ground with an acetylacetone solution that was added in 1mL increments. Using the doctor blade method a thin layer was placed on the Indium Tin Oxide (ITO) slides. After a couple minutes the TiO2 covered slide was placed on a hot plate, preheated to 400 degrees Celsius, for an hour. Once the hour time period was up it sat for fifteen minutes to cool down; while cooling the dye solution was prepared, consisting of grape juice as a substitute for crushed berries. After the cooling period was completed the slide was placed into the dye solution upside down for a half hour. When that was completed a thin layer of carbon was placed on a separate conductive slide of ITO. The rest research for the project is still going therefore there are no definite results at this time.

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**Modeling and Simulation of the UC Irvine Campus Electric Service**

Karina Reyes, University of California, Irvine

In this project, a map of the University of California, Irvine campus is used to trace out the electric power distributed throughout the school. The campus is powered by a variety of sources that include on-campus generation of about 10MW at the central plant, distributed solar photovoltaic, and an external Southern California Edison 66kV source. There are a total of 10 high voltage 12kV cables connected to the substation that run throughout the school to deliver electricity from the sources to the loads. Each cable is individually traced out in the map in order to see the setup of the transformers and the connected buildings.

A separate drawing is then made that shows the path of each individual circuit and its associated buildings and transformers. The power usage for many of the buildings on campus is recorded at 15-minute intervals on an ITRON network that is used to generate load data. The building data is then put in a Matlab/Simulink file that creates a simulation using the transformers acquired from the map.

The objective of this project is to create a simulation that will generate insight into how the power is used at UCI, evaluate the effect of increased campus generation, such as the addition of more solar photovoltaic or another central plant generator, and find better ways to use the power.

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**Data Mining of Socio-economic Factors to Predict Violent Crime in Communities**

Jerome Rogers, University, St. Thomas U.S.V.I  
Mohammad Mustafa and Marc Boumedine, University of the Virgin Islands, St. Thomas

One of the key concerns the law enforcement agencies is how to enhance investigative effectiveness by analyzing large data sets that are collected from different sources. The main goal of this research is to predict crime patterns by using data mining tools.

The data sets that were used primarily focus on social and economic factors that contribute to obtaining information on the crime per capita ratio. The data were obtained from the machine learning repository at the University of California Irvine (http://archive.ics.uci.edu/ml/machine-learning-databases/communities/communities.names). Data sets were compiled from the 1990 US Census, the law enforcement data from the 1990 US LEMAS survey, and crime data from the 1995 FBI UCR.
The data sets includes variables such as the percent of the characteristics of the population, family income, education level, number of police officers, and percent of officers assigned to drug units. The per capita violent crime variable was calculated using population and the crime variables considered violent crimes in the United States such as murder, rape, robbery, and assault. In order to analyze these large data sets, an artificial neural network (ANN) predicts the unknown dependent variable, which is the per capita ratio given the values of the independent variables (socio-economic factors). The ANN has been trained using cross-validation and k-fold (k=2,18).

Our experiments show that selecting 21 socio-economical attributes with at 10-fold cross-validation generate the most accurate prediction. We obtain a high correlation coefficient value of 0.7126 and a mean absolute error being 0.1179. Additional indicators such as the root mean squared error at 0.1795, the root absolute error at a 66 %, and the root relative squared error being at a 77 % are encouraging and confirm that machine learning techniques are powerful tools to predict the crime per capita ratio using socio-economic factors. [This research is partially funded by NSF HBCU-UP - Grant Number HRD 0506096.]

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Vascular Endothelial Growth Factor Retains Cellular Activity While Bound to a Polystyrene Surface and Induces Cell Migration and Internalization
Shayne Siegman, University of California, Los Angeles
Sean Anderson and Tatiana Segura, UCLA

Although growth factors can exist as soluble and bound molecules in nature, the properties of bound growth factors have not been thoroughly investigated. In this research we are studying the properties of bound Vascular Endothelial Growth Factor (VEGF). Understanding the properties of bound Vascular Endothelial Growth Factor (VEGF) may lead to the manipulation of blood vessel growth at desired locations within the body, which can be used in the fields of medicine and engineering. The Segura laboratory has previously shown that covalently and electrostatically bound VEGF leads to VEGF receptor-2 (VEGFR-2) phosphorylation.

In this study we compare the migration of Human Umbilical Vein Endothelial Cells (HUVEC) and endocytosis of 300nm, 3µm and 10µm diameter particles that contain covalently bound VEGF on their surface. VEGF was covalently bound to amine-modified polystyrene beads through a Schiff base reaction and then characterized by an Enzyme-linked immunosorbent assay (ELISA), which confirmed that VEGF bonded specifically to both 3µm and 10µm diameter beads with a density of 400 pg/ml, and to 300nm beads with a density of 600 pg/ml. To confirm VEGF activity, the VEGF-bound beads were incubated with HUVEC cells for 5 minutes, and western blots confirmed phosphorylation at the p1175 tyrosine.

A migration assay tested the ability of the VEGF-beads to guide wound closure and cellular migration. The distance of the wound was measured and normalized, and the data indicated that covalently and electrostatically bound VEGF induced 2.5 times more cell migration than soluble VEGF. A CAM assay was then performed to observe blood vessel formation in an in vivo environment, and images suggest VEGF-beads increase blood vessel formation. Our future plans are to perform an in vitro tube formation assay which will mimic an in vivo environment before we begin working with live specimens. [I would like to acknowledge the National Institutes of Health and the National Science Foundation for funding this research, as well as the NIH funded CARE program at UCLA for funding and support.]

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Glider Power Management
Antonio Smith, Grambling State University
Narayan Mandayam, PhD, Ilya Chigirev, Isley Serrano, and Kevin Ngan, Rutgers University

A Slocum Glider is a type of autonomous underwater vehicle used to collect data or to measure various physical and chemical properties in the open sea. The glider uses small buoyancy in conjunction with wings to convert vertical motion to horizontal. In the typical trial, the glider is launched in the Atlantic Ocean; it moves from point A to point B, collecting data on multiple measurements such as temperature, salinity, sound waves, speed of current and density. Finally, the glider returns to the starting point.

The Slocum Glider project actually belongs to the Institute of Marine and Coastal Sciences. However, they have multiple departments working on different components of the glider. Therefore, our component for the glider is creating a power measurement and management system. As of right now, the glider does not have a good power management system; therefore, causing us to cut missions short before the conclusion of the mission.

Our goals are to design a more enhanced power measurement and management system. We have been studying the SPI Bus, Serial Peripheral Interface Bus, and learning the use of its capabilities. In order for us to implement SPI Bus, we would need a master/slave setup. The process of this setup would be that we have three boards: one master, and two slave boards. Each board contains a microcontroller which is the brains of the operation. The slave boards contain two sensors which are resistive sensor and Hall Effect sensor. These sensors are used to measure the current and voltage going through the main power, buoyancy pumps, and brakes of the glider.

By using these two types of readings we can calculate the power used by these components. Through SPI communication, the
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master board shouts out commands to the slave boards telling them when to collect and store data in their Micro SD cards and then send it to the master board to be stored in its Micro SD card.

So far, we wrote a program for the microcontrollers in the slave boards, so that we could get them to communicate with master board. We also built a resistive sensor which contains a current sensing amplifier, sense resistor, load resistor and power source. We ran many voltage reading tests on the two types amplifiers to see if they were working correctly. We then used the amplifiers to amplify the voltage going across the sense resistor (0.1 ohms) to get a better reading of the current going through the circuit. We then compared input voltage vs. the output voltage.

The results showed that both amplifiers had a linear region of operation but different cut in voltages, which means that the amplifiers we working properly. Our future directions are to get access of the old board, make modifications, and run a deployment. We will then continue working on the new board, making changes and adding new components according to the observations from the old board.

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Fuel Cell Powered Electric Vehicle

Babatunde Taiwo, University of the District of Columbia
Michael Brown, Sean Smith, and Ashenafi Lambebo, University of the District of Columbia

Hydrogen-powered fuel cell vehicles will play a central role in future transportation systems. Proton Exchange Membrane (PEM) fuel cell is a device that converts electrochemical energy to electricity at high efficiency without combustion. The new generation of electric fuel cell vehicles consists of hydrogen tank, a 3 phase AC electric motor, a high output lithium ion battery, AC to DC converter, and other forms of power electronics required to thrust the vehicle into motion. The electric motor replaces the internal combustion engine in traditional vehicles. In this study a 10V PEM Fuel Cell Stack is designed and used to power an experimental prototype electric vehicle. DC/AC power inverter converts the 10V DC to 120V AC that powers a 3-phase AC motor, which provides the electromechanical energy required to propel the vehicle.

This presentation covers the detail design and operation of the PEM Fuel cell as a component of an electric car, the schematic of a fuel cell vehicle, and the study of its fueling infrastructure and propulsion system. Our goal is to build a prototype of this vehicle to gain an understanding of how fuel cell can be used as alternative method for cleaner, fuel efficient automotive systems. We would like to thank Louis Stokes Alliances for Minority Participation (LSAMP) Program and STEM for Funding our Research. Due to the complexities of our research our project is still ongoing.

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Matching 3-D Models to Fluoroscopic Images to Assess Knee Implant Performance

Odari C. Thomas, College of Science and Mathematics, University of the Virgin Islands
Mentor: David R. Walker, PhD Candidate, Dept. of Mechanical and Aerospace Engineering, University of Florida
Faculty Advisor: Dr. Scott A. Banks, University of Florida

Suppose you suffer a severe accident that renders your knee immobile or damage to the cartilage on either one of the bones that make up the knee causes you to suffer from severe arthritis. Normally these incidents would be conditions that could only be treated and never fully “cured” in the sense that all the functions of the knee are restored.

Fortunately, advances in technology specifically in the field of biomechanics and implant design has led to the widespread use of total knee arthroplasties (TKA’s) to treat these conditions. However, before the development of fluoroscopic imaging techniques surgeons had no way of measuring which implants restored the motion of the knee best.

In our research, we have been performing 3-D to 2-D model-image registration using the JointTrack software in an attempt to measure the performance of knee implants in-vivo. Our hypothesis was that these models would accurately be able to match these models to the replicate the motion of the knee implant at the moment when the image was taken so that we would ultimately be able to determine the maximum range of freedom the patient experiences with the implant. We successfully fit the models of the implants to the fluoroscopic images and we were able to acquire data on the performance of the implants and compare that data to data acquired from patients with normal knees. This technique has also been applied to measure the performance of reverse total shoulder arthroplasties (RTSA) and may also be used to measure the performance of other joints and implants in the body. [The National Science Foundation through the South East Alliance for Graduate Education and the Professoriate (SEAGEP) program funded this research. Grant #: UF05034.]

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A Classroom Model for Understanding Earth’s Climate Change

Michael Thompson, Arizona State University (ASU)
Jorge Gale and Jose Martinez, ASU, Tempe

This project uses a rotating tank to conduct fluid experiments for studying the sensitivity of Earth’s climate due to external
perturbations. Mimicking climate change, several flat-bottom runs have produced a wide range of behaviors of the fluid flows by changing the imposed temperature gradient and rotation rate. In addition, we have finished a new design of a sloping bottom for the rotating tank. It will enrich the dynamics of the fluid system by including Rossby waves. An attempt is also underway to cross validate the laboratory experiments with numerical simulations using the computational fluid dynamical solver in ANSYS-Fluent. [This project acknowledges funding from LSAMP/WAESO.]

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Effect of initial microstructure on the processing of titanium using equal channel angular pressing
Carine Todmia, University of California, Irvine
Shehreen Dheda, University of California, Irvine

Equal channel angular pressing (ECAP) is a metal processing technique that is used to produce materials with ultrafine (< 1 m) grain sizes. In this project, the effect of the initial microstructure on ECAP of commercially pure titanium (CP Ti), a material used in many industrial applications, was investigated. To produce different initial microstructures, samples of CP Ti were exposed to several different heat treatments. Samples associated with each treatment were subjected to one and/or two passes of ECAP and the resulting microstructures were analyzed using XRD, SEM and TEM, and compared to the microstructures before ECAP.

Since structure affects properties, mechanical properties of the different samples were tested. The results are compared and discussed in terms of the micro-structures associated with each heat treatment before and after ECAP and the effect of these microstructures on mechanical properties.

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Volume Change in Unsaturated Soils due to Seismic Loading
Veronica Tolnay, University of California, Los Angeles

Properties of soil are altered when subjected to earthquakes and can tell us a great deal about the expected behavior of the soil. Due to the earthquake in Niigata, Japan, 2007, a soil under the nuclear power plant of Kariwa, Japan, deformed and settled, shutting down the entire plant. Because earthquakes of large magnitude in heavily populated areas such as Niigata are rare, the accuracy of methods used to predict volume change in soils having undergone earthquakes is not well known.

A sample of soil from Kariwa, named Kashiwazaki soil, classified as a silty sand, was obtained for study to compare predictive measures of seismic volume change with those experienced in the field. The properties of the soil obtained in the laboratory and compared to the field values are: void ratio (volume of voids to the volume of solids), density and settlement after shear loading (shear loading mimics earthquakes), and grain size distribution. Shear loading is performed to relate shear in a soil to its density. Density of a soil varies greatly among different soil classes; therefore, a normalized value of density is used.

Relative compaction, the ratio of the actual density of a soil to its theoretical maximum density, is currently used for all soils other than clean sands. Working with other soils classified as silty sands, Wilshire and Orange soils, procedures were mastered for finding grain size distribution (using sieve analysis tests), void ratio (Atterberg Limits tests) and relative compaction (modified Proctor test). [A special thanks to National Institute of Health (Grant: HIN NiGMS 55052).]

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The Corrosion Study of Mg-Based Biomaterials
Dominique Tucker-Roberson, Bennett College, NC
Seonghyuk Ko, PhD, North Carolina A&T State University

To understand corrosion behavior of biodegradable magnesium-based alloys in the human body as a medical implant, we have conducted immersion corrosion tests of pure magnesium and its alloys with different solutions such as deionized water, simulated body fluids (SBF), and fetal bovine serum (FBS) which contains SBF. After the immersion of samples, we took microscopic photographs of the sample surfaces to monitor the effect of solution on the corrosion process.

The research is significant in helping us understand corrosion behavior of magnesium-based biomedical materials surrounding biological environments. Samples AZ31 had a major corrosion process in solution versus the pure Magnesium. Further research needs to be undertaken to determine the time taken for corrosion to occur and how long these implants may remain in the human body. The studies will also aid our understanding of the influence of alloying elements of magnesium (aluminum, zinc, yttrium, etc.) on the formation of corrosion protective interfaces.

This research is important thus it has great promise as being a medical implant in the human body, the corrosion study determines when the samples corrode and which samples would be a functioning potential candidate for a medical implant.

[This study was supported, in part, by a grant from the National Science Foundation under Grant No. EEC-0812348 awarded to Jagannathon Sankar, Director of the Engineering Research Center, under the Revolutionizing Metallic Biomaterials program at North Carolina A&T State University, Greensboro, NC. The HBCU-UP Project, funded through the National Science...]
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Technology & Engineering
Predicting an Increase in EMS Breathing Problem Calls as a Function of Inclement Weather in Richmond Virginia
Jonicka Washington, Virginia Union University
Solomon Luckett, Jr., Richmond Ambulance Authority, Richmond, VA
Phillip W. Archer PhD, Virginia Union University

It is presumed that downdrafts and outflows produced by thunderstorm activity are one of the leading causes for exacerbation of chronic respiratory problems. Most case studies have demonstrated that subjects who were most commonly affected and admitted to the emergency department (ED) during a thunderstorm were individuals who presented with acute exacerbations of asthma. Yet, very little research to date provides the same association of thunderstorms to other patients with respiratory problems such as chronic obstructive pulmonary disease (COPD), chronic bronchitis, and emphysema.

The aim of this study was to investigate the occurrence of increased EMS calls related to breathing problems during inclement weather associated with thunderstorms in the city of Richmond Virginia during the 2009 calendar year. It was hypothesized that a retrospective analysis would reveal an increase in EMS breathing problem calls related to thunderstorm activity.

Data on the quantity of calls dispatched relative to clear code 06 -Breathing Problems for EMS were compiled from the Richmond Ambulance Authority (RAA) Computer Aided Dispatch system database for the 2009 calendar year. A linear regression analysis revealed a statistically significant strength-of-—relationship (r = 0.538, p<0.01) between thunderstorm activity and an increase in the number of EMS calls related to Breathing Problems. On average, higher frequencies for the amount of call dispositions due to breathing problems were observed during inclement weather days.

It can be concluded that meteorological changes related to thunderstorms and their subsequent down drafts and outflows can trigger or exacerbate acute and chronic respiratory problems. By monitoring the weather for potential thunderstorm activity, EMS systems can anticipate and prepare for an increase in the number of EMS calls due to breathing difficulty.

Thus prompting EMS systems to ensure adequate staffing in the field, alert all field supervisors of probable spike in overall call volume, as well as alert local area emergency departments of the potential for more respiratory distress related transports.

[This study was funded by the Richmond Ambulance Authority in conjunction with the Virginia Nebraska Alliance.]

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Self-folding Hydrogel Scaffolds for Tissue Engineering
Ka’Laun Westry, Clark Atlanta University, GA

For many years, the study of cell behavior, activity, viability, and dysfunction has been observed using cell cultures grown in Petri dishes. The growth of cell cultures in a Petri dish limits the cell study to that of a two dimensional environment.

However, through various research ventures, it has been proven that cells grown in a three-dimensional environment can behave remarkably differently from those grown in a two-dimensional Petri dish. A number of methods have been employed to culture cells in 3D.

The use of hydrogels to study this three-dimensional cell behavior has increased; however, the random spatial arrangement of the cells in the hydrogel has been proven to be a limitation in these studies. Another recent approach to directing the growth of cells into complex, curvilinear 3D geometries involves self-folding.

By patterning stress regions within 2D templates fabricated using conventional micro-fabrication techniques, then subsequently releasing them from the underlying flat substrate, the templates can self-fold into anatomically relevant geometries such as cylinders, spirals, and bidirectionally folded sheets.

Combining self-assembly with hydrogels may enable in vitro cultures to better mimic the in vivo microenvironment of cells. Using photolithography and the hydrogel gelatin, we were able to fabricate micro-patterned structures to try to carry out the folding of the hydrogel.

In order to properly determine whether the hydrogel had been folded by the micro-patterned structures, we used the dye Rhodamine B; however, that dye produced inconclusive results because it stained the hydrogel, as well as the polymer bilayer.

Therefore, Fluorescein was used instead to stain the hydrogel. This dye successfully stained the hydrogel without staining the polymer bilayer. From these results, it can be concluded that hydrogels can be folded using micro-patterned structures. The next step in this research will be to encapsulate cells in the hydrogel and attempt to fold the cell-seeded gelatin using the same methods.
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Mercury Sequestration by Zebra Mussels in the Seneca River, New York, USA

Theodore Williams, Syracuse University, NY

Are zebra mussels (ZM) a nuisance or valuable to aquatic ecosystems? The Cross Lake which intersects the Seneca River is located upstream from the sampling sites. The Cross Lake is highly rich in suspended solids and phytoplankton during the warmer months. As a result, a dense population of zebra mussels (Dreissena Polymorpha) have accumulated downstream within the Seneca River cut, upstream from the Onondaga Lake. ZM are invasive species of filter feeders that deplete the river of dissolve oxygen, decrease food supply for other aquatic species, decrease beneficial bacteria, clog pipes and reduce flow.

Are these mussels valuable? Zebra mussels improve water quality by removing waterborne pathogens, improve water clarity and can also remove contaminants such as mercury from our aquatic ecosystems by storing it within their tissues and possibly their shells. From this study it is clear that the rate of sequestration is affected by the variation of the seasons because ZM mercury concentration decreased from 45.4 ng/g in Spring to 23.8 ng/g in the fall. The underlying question remains: How effective are these mussels at short term and long term sequestration of mercury?

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Rainfall Patterns Over Three Regions of Africa

Delroy Wills, CUNY City College New York, NY

If there is a change in earth’s wind circulation, then this means that there is to be a variability in monthly mean rainfall. In addition, this change in earth’s wind circulation leads to the variability in the yearly average rainfall. As sea surface temperature increases with the change in earth’s wind circulation, there will also be a change in average rainfall.

This study examines the rainfall variability and type of distribution over three selected regions in Africa. These regions are located in the western (10-20N, 20W-0E), eastern (10-20N,0N-20lat) and southern (location), parts of Africa. Rainfall is the primary data that was used for this study. It was obtained from the Global Precipitation Climatology Project (GPCP).

This data has a record of 12-yrs (1997-2008) on a monthly time-scale. The Matlab software was used to calculate and graph the monthly mean (averaged over all years), along with the individual year’s monthly mean rainfall pattern. Correlation with Sea Surface Temperature and the seasonal rainfall pattern were computed using Matlab. Wind data was observed and compared with rainfall pattern in order to observe the consistency of wind circulation with rainfall.

Our results show that the rainfall over western and eastern Africa is characterized by the mono-modal type and it occurs during the Northern Hemisphere during the summer (June-September). Southern Africa gets its rainfall during the winter months and the pattern appears to be bi-modal. Preliminary results show that during the months of June, July and August, trade winds transport evaporated water towards Region 1 and 2, while Region 3 is not favored during these months. We can conclude that the summer season is a dry season for region 3, while summer is a wet season for regions 1 and 2. Correlation analysis between the global Seas Surface Temperatures and rainfall shows higher correlations between the eastern equatorial Pacific and region 1 and 2. Also, the correlations between equatorial Atlantic and rainfall between Region 1 and 2 are higher. This implies that Seas Surface Temperature has a greater influence on rainfall patterns for region 1 and 2.

The other potential mechanism that may have a strong influence on rainfall may be wind flow. Clearly, moist flow would fuel convective activity. Therefore, it would be important to examine the flow characteristics and variability for my continuing study. The answers found in this study would help to increase the accuracy of hydrological models. It will also help us to better predict droughts and floods. These answers found can also help to save and improve living conditions for people. [I will like to give NOAA-CREST and the CREST REU special thanks for making this research experience possible.]

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ArcGIS: Mapping an Oral History

Jacob Yung, University of Hawai’i at Hilo
Lisa Canale, University of Hawai’i at Hilo

Throughout time, cultures across the world have transmitted their history orally from one generation to the next. These oral histories now referred to as intangible culture, provide [cultures] with a sense of identity and continuity, thus promoting respect for cultural diversity and human creativity. (Wikipedia, 2010) The ArcGIS®: Mapping Oral History project is using the technology of today to record, analyze, and disseminate oral histories of Keaukaha, Hawaii. Creating a GIS interactive map based on oral accounts will provide this intangible culture a tangible legacy, while promoting the integration of technology into a cultural context.

Data is first collected through an interview with an elder community member. The research is focused on a specific area, which has cultural significance or history on Hawaii Island. Once the interview is completed, it is then transcribed. Excerpts that have a descriptive significance on an area or its history, are identified and mapped using ArcGIS®. Layers are created to
represent and identify map-able content and are inputted into ArcGIS®. Hyperlinks and macros are put into the map to produce historic photos and interview excerpts of that particular point. GPS is also used to plot specific points of interest to determine an exact location. The mapping process will also be applied to Google Earthpro®. Step-by-step methodology of both mapping projects will be recorded, documented, and used as a teaching tool for high school students to incorporate ArcGIS® technology into their projects.

The completed map is used as an interactive learning tool contributing to a deeper understanding of the area and its value in relation to cultural practice and identity. Hyperlinks and macro files within a map will allow the viewer access to photos and interview excerpts describing the specific points of geographic, historic, and academic importance.

An instructional “how to” guide will also be produced to support agencies and/or individuals in using this process to record, analyze and disseminate other oral histories. The instructional guide will be incorporated into intermediate and high school projects at Ka “Umeke Ka”eo Hawaiian Language Public Charter School located in Keaukaha, Hawaii. Utilizing this approach to record and present their projects will empower the students to map oral histories and other significant cultural information of that area. The implementation of ArcGIS® technology into Ka “Umeke Ka”eo Intermediate and High School curriculum will support growth in the sciences and technology while making it culturally relevant.

This project will be one tool utilized to bridge the gap between technology and culture. It will empower cultures to document their oral histories in a new and innovative way supporting cultural continuity as well as technological growth. Through this project teachers, students, and community members are able to collect undocumented data and visually analyze it leading to discoveries and conclusions not supported by traditional processes. Resulting conclusions of examining these histories through a spatial lens will help answer the question: Is the data collected and mapped any more significant than previous findings, OR does it answer any unanswered questions?

[This project is supported by the Kealohla STEM Scholars Program funded by NSF/T-CUP grant; Principal Investigator Dr. Sonia Juvik, NSF/LSAMP grant; Principal Investigator Dr. Dan Brown, Department of Education grant: Principal Investigator Joshua Kaakua.]

**Graduate Abstracts for Oral Presentation**

**BIOLOGICAL SCIENCES**

Grad. OA #1
In Vitro Migration of Glial Progenitor Cells Toward TGF-alpha, PDGF BB, and bFGF

Richard Able, Jr., Graduate Center CUNY
Celestin Ngabeuye, Department of Biomedical Engineering, The City College of New York
Eric C. Holland, MD PhD, Memorial Sloan Kettering Cancer Center, New York, NY
Maribel Vazquez, ScD, Department of Biomedical Engineering, The City College of New York

Gliomas are the most common type of central nervous system tumors found in adults. Gliomas are highly invasive and will lead to an average survival expectancy of twelve months post treatment. In part, this prognosis is due to the uncontrolled growth and dissemination of malignant tumor cells, which make complete surgical resection nearly impossible. Both uncontrolled growth and dissemination are thought to be enhanced via aberrant cytokine stimulation.

We seek to understand the distinct migration patterns of gliomas and glial progenitors cells (GPCs) in response to specific cytokines known to be involved in glioma regulation. Using transwell assays the preferential migration of mouse GPCs was evaluated towards their own conditioned media (CM) and three cytokines: TGF-α, PDGF-BB, and FGF-2. Results demonstrated that GPCs were chemotactic to low picomolar concentrations of cytokines.

In order to further investigate the migratory pattern and rate of migration, a microfluidic system was used to monitor the induced invasion of individual cells. This system, named the μLane, generates controllable one-dimensional diffusion concentration gradients and enables real-time visualization of cell migration in response to specific concentration ranges. To date, we have used the μLane to study the migration of the GPCs in response to an optimal concentration of the cytokine TGF-α, as determined in the transwell assays. Additionally, a repulsive phenotype was found when GPCs were exposed to higher cytokine concentrations. We plan to further investigate GPC migration patterns when exposed to other cytokines using the μLane. [Funding agencies: NCI, NIH, and LSAMP.]
Grad. OA #2
The Influence of Hepatocyte Growth Factor During Outer Segment Phagocytosis by Retinal Pigment Epithelium

Jonathan F. Blaize, The Graduate Center-CUNY/ College of Staten Island-CUNY
Janto Tachjadi, The Graduate Center-CUNY/ College of Staten Island-CUNY
William J. L’Amoreaux, The Graduate Center, CUNY/ College of Staten Island-CUNY

Inhibition of outer segment (OS) processing by retinal pigment epithelium (RPE) has been linked to photoreceptor injury; as such, complete understanding of the cellular mucises that precede RPE failure is crucial for visual health maintenance. Sub-retinal clearance by RPE is facilitated by specialized phagocytosis featuring both RPE specific and traditional FCγR mediated signaling cascades. This integration renders RPE capable of internalizing both specific and non-specific targets. The discovery that lack of c-Met signaling results in impairment of phagocytosis in alveolar and hepatocyte macrophages by Huh et al. suggests c-Met’s role as modulator of this process. Since PI3K has been shown to activate Rac, a key regulator of phagosome formation during FCγR mediated phagocytosis, we hypothesize that PI3K phosphorylation by c-Met is capable of mediating OS clearance by RPE and that secretion of HGF is involved in regulation of this behavior.

To test our hypotheses, ARPE-19 were cultured until 70% confluent and then serum deprived for 24hrs. Cells were then exposed to various concentrations of HGF prior to chemical fixation. Established immunocytochemical techniques were employed to prepare cells for florescence microscopy where receptor expression was evaluated. Intensity values suggest that ARPE-19 respond maximally to concentrations of 25 ng/ml of HGF when compared to controls (0ng/ml HGF). Similar studies evaluating expression of phosphorylated c-Met, downstream targets of c-Met and binding of non-specific targets were conducted with cells prepared as before. Our findings suggest that RPE respond to increases of exogenous HGF concentrations by up-regulating its receptor and certain downstream targets. Additionally, our data show a significant increase of fluorescently labeled E.coli and fluorescently labeled latex bead binding in treated groups. Taken together, these findings suggest that RTK cross-talk initiated by c-Met activation can partially mediate uptake of non-specific debris and may influence OS recognition by RPE. Future experiments will reveal whether the exclusive activation of PI3K is sufficient to evoke similar behavioral responses by OS challenged RPE. [The authors of this work would like to thank the Louis Stokes Alliance for Minority Participation for their support, financial and otherwise.]

Grad. OA #3
A Genomic Approach: The Effects of Bisphenol A on Zebrafish

Jessica Davis, College of Science, Engineering and Technology, Jackson State University, MS
Lynn Escalon, SpecPro, Vicksburg, MS
Edward Perkins, US Army Research and Development Center, Vicksburg, MS
Dan Villeneuve, US Environmental Protection Agency, National Health and Environmental Effects Research Laboratory, Duluth, MN
Raphael D. Isokpehi and Natalia Garcia-Reyero, Jackson State University

Genomics, proteomics, and metabolomics are emerging technologies used to analyze the effects of the increasing level of environmental pollutants that are affecting aquatic organisms. Some of these toxins are considered endocrine-disrupting chemicals (EDC) due to their interference with the hormonal activity needed for the maintenance of homeostasis within the body, as well as developmental processes. To determine the effects of these EDCs fish models such as the fathead minnow (Pimephales promelas) or the zebrafish (Danio rerio) are used to analyze mode of action of the chemicals and their effect on biological systems. Bisphenol A (BPA) is an organic compound with two phenol groups that is used to make polycarbonate plastic and epoxy resins, among other applications. Due to its estrogenic activity it is a compound of great concern to the US Environmental Protection Agency and other regulatory agencies worldwide. As the compound is often present in freshwater systems like rivers or lakes, we used the zebrafish model to find its NOTEL dose (no observable transcriptional effect level). Zebrafish females were exposed to 0, 0.01, 0.1, 1, 10, and 100 mg/L BPA for 96h. We used 44,000 feature microarrays (Agilent platform) to analyze gene expression at each of these doses. We also analyzed ex vivo sex hormone levels and found no changes in ex vivo estradiol at any of the doses. [Acknowledgements: LSAMP. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the funding agencies.]

Grad. OA #4
Functional Characterization of Sphingosine Kinase 1 and 2 Using Short Hairpin RNA

Sandra Dillahunt, Howard University / Laboratory of Immunogenetics, NIAMS, NIH
Juan Rivera and Ana Olivera, Laboratory of Immunogenetics, NIAMS, NIH, Bethesda, MD

Sphingosine-1-phosphate (S1P) is a lipid second messenger and an autocrine/paracrine mediator generated by two sphingosine kinase isoforms (SphK1 and SphK2). Upon mast cell (MC)
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stimulation, SphK1 and SphK2 are activated and phosphorylate sphingosine to produce S1P. Studies using MC derived from embryonic liver progenitors from SphK1, SphK2, or SphK1/SphK2 null mice, showed that Sphk2 is critical for MC degranulation, cytokine production, and calcium responses. However, using siRNA in MC derived from the bone marrow of adult mice (BMMCs), Sphk1 was found to be predominant in regulating MC function. To elucidate whether the differences in these studies were due to differentiation of progenitors into distinct populations of MCs or the experimental conditions used for knockdown, we used lentiviral based short hairpin RNA (shRNA) in different MC populations. This approach allows for the stable knockdown of SphKs in WT cells, unlike the transient knockdown obtained with siRNA, and avoids potential developmental defects of the genetic models.

Stable knockdown of more than 60% of Sphk2 with shRNA in BMMCs and peritoneal derived MCs (PDMCs) shows a significant decrease in degranulation corresponding with a reduced calcium response. In contrast, Sphk1 knockdown in both cell types results in normal degranulation and calcium responses. This correlates with a lack of immediate hypersensitivity in the Sphk2 but not in Sphk1 null mice in a model of cutaneous anaphylaxis. Knockdown of only Sphk2 results in decreased IL-6 and TNF-alpha production; however, knockdown of both kinases results in decreased chemotaxis towards antigen, indicating redundant as well as specific functions for these kinases. Future studies will aim to deduce the role of SphKs in human mast cells as well as MCs derived from alternative murine progenitors and this can help design specific drugs to target one or both of the isoforms depending on the type of allergic disease. [Research funding is provided by the Intramural Research Program of NIAMS, NIH.]

Grad. OA #5

Study of the Effects of Listeria Monocytogenes on the Native Microflora in Teewurst Sausage using PCR-DGGE

Ar’Quette Grant, Delaware State University
Clyricce Watson, Delaware State University

Teewurst is a soft, spreadable, sausage made from beef and pork products usually served with tea; it is labeled as either uncooked or cooked, with the former of the two being raw. The connection with food born outbreaks and teewurst is well documented; being cited as a source for illnesses associated with E. coli. Considering the moisture content and the pH, teewurst favors microbial growth, which makes it an ideal environment to study the behavior of Listeria monocytogenes. The purpose of this research project is to examine the effects of L. monocytogenes on the native micro-flora in teewurst sausage at abuse temperature, 10°C, using polymerase chain reaction denaturing gradient gel electrophoresis (PCR-DGGE), and to compare those results to the data previously obtained using culture dependent methods. PCR primers amplifying the V3 region of the 16S rDNA showed a 200-250base pair product that was able to be evaluated with DGGE. Subtle differences were noted between the control groups, which were not challenged with L. monocytogenes, and test groups, which were challenged with L. monocytogenes. This study is currently in the process of amplifying the extracted DNA via PCR and analyzing these products by DGGE. Microbial communities will then be analyzed for microbial shifts over the sampling period and DNA bands of interest will be excised and sequenced for species identification specificity. The results from the culture dependent study which indicated suppression of L. monocytogenes growth by the native microflora will be compared to the results of the culture independent study. [Acknowledgements: Delaware State University, LSAMP-Bridge to the Doctorate.]

Grad. OA #6

Molecular Interactions of a Dopamine Auto-receptor with Gα subunit in C. elegans Behavioral Plasticity

Mahlet Mersha, Delaware State University
R. McDonald, P. Pandey, C. Sabanayagam, and H. S. Dhillon, Delaware State University

The similarity in the basic molecular processes between diverse organisms allows the use of model organisms in understanding basic molecular and cellular processes. We are interested in unraveling the molecular bases of plasticity in learning behavior by studying the nematode Caenorhabditis elegans. This model organism can be easily manipulated genetically and its behavior is influenced by the environment. Recent work in C. elegans has shown that dopamine release in behavioral plasticity is modulated in part through a D2-like dopamine auto-receptor dop-2 in the pre-synaptic neurons. Dopamine receptors (DOP-2) are characterized by a structure of seven trans-membrane domains, and are known to act through G-protein coupled pathways.

We found that loss-of function dop-2 mutants display abnormal habituation behavior. In order to identify molecules that may participate in this dopaminergic behavioral plasticity we carried out a yeast two-hybrid screen and fished out gpa-14 which codes for a Gα-subunit Ga amongst other candidate gene products that interact with DOP-2. Data-mining the C. elegans expression database revealed that dop-2 shares expression overlap with gpa-14. Characterization of loss of function gpa-14 mutants displayed similar plasticity aberrations.

We are now focusing on experiments to test for the physical interaction of the auto-receptor and the Ga through co-immunoprecipitation. Additionally, in order to examine physiologically relevant distance dependent physical interaction between DOP-2 and GPA-14, we are generating transgenic animals carrying fusion constructs of dop-2:cfp and gpa-14:yfp for use as biological reagents in fluorescence resonance energy transfer (FRET) experiments.
Grad. OA #7
Differential Glycan Patterning of CXCR4 in Neuroblastoma Cell Lines

Tori A. Owens, Delaware State University
Mentor: N.S. Ivey, Delaware State University

Neuroblastoma is the second most common pediatric malignancy within the US and occurs mostly in children age 2 or younger with ~650 new cases per year. The chemokine G-protein-coupled receptor, CXCR4, can be over expressed in neuroblastomas. Over expression of CXCR4 is thought to be an initiator of metastasis of neuroblastoma to bone tissue due to a chemotactic response induced by CXCR4’s ligand SDF-1 (stromal cell-derived factor-1).

To better understand CXCR4’s role in metastasis we are characterizing its complement of N-glycans. CXCR4 contains two N-linked glycosylation sites, one near the extracellular N-terminus, and another on the 2nd extracellular loop. We believe these two CXCR4 N-glycans are differentially glycosylated across increasing stages of development in neuroblastomas and that we can use these unique glycan patterns to characterize and differentiate between staging events in neuroblastomas.

Currently, we are using IMR-32 cells that represent metastatic stage 4 neuroblastoma. To determine if these N-linked glycosylation sites are indeed unique to the cell type and the cancer cell stage, we are using a novel antibody capture method to characterize the two N-glycans. SDS-PAGE/Western blotting is being used to create banding patterns of the captured protease cut CXCR4 glycopeptides. Our antibodies bind native CXCR4 in solubilized IMR-32 cell membrane preparations, the synthesized antigenic peptides (unglycosylated), and trypsin-digested IMR-32 CXCR4 glycopeptides. We predict that the glycopeptide gel patterns from the IMR-32 cell line should be unique and differ from other neuroblastoma cell lines. Our overall goal is to establish reproducible CXCR4 glycopeptide patterns to use in identifying neuroblastoma cell lines and corresponding cell development stages. [Funding Sources: NIH INBRE II and Cancer Federation.]

Grad. OA #9
Influenza A virus induces death but virus production relies on chaperone-mediated autophagy and cathepsins

Fiorella Tapia-Ortiz, Queens College, Queens College of the City University of New York
Emmanuel Datan, Dimitri Matassov, Alireza Shirazian, and Zahra ZakeriQueens College of the City University of New York

We need to understand how the interaction between influenza A virus and the host cells renders it so virulent. The virus induces apoptosis in cultured cells. Inhibiting apoptosis causes LC3, hallmark protein of autophagy and autophagosome formation activated by Beclin-1 and ATG5 to be upregulated. We examined the response of autophagic pathways, specifically macroautophagy (MA) and Chaperone mediated autophagy (CMA), as Influenza A induced cell death. We used Beclin-1 knockdown (BLN KD) cells and ATG5 knockout (ATG5 KO) cells, to evaluate MA, LAMP2A KO cells to evaluate CMA, and KO cells for each of several cathepsins to evaluate intracellular proteolysis.

These cells were characterized during Influenza A infection by examining various apoptotic and autophagic markers and the effect of the mutation on virus production. Infected ATG5 KO cells survived significantly less well than their parental wild type (wt) cells but produced similar amounts of virus and similar amounts of nucleoprotein (NP), a structural protein important in directing virus protein assembly and a measure of prematuration production of virus. However, infected LAMP2A cells were more resistant to infection than the wt and produced significantly less virus and NP. Knocking out cathepsins B, D, and L (lysosomal proteases) as well as inhibition of these enzymes
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leads to a significant increase in cell death, a decrease in lysosomal acid phosphatase activity, and an increase in virus production. We conclude that chaperone-mediated autophagy and activity of cathepsins are important factors that suppress production of the Influenza A virus.

Grad. OA #10
Targeted Disruption of Androgen Receptor Regulation by the Immunophilin FKBP52

Johanny Tonos De Leon, University of Texas at El Paso
Aki Iwai, Jane Trepel, and Leonard M. Neckers, National Cancer Institute, MD
Yenni Garcia and Marc B. Cox, University of Texas at El Paso
Clementine Feau and R. Kip Guy, St. Jude Children’s Research Hospital, TN
Robert Fletterick, University of California San Francisco

Steroid hormone receptors require the ordered assembly of various chaperone and cochaperone proteins in order to reach a functional state. The final stage in the receptor maturation process requires the formation of a mutimeric complex consisting of an Hsp90 dimer, p23, and one of several large immunophilins. Studies conducted previously demonstrated that the large immunophilin FKBP52 acts to potentiate glucocorticoid, androgen, and progesterone receptor signaling pathways. Although we have made progress in identifying regions of functional importance on FKBP52, the site of interaction between FKBP52 and the receptors remains to be elucidated.

The aim of these studies was to identify and characterize FKBP52-specific inhibitors that would not only serve as tools for the pharmacological analysis of FKBP52-receptor interactions, but may also lead to novel drugs with significant therapeutic potential. A modified receptor-mediated reporter assay in yeast was used to screen a natural compound library for FKBP52 inhibitors, which led to the identification of multiple hits. Structure activity relationship studies using the yeast-based assays led to the characterization of fifteen additional inhibitors, some of which display dramatically increased potency. Surface plasmon resonance studies confirmed that these inhibitors disrupt FKBP52 function through interaction with the AR hormone binding domain. In addition, scintillation proximity binding and fluorescence polarization assays demonstrated that the compounds bind to a previously unrecognized regulatory surface on the AR LBD termed BF3. Interestingly, mutations within the BF3 surface lead to increased dependence on FKBP52 for normal function.

Preliminary assays in LNCaP cells demonstrated that the compounds inhibit Prostate-Specific Antigen expression and androgen-dependent proliferation. As a control the experiments were performed in the presence of Bicalutamide, a commercially available androgen receptor inhibitor but there was not FKBP52-specific inhibitory effect as observed with our inhibitory molecules. In summary we have identified molecules that inhibit FKBP52 regulation of AR function and represent an exciting new approach for the treatment of prostate cancer. In addition, these studies provide new insights into FKBP52-AR interactions. [Support: Grant Number 5G12RR008124 from the National Center for Research Resources (NCRR), a component of the National Institutes of Health (NIH). American Recovery and Reinvestment Act (ARRA) funds through grant number SC1GM084863 to M.B.C. from the National Institute of General Medical Sciences, NIH. R.K.G. and C.F. were supported by the American Lebanese Syrian Associated Charities (ALSAC), St. Jude Children’s Research Hospital (SJCRH), the NIH (DK58080) and the Department of Defense Prostate Cancer Research Program (PC060344-W81XWH-07-1-0073).]

Grad. OA #11
Plant Regeneration and Agrobacterium-mediated Genetic Transformation in Valeria (Valeriana officialis L)

Alicia Williams, Fort Valley State University, GA
Seema Dhir and Sarwan Dhir, Fort Valley State University

Valeria (Valeriana officialis L.) is a hardy, perennial, flowering plant used as a herbal medicine. The roots contain a compound, Valerian, an excellent remedy for anxiety, nervous tension and insomnia. Tissue culture and molecular engineering have provided rapid methods to develop desirable varieties of cultivated plant species.Transient expression has a wide range of applications in molecular biology.

The goal of this work was to establish an optimal transient expression system using Agrobacterium for T-DNA gene delivery into different explants from which the whole plantlets can be regenerated. Leaf explants derived from one-month-old seedlings of in-vitro-grown Valeria plants were infected by A. tumefaciens carrying a binary vector that harbors a gusA gene and an nptII gene. The infected leaf explants were incubated for three days before they were subjected to gusA histochemical assay. The transformability was determined as the percentage of leaf explants expressing the gusA gene and as the intensity of gusA expression per responsive leaf explant.

Parameters tested in this study included - different acetosyringone concentrations used during co-cultivation in Agrobacterium suspension, the length of the pre-culture period of explants prior to infection, co-cultivation period, different bacterial density (OD) and duration of immersion periods.

The results based on transient gusA gene expression of explants suggested that one month old leaf explants inoculated for 60 minutes with 0.4 OD and 150 um acetosyringone and co-cultivated for 3-4 days in MS medium with 2, 4-D showed 80-90 % transformation efficiency. Therefore, the investigation of
factors that influence T-DNA delivery is an important first step in the utilization of Agrobacterium in the transformation of Valeria tissue.  [This research was supported, in part, by a grant from the National Science Foundation (NSF Grant DBI-1004764) awarded to Sarwan Dhir, PhD, Director for the Center for Biotechnology, Fort Valley State University, Fort Valley, GA 31030.]

CHEMISTRY & CHEMICAL SCIENCES

Grad. OA #12
Schiff Base and Other Ligand Complexes of Nickel(II) as Models for Potential Active Sites of Relevant Metalloenzymes

Kouassi Ayikoe, Howard University, Washington DC
Raymond J. Butcher and Yilma Gultneh, Howard University

The discovery of Unease, a di-nuclear nickel(II) enzyme that catalyses urea into ammonia and carbonic acid, has encouraged further works in regard to understanding the roles of nickel, its dependence on other metals such as ion (Fe), or possible existence of other nickel enzymes unknown to date. The specific roles of nickel, its reaction mechanism at the active sites of known enzymes are unclear. To understand its chemistry, the focus has been on synthesizing new complexes of nickel (II) using Schiff bases, amino acid Schiff bases or a mixture of different oxygen and nitrogen donor ligands as great sources of electron transfer (redox) sources.

In this study we focused on oxygen and nitrogen-rich ligands made from salicylaldehyde derivatives, amino acids and other amines for nickel (II) complexes with potential mimicking of enzyme active sites. For example, direct condensation of aldehyde and primary amines led to four Schiff base ligands: Bis (2-hydroxy-4-methoxybenzaldehyde methylimine) (L1), N,N’ bis (salicylaldehyde orthophenyleneimine) (L2), 5-nitro salicylaldehydeimine-2-dimethyl ethanol (L3) and 2-hydroxy-p-anisaldehyde methylimine (L4). Mono-nuclear, di-nuclear, tetra-nuclear and hepta-nuclear nickel(II) complexes have been synthesized and characterized structurally using X-ray diffractometer, spectrochemically by UV-vis, electrochemically by cyclic voltammetry, magnetically by room temperature magnetism. At room temperature, almost all the complexes displayed paramagnetic properties ranging from 2.5 BM to 3.2.

The UV-vis results confirmed the octahedral coordination environment of most of the complexes as revealed by the X-ray diffraction structure. As for amino acid Schiff bases complexes, only L-tryptophan Schiff base nickel (II) complex has been synthesized and successfully crystallized. On the other hand, Ni4O4 cubane-like complex, hepta-nuclear nickel(II) with or without Schiff base were also characterized. Except from nickel salen complexes that show square planar coordination, the rest of the complexes have six coordination environments. In total, fifteen nickel complexes and two manganese complexes have been synthesized and characterized. Among them, four mono-nuclear salens (complexes 1, 2, 3, 4), three mono-nuclear with mix ligands (5,6, 7), two di-nuclear with bridging sodium(s) (8, 9), three tetra-nuclear with bromide or perchlorate counter ions (10, 11, 12), three poly-nuclear clusters with Ni-O-Ni bridge (13,14,15), and two six-coordination-environment manganese salens (18, 19). Note that the two manganese salen complexes were synthesized to confirm that Mn3+ prefers octahedral environment with salens as supposed to square planar for Ni2+.

Our future works will focus on the temperature-dependent magnetism of the synthesized poly-nuclear clusters to investigate their potential single molecule magnet properties. These properties are vital in data storage, switching devices and electrochemical applications. We will also focus on catalytic studies as well as stereo-selectivity reaction potential of these nickel complexes. [This study was supported, in part, by a grant from NSF awarded to Dr. Raymond J. Butcher, Professor of Inorganic and Structural Chemistry, Howard University Washington, DC 20059; and the Graduate School, Howard University, Washington DC, 20059].

Grad. OA #13
Simulations of Nanocylinders Self-assembled from Cyclic β -triptides

Michael A. Cato, Jr., Jackson State University, MS
Noam Bernstein, John L. Kulp III, and Thomas D. Clark, Naval Research Laboratory, Washington, DC

This work examines the self assembly of cyclic β-tripeptides using density functional theory (DFT). Based on literature precedents, these cyclic peptides were expected to self-assemble into cylindrical structures by stacking through backbone-backbone hydrogen bonding.

Our calculations show that such stacking is energetically favorable, the association energy per cyclic peptide decreases (becomes more favorable) and the overall macrodipole moment of the cylindrical assembly increases with the number of stacked rings, for up to eight rings. For a structure in which two peptide ring units are joined through a single sidechain-sidechain covalent linker, the association energy between the two rings is favorable, albeit less so than for the unlinked rings. Significantly, the association energy in the dimers is only weakly dependent on the length (above a certain minimum) and conformation of the covalent linkers.

As a plausible route for controlling assembly/disassembly of nanocylinders, we show that, for a pair of rings each bearing a single amino-functionalized sidechain, protonation of the amino group results in a strongly positive (unfavorable) association energy between the two rings. The results of this research will be used to design and synthesize covalently linked peptides.
Abstracts

Noble metal colloids have historically found application in surface coatings, microfluidics, imaging, paints, and spectroscopy but due to the various solution and surface materials involved in these processes, extending the efficient use of copper colloids to these fields would mandate preparation of particles in a variety of solvents. To date, the chemistry of copper colloids has been limited to strongly polar media such as alcohols and water with dielectric constants ranging from 32 to 79.

The current investigation was endeavored to generate metallic copper particles of the nm-size range in octane (ε = 1.95) to test the hypothesis that light-generated radicals can reduce Cu2+ salts dissolved in hydrocarbon solvents. An anhydrous copper(II) oleate (Cu(OOR)2) complex was synthesized which dissolved readily in octane while the tertiary amine oleysarcosine (OS) was used as both an electron source and a particle stabilizer. When oxygen-free, anhydrous solutions containing 1.0 mM benzophenone (BP), 10 mM OS, and 0.5 mM Cu(OOR)2 were irradiated with 350 nm photons (I0 = 32 μM/sec) metallic copper particles were formed; an analogous solution irradiated in the absence of BP produced no reaction. The solvent could be evaporated and the resulting particles could be readily dissolved in a variety of low dielectric media to include hexane, chloroform, and carbon tetrachloride.

The photochemistry of benzophenone in the presence of tertiary amines is well known, which enables prediction of the redox mechanism. When BP is irradiated with UV photons, the singlet excited state is created, 1BP*, which rapidly undergoes intersystem crossing to form the triplet excited state, 3BP*, with a quantum yield, φ, of 1. The 3BP* is capable of abstracting a hydrogen atom from the amine (electron abstraction followed by rapid proton transfer) to form a ketyl and an alkylaminyl radical.

It is believed that the ketyl radical is responsible for the reduction process while a BP oxidizes the alkylaminyl radical to from another ketyl radical. The absorption maximum at 720 nm (ε = 200 M-1 cm-1) was monitored to follow the consumption of Cu(OOR)2 (φ = .819, where φ = r/10) while the peak at 562 nm (ε = 3100 M-1 cm-1) was used to follow the product formation (φ = .043). TEM images reveal a mean particle diameter of 12 nm with sizes ranging from 9 to 15 nm.

These data indicate that metallic copper nanoparticles are formed which supports the hypothesis that photogenerated ketyl radicals are capable of reducing Cu2+ to Cu in octane followed by aggregation to form particles. In addition to the successful generation of metallic particles in hydrocarbon, these results are significant for the reason that ketyl radicals are unable to reduce Cu2+ to Cu in water do to the energetically unfavorable redox potential in aqueous solution of E° [Cu+/Cu (atom)] = -2.7 V. [The current work was sponsored by an agency of the United States Government by a grant from DOE/EPSCoR awarded to Dr. Jayhoon Khodadadi and Dr. German Mills of Auburn University, Auburn, AL.]

Grad. OA #14
Photochemical Formation of Crystalline Copper Nanoparticles in Low Dielectric Media

Dan Clary, Auburn University, AL

Sr-UPRM-5 Titanium Silicate Sorbent: Effect of the Dehydration Temperature on the Framework Contraction

Jose N. Primera-Pedrozo, University of Puerto Rico, Mayaguez, PR
Karen J. Guerrero-Medina and Arturo J. Hernandez-Maldonado, University of Puerto Rico, Mayaguez, PR
Riqiang Fu, National High Magnetic Field Laboratory, Tallahassee, FL

UPRM-5 is a new titanium silicate prepared with tetraethylammonium hydroxide acting as a structure-directing agent. It exhibits flexible framework characteristics of other titanium silicates, but with higher surface area and enhanced CO2 adsorption capacity. The strontium-based variant has been characterized via in situ high temperature X-ray diffraction (XRD) and 29Si magic angle spinning nuclear magnetic resonance (MAS NMR).

The as-synthesized material was prepared via conventional and microwave-assisted hydrothermal methods, the latter resulting in a reaction time an order of magnitude shorter than the former case. In situ high temperature XRD tests performed on Sr-UPRM-5 indicated that at 120 °C water coordinated to the structure is released initiating the collapsing of the framework, eventually becoming an amorphous phase around 220 °C. 29Si MAS NMR analyses for as-synthesized UPRM-5 confirmed two different silicon environments: Si(2Si, 2Tiota) and Si(3Si, 1Ti-semi-octa), which are similar to those exhibited by titanium silicate ETS-4.

On the other hand, in situ high temperature 29Si MAS NMR analyses for Sr-UPRM-5 demonstrated that changes in the silicon environment due to the presence of titanium centers possessing additional multiple coordination states, which arise from elimination of framework coordinated water molecules, are responsible for the structure collapsing. In general, these
results underline the importance of avoiding complete removal of tenacious water molecules in order to preserve the Sr-UPRM-5 properties suitable for adsorption and catalysis applications, including the removal of CO2 from light gas mixtures.

Grad. OA #16
Positive Cooperative Mechanistic Binding of Proteins at Low Concentrations

Monica R. Sylvain, Department of Chemistry, Louisiana State University
Susmita Das, Bilal El-Zahab, and Isiah M. Warner, Department of Chemistry, Louisiana State University
Jack N. Losso, Department of Food Science, Louisiana State University

Gel electrophoresis in the 1D and 2D format are ubiquitous and powerful separation techniques for studying proteomics. However, the dissolution of membrane proteins and the understanding of their solubilization remains a problem.

Thus, we have studied the interactions of the negatively charged anionic achiral molecular micelle, poly (sodium N-undecanoyl sulfate) (poly-SUS), with different proteins using intrinsic and extrinsic fluorescence spectroscopic probes. A comparison of poly-SUS with the conventional surfactant, sodium dodecyl sulfate (SDS), and the monomeric species, SUS, was also completed.

The selection of poly-SUS for these studies is due to its molecular structure. Poly-SUS is an amphipathic molecule with an achiral hydrophilic head group and a covalently bound hydrophobic tail. In general, poly-SUS is formed by polymerizing the double bond at concentrations higher than the critical micelle concentration (CMC) using γ-irradiation. This concentration ensures that a spontaneous self-assembled phase exists. Subsequently, the dynamic equilibrium between the surfactant monomer and the micelle is largely eliminated after irradiation/polymerization.

Therefore, molecular micelles do not have a CMC, and their overall stability is not compromised when interacting with proteins. The irradiation process imparts a unique morphology to the molecular micelle through formation of a covalently bound highly hydrophobic micro-domain. Such molecular micellar hydrophobicity is in stark contrast to conventional and second generation surfactants. Thus, it is expected that poly-SUS should have access to greater numbers of sites on proteins that are improbable as a result of the dynamic assembly and disassembly of a conventional micelle.

As a result, we hypothesize that protein binding would be achieved at much lower concentrations using a molecular micelle than is achieved with a conventional surfactant such as SDS. In this work, we observed that poly-SUS preferentially binds to acidic proteins, exhibiting saturation and positive cooperativity at concentrations less than 1 mM for all proteins studied. Moreover, it appears that the hydrophobic microdomain formed through polymerization of the terminal vinyl group of the monomer, SUS, is largely responsible for the superior binding capacity of poly-SUS.

From these results, we concluded that the interaction of poly-SUS with the acidic proteins was predominantly hydrophobic and postulated that poly-SUS would perform superior to SDS at low concentrations in polyacrylamide gel electrophoresis (PAGE). As predicted, use of poly-SUS allowed separation of the His-tagged tumor suppressor protein, p53, at sample buffer concentrations as low as 0.08% w/v (2.9 mM), which is 24 times lower than required by SDS in the standard reducing PAGE protocol. Detailed examination of these data show that poly-SUS is a robust surfactant that is facile, flexible, and hydrophobic with high affinity for globular proteins at concentrations in the low millimolar concentration range. Future research consideration includes the investigation of the use of poly-SUS and other molecular micelles as solubilizing reagents for hydrophobic membrane proteins in proteomics studies. [I.M.W. acknowledges support from the Philip W. West Endowment at Louisiana State University and a grant through the National Institutes of Health. M.R.S. acknowledges a National Science Foundation Graduate Research Fellowship and a UNCF/Merck Graduate Science Dissertation Fellowship.]

COMPUTER SCIENCES & INFORMATION MANAGEMENT

Grad. OA #17
Research on Creating Life-like Animated Virtual Tutor

Ruth Agada, Bowie State University, MD

The development of effective animated pedagogical agents is a topic of rising interest in the computer science community. Studies have shown that effective individual tutoring is the most powerful mode of teaching. These agents are designed to be lifelike autonomous characters that support human learning by creating rich, face-to-face learning interactions. Animated pedagogical agents offer great promise for broadening the bandwidth of tutorial communication and increasing learning environments’ ability to engage and motivate students.

It is becoming apparent that this generation of learning technologies will have significant impact on education and training. Successful outcomes of this research will provide a new procedure for developing more engaging and natural dialogs and narrations by pedagogical agents, which are expected to lead to more effective learning outcomes. Successful outcomes of this research will provide a strong theoretical and empirical foundation as well as pilot data to
support subsequent research to be described in an NSF career proposal. Subsequent research will aim to extend the knowledge gained in the proposed experiments and to automate many of the procedures that are implemented manually in the proposed work. [This work is supported by a grant from NSF awarded to Dr. Yan PhD.]

Grad. OA #18
Stabilizing Air Pressure in a Hermetic Environment with Embedded Technology

Zamon Granger, University of Maryland, Baltimore County
Jeremy Harper, Jackson State University

A number of scientific experiments must be performed under atmospheric pressures significantly different than the ambient environment. The parameters of the atmosphere can often have adverse effects on certain experiments. Therefore scientists with such requirements desire a controlled environment that will identify potential constraints.

The premise of the research is to create a system that will allow scientist to control air pressure inside a sealed space to simulate various atmospheric environments. The main components of the system include a PIC16F877A-I/P microcontroller (PIC), a MPX6115 air pressure sensor, and an OUAZ-SS-105D relay. The MPX6115A6T1 air pressure sensor was selected because it has pressure range of 15 kPa (2.17 PSI) to 115 kPa (16.67 PSI). This pressure range allows the sensor to detect air pressure above and below Earth’s atmospheric pressure at sea level (approximately 14.7 PSI). When the sensor is placed inside a sealed space it will continuously monitor a predefined air pressure. The numeric value of the sensor’s output voltage will have direct correlation with the amount of air pressure inside the sealed space. When the PIC detects a drop or rise in voltage, it will activate the fan until it receives a voltage that indicates the desired air pressure has been obtained. If the user requires a pressure range instead of a specific pressure, an algorithm that mimics hysteresis will be present on the PIC. In theory, the air pressure monitoring system will be able to be modified to monitor and regulate air pressure inside virtually any size sealed space to be conducive with the scientists’ requirements. [This research is funded, in part, by the NSF LSAMP Bridge to the Doctorate Fellowship.]

Grad. OA #19
Path Planning of a Robotic Arm in Real-Time

Kavita Krishnaswamy, University of Maryland, Baltimore County
Tim Oates, University of Maryland, Baltimore County

Individuals with physical disabilities need assistance because of their lack of physical strength. In order to provide a solution, we propose to build an assistive robotic companion to provide physical assistance services and support care for elders and individuals with disabilities in real-time through the Internet. For an assistive robotic arm with a collaborative mode of control, given the initial arm configuration we will attempt to increase the speed of response times for the user requesting physical assistance by calculating the paths of reach to the possible target goals before the time of command.

The specific aims of our research project are to a) determine the trajectory path of a human arm to perform tasks; b) deduce the forward and inverse kinematics by calculating trajectory movement and identify the paths of frequent use; and c) analyze ways to improve path planning performance and begin testing new strategies by caching it in memory.

In the first stage, we will investigate the most frequently requested tasks of physical assistance in cases where a robotic arm will be preferred over a personal assistant. To collect the data, we will place a sensor on the elbow and the back of the palm on both hands of an assistant by using a motion tracking system. With the collected information, we will conduct an initial data analysis to understand the statistics of the motions to identify paths of frequent use. For example, if the target task is eating, we may calculate the percentage of volunteering participants picking up a fork, returning the fork, reaching for a cup, and returning the cup.

The caching analysis will be conducted with this information by using the user response time for a benchmark. The deduced forward kinematics and inverse kinematics for the robotic arm will also be examined for calculating trajectory movement. We will also understand the inverse kinematics of the human arm to stimulate the motion for a robotic arm. Based on these statistical characterizations, we will develop an architecture to improve the performance of path planning by taking into account cache hit rates. Upon reaching a theoretical justification, we will begin implementing and testing the new strategies for the proposed architecture. We anticipate an increase in performance and time will be saved for the computation of path planning. Therefore, the action required for a task request is ready to be performed as soon as the command is issued without any delay in path computation. In the future, we will develop a Web interface to manipulate a robotic arm to assist people with disabilities by using the proposed architecture. [This research was supported, in part, by the NSF LSAMP Bridge to the Doctorate Fellowship.]

Grad. OA #20
Virtual Tutor Application

Madhuri Somarapu, Bowie State University, Bowie, MD
Jie Yan, Bowie State University

The development of effective animated pedagogical agents is a topic of rising interest in the computer science community.
Studies have shown that effective individual tutoring is the most powerful mode of teaching. These agents are designed to be lifelike autonomous characters that support human learning by creating rich, face-to-face learning interactions. Animated pedagogical agents offer great promise for broadening the bandwidth of tutorial communication and increasing learning environments’ ability to engage and motivate students. It is becoming apparent that this generation of learning technologies will have significant impact on education and training.

Successful outcomes of this research will provide a new procedure for developing more engaging and natural dialogs and narrations by pedagogical agents, which are expected to lead to more effective learning outcomes. Successful outcomes of this research will provide a strong theoretical and empirical foundation as well as pilot data to support subsequent research to be described in an NSF career proposal. Subsequent research will aim to extend the knowledge gained in the proposed experiments and to automate many of the procedures that are implemented manually in the proposed work.

The objectives of the project are: 1.) To develop a powerful new experimental approach for investigating engaging and effective communication by lifelike animated characters through speech, head movements and facial expression of emotions; and 2.) To conduct experiments to gain new insights about how voice and facial expressions can be combined in optimal ways to enable pedagogical agents to provide more believable and effective communication experiences.

MATHEMATICS & STATISTICS

Grad. OA #21
Propagator of a Damped Time-Dependent SchrÖdinger Equation

Ricardo Cordero, Arizona State University

We present a simplified explicit solution of a Schrödinger equation with a general quadratic Hamiltonian operator with arbitrary time-dependent coefficients. The solution previously obtained by the authors, presents practical difficulties since the Green’s function of the equation requires solving a second-order differential equation with time-dependent coefficients called the characteristic equation.

In the present paper, the authors use a gauge transformation lemma to generate a reduced characteristic equation that in relevant cases, is much easier to solve explicitly. The lemma itself provides a simpler form of the general solution to the Schrödinger equation. As an application of the lemma, we explicitly find the propagator for a general time-dependent damped Schrödinger equation and obtain general uniqueness results for the initial value problem in Schwartz Space. This equation has applications to quantum optics, specifically to quantum devices known as quantum dots.

Furthermore, the usefulness of the gauge transformation in the time-dependent Schrödinger equation leads to important future conjectures such as being able to use time-dependent damping terms to mimic nonlinearities. This application is very useful given that such mimic functions could optimize the practical problem of retaining explicit solvability and retaining the physical relevance of forced harmonic oscillators in quantum optics and other applications. [This study has been supported by the NSF, WAESO LSAMP Bridges to the Doctorate Program, the DEF of the Graduate College at ASU and the Alfred P. Sloan Foundation.]

Grad. OA #22
Semiparametric Estimators for Restricted Moment Models with Measurement Error

Tanya P. Garcia, Texas A&M University

Root-n consistent, asymptotically normal and locally efficient estimators are constructed for regression with errors in covariates and an unspecified model error distribution. Until now, root-n consistent estimators for this setting were not attainable except for special cases, such as a polynomial relationship between the response and mismeasured variables. Our method is the first to deliver root-n consistent estimators when the distributions for both the model error and the mismeasured variable are unknown and can be misspecified. The estimators are based on the semiparametric efficient score which is calculated under several possibly incorrect distribution assumptions resulting from the misspecified model error distribution, from the misspecified error-prone covariates’ distribution, or from both.

A simulation study demonstrates that our method is robust and outperforms methods which either ignore measurement error, or allow measurement error but require a correctly specified model error distribution. A real data example illustrates the performance of our method. [This research is supported in part by the US NSF grant DMS-0906341 and the NSF Bridge to Doctorate Fellowship.]

Grad. OA #23
Mothers and Their Eggs: Vertical Transmission in a Model of Dengue

David Murillo, Arizona State University
Carlos Castillo-Chavez and Susan Holechek, Arizona State University
Abstracts

Dengue is one of the most important emerging and re-emerging infectious diseases. According to the World Health Organization, 40% of the global population is at risk for Dengue infection with an estimated 50 to 100 million infections per year including 500,000 cases of Dengue hemorrhagic fever (DHF) and 22,000 deaths, mostly in children. Our model is inspired by the 2000-2001 Dengue outbreak in Peru where the introduction of the Dengue strain DENV-2 Asian caused the first outbreak of DHF ever seen in the region.

We hypothesize that vertical transmission is a significant factor to the speed and severity of the Dengue outbreak observed in Peru. To test this hypothesis we use a mathematical model and the methodology of inverse problems with the number of weekly reported cases from the outbreak from 2000-2001.

According to our model, vertical transmission increases the basic reproductive number for DENV-2 Asian; making the likelihood and severity of Dengue outbreaks higher and possibly explaining why DENV-2 Asian appears to outcompete DENV-2 American whenever the two strains co-circulate. To fully explore the impact of vertical transmission, a more complete treatment of the life cycle of the vector may be used in the future. This would shed light into the short-term and long-term dynamics of an area endemic with Dengue. [This material is based upon work supported by the WAESO LSAMP Bridge to the Doctorate and the National Science Foundation under Grant No. DGE 0504248, IGERT in Urban Ecology. Any opinions, findings and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation (NSF).]

Grad. OA #24
Propensity Score Models for the Evaluation of Average Causal Effects on Binary Outcomes

Faraz Shaikh, University of Maryland Baltimore County
Ginto Jacob and Brandon Fleming, University of Maryland Baltimore County

Mainly epidemiologic studies aim to evaluate whether the association between an exposure and a disease is causal or not. Using causal inference, we could identify risk factors, determine preventive measures, and evaluate treatment effects quantitatively. Randomized clinical trials are considered the gold standard in Epidemiology but they are not always feasible and ethical to carry out. Thus, we rely on causal inference methodology to provide valid inference on average causal effects based on widely available, observational studies. To draw inferences about the effects of a treatment on subjects, we use an observational study. In observational studies, the assignment of subjects into a treated group versus a control group is beyond investigator’s control. The assignment of treatments to subjects lacks randomization, thus there is bias in estimation of treatment effects and an imbalance on covariates results.

The alternative method by Rosenbaum and Rubin (1983) for estimating treatment effects when treatment assignment is not random, but can be assumed unconfounded, is known as the propensity score. Propensity score is defined as the conditional probability of assignment to a treatment given a vector of observed covariates before treatment. In an observational study in which average treatment effect between treatment and control groups are compared, propensity score can help us reduce bias due to all observed covariates. The various models based on propensity scores are: 1) covariate adjustment using propensity score (covariate adjustment without using propensity score is regression estimation), 2) stratification on the propensity score, 3) propensity-score matching, and 4) inverse probability of treatment weighting (IPTW) using the propensity score.

In this paper, we go through the methodology of propensity scores and its main applications, and discuss the stratification on the propensity score on binary outcomes. We hope to assess bias, precision, and mean-squared error of the propensity score estimators of an application. [This research is funded, in part, by the NSF LSAMP Bridge to the Doctorate Fellowship.]

Grad. OA #25
Classifying Subgroups of Direct Products

Josiah Sugarman, CUNY, NY

In a group theory course one of the first things a student learns are what direct products are and what subgroups are. It is therefore very natural to ask 'What are the subgroups of a direct product of groups.' In this paper we classify the subgroups for direct products with two factors, via a correspondence with isomorphisms between subquotients, a theorem known for over a hundred years and then generalize the result to three groups, which was apparently unknown. For the majority of the theorem use little more than the isomorphism theorem therefore we expect it to generalize to other algebraic contexts. In the future we will generalize this result to n objects in other algebraic categories. [Acknowledgement: I'd like to thank NSF and LSAMP for supporting this research.]

NANOSCIENCE

Grad. OA #26
Effect of Sulfonation Level and Counter Ion Substitution on the Proton Conductivity of Poly(styrene-isobutylene-styrene) Membranes

Sonia L. Aviles Barreto, University of Puerto Rico, Mayaguez, PR

In this study, poly(styrene-isobutylene-styrene) (SIBS), a triblock copolymer, was functionalized with sulfonic groups in order to
obtain more selective membranes for gas sensors and fuel cell applications. Sulfonated SIBS was characterized using Fourier transform infrared spectroscopy (FTIR) and elemental analysis (EA), to confirm and determine accurate sulfonation levels. Subsequently, the sulfonated polymer was neutralized with +2 and +1 cations: Mg+2, Ca+2, Ba+2, Mn+2, Cu+2, K+1; to reduce water swelling and create highly selective polymer-metal nanocomposite membranes. Since the potential interconnectivity of the membrane’s sulfonic groups is very important for the performance of these dielectric materials, the proton conductivity of the samples was measured.

Results show that proton conductivity increases with sulfonation level until a maximum suggesting an optimum ion exchange capacity (IEC) level, while counter ion substitution decreases proton conductivity. Morphologies studies using Small-angle X-ray scattering (SAXS) were performed to determine size and shape of nanostructured channels. Although increasing sulfonation levels influences morphology towards a more ordered structure (i.e., spherical, hexagonal cylinders, lamellar), increasing sulfonation beyond a certain level creates an amorphous morphology perhaps with additional interconnections in the 3-D network.

Thermogravimetric analysis (TGA) were performed in order to evaluate the thermal stability, which increases with sulfonation level; while counter ion substituted membranes maintained the same degradation temperature. To complement the studies, absorption limitations and their effect on the membrane transport were investigated through water swelling and methanol permeability experiments. [This work was performed with the financial support of the National Science Foundation through grant No. HRD-0833112 (CREST Program) and grant No. HRD-0832961 (PRLSAMP - BD Program).]

Grad. OA #27
Investigation of Selective CdTe Nanoheteroepitaxy Growth on Si(100) substrates for HgCdTe Infrared Detector Applications

Aryzbe Diaz, University of Texas at El Paso
Dr. Stella Quinones, University of Texas at El Paso

Mercury cadmium telluride (HgCdTe) has been the most widely used compound semiconductor material for military, civil and commercial infrared (IR) detector applications, due to its direct bandgap of 1.6 eV, high absorption coefficient, and the availability of wide bandgap lattice-matched substrates for epitaxial growth. The development of these detectors requires high sensitivity, small pixel size, low defect density, long-term thermal-cycling reliability and large area substrates. CdTe substrates were initially used for the epitaxial growth of HgCdTe films.

However, CdTe has a lattice mismatch with long-wavelength infrared (LWIR) and middle-wavelength infrared (MWIR) HgCdTe that results in detrimental dislocation densities above $10^4 \, \text{cm}^{-2}$. The nanoheteroepitaxy (NHE) technique makes it possible to grow CdTe on Si(100) substrates with low defect densities at the CdTe/Si interface. The NHE technique has been used for the selective growth of CdTe on patterned Si(100) substrates using a variety of growth techniques.

In this work, Si(100) was patterned using photolithography and dry etching to create 450 nm-1 μm pillars and CdTe was deposited using the closed-space sublimation (CSS) technique. Scanning electron microscopy (SEM) was used to characterize the CdTe selective growth and grain morphology, and X-ray diffraction (XRD) was used to analyze the structure and quality of the films. Selective growth of CdTe was achieved on the top and in some cases on the side walls of the Si pillars, but not on horizontal surfaces between pillars. Single CdTe grains were observed on top of the Si pillars for a range of growth conditions. CdTe selectivity was achieved for all substrate and source temperatures used in this study, however, high quality single CdTe grain growth on Si pillars was observed for source and substrate temperatures of 550°C and 450°C respectively.

The deposition parameters and the Si pillars size were observed to have an impact on the CdTe grain growth. It was observed that increasing the deposition time increases the grain size and the uniformity of the selective CdTe growth throughout the patterned substrate. Increasing the source temperature increases the CdTe grain size, and decreasing the pattern size decreases the CdTe grain size. The ability to selectively deposit CdTe on patterned Si(100) substrates without the use of a mask has not been observed before using the CSS technique.

The results from this study confirm that CSS can be an effective and low-cost technique for the selective nanoheteroepitaxial growth of CdTe films on Si(100) substrates for infrared detector applications. [This study was supported by The Forrest O. and Henrietta Lewis Professorship of Electrical Engineering at the University of Texas at El Paso, and the NSF Bridge to the Doctorate Fellowship awarded to Aryzbe Diaz, MS., University of Texas at El Paso, El Paso, TX 2010.]

PHYSICS

Grad. OA #28
Study of Linear and Nonlinear Absorption of Metallic Colloids Using Photothermal Lens Spectrometry

Franz Delima, Delaware State University
A. Marcano, Y. Markushin, and N. Melikechi, Delaware State University

We report on photothermal lens experiments performed on metallic nanoparticles in water solution using an optimized mode-mismatched pump probe scheme. In this scheme, the pump beam of light is focused and the probe beam is
Abstracts

collimated. The method clearly identifies the presence of nonlinear absorption by measuring the Z-scan signature of the signal.

Indeed, nonlinear absorption exhibits a Z-scan peak one order of magnitude sharper than the peak obtained when only linear absorption is present. We use as pump light the doubled harmonic (400 nm) of the femtosecond 800-nm radiation from a Ti:Sapphire laser and as probe light the radiation from a low power He-Ne laser. The pump beam is focused using a 20-cm focal length lens and the probe is collimated using a telescope up to a diameter of 4 mm. We measure the photothermal lens Z-scan signatures of iron, gold and silver nanoparticles of different diameters (2-10000 nm) contained in 1-mm and 0.2-mm path-length glass cells.

We show that iron, silver and gold nanoparticle exhibit a doubled peak Z-scan signature that corresponds to the simultaneous presence of linear and nonlinear absorption. Estimations for the linear and nonlinear absorption values are obtained. The effect is similar to two-photon absorption but it has a different physical origin.

We propose that the nonlinear absorption effect is due to the mechanical action of light over the nanoparticles that results from surface plasmon resonances. This effect induces a distribution of nanoparticles that depends on the local value of the field fluence. The effect depends on the dimension of the nanoparticles, concentration, and pump field wavelength. This model predicts a flat open Z-scan response that should not be observed if the nonlinear effect is due to two-photon absorption. We perform open Z-scan experiments on the metallic colloids that rule out the possibility for two-photon absorption. We also provide micro-photographs of the trapped particles on dried samples as a final proof of the mechanical action of the light over the nanoparticles. [This research has been possible thanks to the support of the National Science Foundation (NSF-CREST grant No 0630388 and NSF-MRI grant No 0922587) and of the National Aeronautics and Space Administration (NASA URC 5 grant No NNX09AU90A). We also thank Dr. C. Sabanayagam from the Department of Physics and Pre-Engineering of the Delaware State University for providing the silver colloid.]

Grad. OA #29
SAM Organic Contaminant Library Development and Interfacing

Raul Garcia-Sanchez, Howard University, Washington, DC
Prabhakar Misra, Howard University
Paul R. Mahaffy, NASA Goddard Space Flight Center, Greenbelt, MD

The primary purpose of the research is to develop an organic contaminants database for the Sample Analysis at Mars (SAM) project that supports the Mars Science Laboratory (MSL). SAM utilizes an oven to pyrolyze Mars soil samples. Due to contact with the rover and Earth’s atmosphere, might be contaminated with compounds native to the Earth system. The identification and spectral characterization of the terrestrial impurities will be necessary because of the important ramifications of the gas chromatography (GC) and mass spectroscopy (MS) measurements on Mars for either supporting or disproving the possibility of life.

To develop this organic contaminants database, which will allow us to determine what compounds are found here on Earth and would be inadvertently detected in the Mars soil and gaseous samples as impurities, we utilize several GCMS analysis software. The National Institute of Standards & Technology (NIST) MS Search provides us with an assessment of the degree of match for our compounds with the known compounds in the NIST database library. We use the Automated Mass Spectral Deconvolution and Identification System software to extract clean spectra from the complex GCMS data. We use Ion Fingerprint Deconvolution to determine the compounds that are located in the Total Ion Current Chromatograph of each sample.

We have been able to identify what compounds are found in our data and are continually adding them to the contaminants database. As a result, we have successfully developed an initial target compound database that will aid SAM in determining whether the nature of the components being analyzed continue to add new data to the target contaminants database as more tests are done.

We are also implementing data from Earth sites that are analogous in ambience to Mars, as well as adding organic compound standards spectral data to improve the identification process. We believe that this library will greatly aid the NASA’s MSL project improve its quality accuracy in analyzing soil samples once the rover begins operations in 2012. [We would like to acknowledge the financial support from the Alliance for Graduate Education and the Professoriate for Raul Garcia’s fellowship support. We would also like to thank the DC Space Grant that allowed Raul Garcia to spend the 2009-2010 summer in the Planetary Environments Laboratory (Code 699 GSFC) and the award of a Faculty Summer Fellowship to Prabhakar Misra.]

Grad. OA #30
Mapping the Galaxy with LISA

Jose McKinnon, University of Texas at Brownsville
Matthew Benacquista, University of Texas at Brownsville

Binary white dwarf stars are a source of gravitational waves and the Laser Interferometer Space Antenna (LISA) will be used to detect and obtain valuable information from the gravitational wave, such as amplitude, frequency, phase, and angle locations for example. The parameters obtained will uniquely describe
each binary and knowing how effective LISA will be at detecting these binary stars will help to construct the shape of the galaxy. Selecting binaries that stand out in the initial LISA data, with a signal to noise ratio above a given threshold, have a better chance to be detected with less error in the gravitational wave signal. The parameters of these resolved binaries are then fed into a Matlab Fisher Matrix code, that we have implemented to obtain the expected errors in the parameter estimation, if a true data analysis were performed. These signals are then regressed from the initial LISA signal and the process is repeated until no binaries meet the detection threshold.

The Fisher Matrix code was implemented in order to study how LISA observations of Galactic compact object binaries can be used to better understand Galactic structure. The code simulates the results of data analysis and estimates the variance and covariance of recovered parameters. We will use the recovered parameters to estimate Galactic structure. Here we present first results applied to a standard Galaxy model. These data indicates that the errors found are well defined and can precisely locate most resolved binary stars.

Grad OA #31
Reconfigurable Optics for Augmented Reality Goggle Systems

Maurice Smith, Delaware State University
Yury Markushin, Aristides Marcano, and Noureddine Melikechi, Delaware State University

We report on the use of reconfigurable optics in an augmented reality head worn display system. The system is able to superimpose in focus a virtual image from a microdisplay located in the proximity of the eye with images from the real world. This is important in terms of receiving vital information in a hands free environment i.e. astronaut repairing a satellite in which instruction are given on his or hers visor. The system includes electronic control of the position of the focusing lens.

Results seen from our system was a computer generated picture viewed at a horizontal Field of View of 6.18°. We discuss the figures of merit of liquid lenses, liquid crystal lenses, and deformable mirrors as alternative reconfigurable optical systems and future goals involving a stereoscopic view of the virtual display. [We would like to thank and acknowledge Bridge to Doctorate (Alliance of Minority Participants) and CREST for funding our research.]

SOCIAL & BEHAVIORAL SCIENCES

Grad. OA #32
Distance Learning: Enhancing Awareness of Exceptionalities Across Cultures

Amber Ellison, University of North Texas

Tandra Wood, Brenda Barrio, Sita Periathiruvadi, and Oyoung Lim, University of North Texas

To meet the ever-growing need for special educators across cultures, the current project was funded by the Global Challenge Initiative at the University of North Texas (UNT). UNT seeks to provide four ‘globally enhanced’ on-line courses for prospective teachers in special education. The courses provide: lectures in Spanish as well as English, including best practices across cultures.

For this project, UNT has partnered with Universidad Casa Grande (UCG) in Ecuador. The courses provided in the four course sequence include: Introduction to Special Education, Assistive Technology, Assessment of Special Learners, and Authentic Assessment. All four courses in the sequence have been taught.

The objectives of the collaborative, bilingual courses include documenting the: 1) effectiveness of the collaborative distance learning initiative in four special education master’s level courses that are taught in a bilingual setting (Spanish and English simultaneously), 2) students’ views and perspectives of the course, and 3) student views on inclusion as compared across the two countries.

Using an existing survey created by Tyler-Wood (2005), measuring the skill level of beginning teachers in special education concerning inclusive settings, collaboration among professionals, and the roles in the educational system (Factor Analysis of the Teacher Efficacy Scale, 2005) and summative design, data is collected from students at the beginning and end of the first course.

A total of 48 surveys were collected through the distance learning introductory special education course. Results show the significant difference between the students from Ecuador and students from the United States in 11 of the 25 statements. For qualitative data collection, student performance on case study assignments, student grades, and discussion postings within each course are reviewed.

Comparing the end of course grades for four of the courses, no significant differences were noted. Discussion postings were analyzed using Henri’s (1992) analytical framework. Results of the analyzed data will be further explored. In conclusion, the performance between these two groups was similar. This leads us to continue exploring the interaction and effectiveness of bilingual on-line courses for prospective teachers in special education across cultures and countries. [Special appreciation is granted to the Global Challenge Initiative at the University of North Texas for their funding opportunities.]
Technology & Engineering

Grad. OA #33
Broaden Computing by Introducing Interactive Learning Environments to Chemistry Classrooms

Candice Adams, Auburn University, AL
Cheryl Seals, Auburn University

Web-based learning environments support collaboration among students and encourage interaction in the classroom by providing quality Internet resources for learning. Web-based learning environments can be used to support various core subjects within the K-12 curriculum. This paper will examine the importance of increasing Internet resources within a chemistry classroom by implementing a learning environment that encompasses interactive modules that are centered on teacher-created lessons.

Increasing the use of technology in the classroom is essential because it will help students develop a positive attitude toward learning and increase technologically literate among K-12 students. Web-based applications that are centered on classroom lessons are effective at increasing computer literacy because it increases student motivation and interaction with technology. The objective of this project is to advance computer literacy and to broaden students’ interest in the computing field by introducing web-based learning environments in the classroom.

This project will focus on designing and implementing a web-based tool that contains lessons and themes that are aligned with the current classroom chemistry curriculum. This tool will allow students to interact, manipulate and visually inspect the representation of chemical elements. It also allows student access to lessons at home and at school without having their physical textbook. The ability to utilize this tool to support both formal and informal settings will increase its appeal for teachers and students. The learning environment will help teachers convey many scientific concepts about the periodic table and illustrate to students how these concepts are interrelated.

Chemistry is a field of study that deals with the composition of substances along with their properties and reactions. For that reason, it is a robust mathematically challenging area of science. It provides a fundamental understanding of the world we live in and how it works. Therefore, chemistry is an important part of any student’s curriculum. However, it is a difficult subject for many students to grasp because of the complex concepts presented in the chemistry curriculum.

It is therefore, a benefit to students by incorporating animation and simulations into various chemistry topics and not just relying on traditional teaching methods. One of these topics is the periodic table of elements because it is used over 90% of the time during a student’s enrollment in a chemistry course. It is one of the most powerful tables in chemistry. The resulting website includes the following features: interactive periodic table that provides detailed information about each element, images of scientific lab equipment, animated lab safety tour guide, custom user-friendly interface, and a section dedicated to chemistry quizzes. The resulting conclusions make a tremendous impact on educational software and may serve as a basis for future research on creating educational software packages.

Grad. OA #34
Effects of Aerosols on Microphysics and Warm Season Precipitation in a Complex Urban Environment

Nathan Hosannah, City College of New York

Studies have found evidence of warm-season rainfall increases over and downwind of major cities, such as Atlanta, Phoenix, Mexico City, St. Louis, and Chicago. This precipitation increase has been predominately attributed to the induced updraft of warm air masses. Aerosols are abundant in urban environments, and it has been hypothesized that they play a role in the water balance of humid regions. High concentrations of cloud condensation nuclei (CCN) may induce precipitation in humid urban environments; however, it is also noted that precipitation may also be reduced due to excess CCNs or by the presence of large aerosols, known as giant cloud condensation nuclei (GCCN).

This research is directed towards improving our understanding of the role of aerosols in cloud processes in complex coastal urban environments, through ground observations obtained from AERONET, and weather stations across the New York City and New Jersey region and by use of numerical modeling. Growth of particles from CCN to rain droplet sizes is explored for characteristic aerosol distributions obtained from these observations.

The role of aerosols in precipitation is investigated through numerical analysis of cloud microphysics by implementing population growth by condensation, collision, and coalescence within the computational model. In-situ microphysics data from observations is ingested into the urbanized mesoscale Regional Atmospheric Model System (RAMS) to explore fundamental questions aimed at discerning local precipitation attributed solely to the presence of atmospheric aerosols and precipitation caused by convection. [A special thank you is extended to CREST, LSAMP, and ISET for funding this research.]
Grad. OA #35
Estimating 3D Egomotion from Optical Flow Using a Spherical Omnidirectional Catadioptric Rig

Carlos Jaramillo, CUNY City College, New York, NY
Igor Labutov, Cornell University, Ithaca, NY
Jizhong Xiao, CUNY City College/Graduate Center, New York, NY

Egomotion in three dimensions (3D) refers to the six degrees-of-freedom a camera-robot system can experience with translation and rotation in the 3D scene. In this study, we incorporate the Lucas-Kanade method for obtaining sparse optical flow fields in order to determine (in real-time) the 3D motion of the system.

Our approach for omnidirectional imaging uses a low-cost catadioptric sensor formed by a pair of coaxially-aligned spherical mirrors (in a “folded” configuration) and a monocular camera (Labutov, Jaramillo and Xiao). This catadioptric rig allows for a 360° horizontal and 150° vertical field of view around the equator of the view-sphere. Since the mirror surfaces are nearly spherical, the spherical coordinate system is used to provide accurate estimations of the omnidirectional optical flow, without the need for redesigned spatial gradient filters, when employing hyperbolic and conic mirrors (Stratmann). Albeit our catadioptric rig only approximates the single-viewpoint (SVP) constraint, the measured error is considered to be negligible for the purpose of human-scale navigation.

The first step of this 3D egomotion procedure is to project three image pairs (front/back, left/right, up/down) from the respective great circular planes (Ex; Ey; Ez) of the sensor’s view-sphere using the corresponding projection functions f(u) and g (v) obtained from calibration (Labutov, Jaramillo and Xiao). Hence, we can think of each great circle having two faces. Using OpenCV, an open-source computer vision library, arrays of relevant feature (corners) coordinates are first determined from the face images with routines such as GoodFeaturesToTrack().

Then, the optical flow of the temporal image sequences are calculated with the CalcOpticalFlowPyrLK() routine, which uses the iterative Lucas-Kanade method with pyramids for sparse feature sets. For each sequence in the six circular image planes (faces), the resulting rotation and translation components of the optical flow vectors (in polar coordinates) can be separated through de-rotation methods (McCarthy, Barnes and Srinivasan) based on the Nelson-Aloimonos algorithm.

Thus, each face pair contributes to the robustness of each generalized 2D motion vector for the respective plane. Finally, at each time interval, a major 3D vector v (up to scale factor) is formed from the three 2D major planes motion vectors. The veracity of this 3D egomotion can be tested under simulated imagery where motion ground truth is given. The main egomotion vector v can then be incorporated as messages to other systems that require this information. To overcome incidental problems such as depth parallax caused by background motion, a complete system can reinforce its ground truth localization with additional active sensors such as laser range finders. [This study is supported, in part, by NSF/LSAMP Bridge to the Doctorate awarded to Carlos Jaramillo.]

Grad. OA #36
Assessment of Test Methods that Quantify the Stability of Self-Consolidating Concrete

Sam Keske, Auburn University, AL

Self-consolidating concrete (SCC) is concrete that fills formwork and encapsulates reinforcement as it is placed without needing any mechanical consolidation. It is advantageous where congested reinforcement or formwork shape make mechanical consolidation difficult, such as in the production of precast, prestressed elements. It is critical that SCC not segregate before, during, or after placement, as segregation can severely undermine structural performance. However, stability, or resistance to segregation, is difficult to measure in fresh samples and few tests are available to quantify this vital property during production. The objective of this study was to assess the viability of several stability test methods for SCC used in precast applications.

The following stability test methods were evaluated: column segregation test (ASTM C 1610), visual stability index (ASTM C 1611), penetration test (ASTM C 1712), surface settlement test (NCHRP Report 628), sieve stability test (European Guidelines for SCC), and multiple-probe penetration test. The six tests were performed while placing SCC in four large-scale walls of the following heights: 36, 54, 72, and 94 inches. Tests were then conducted on the hardened walls to correlate in-place concrete uniformity to results from the six test methods. Through-wall ultrasonic pulse velocity tests were conducted at various heights to determine the degree of segregation in each wall. Then, pullout tests were performed on groups of deformed bars embedded at six heights within each wall, with variation in pullout stress analyzed to assess concrete quality.

Nine SCC mixtures and two control mixtures were produced. The strongest correlation between in-situ uniformity and stability test results was established with the surface settlement test, although it was the least suitable for field use among the six evaluated. Results from the more robust sieve stability test correlated well with in-situ uniformity and with results from ASTM C 1610 and ASTM C 1611. Therefore, the surface settlement test should be the primary test method for precast SCC qualification, and the sieve stability test should be the primary test method for precast SCC quality control. Future research should include assessing the above correlations in other SCC mixtures and studying the effects of accelerating the sieve stability test. [This Auburn University study was funded by...]

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Grad. OA #37  
Robust Networking Architecture and Secure Communication Scheme for Heterogeneous Wireless Sensor Networks  
McKenzie McNeal, III, Tennessee State University  

Current communication protocols used for Wireless Sensor Networks (WSNs) have been designed to be energy efficient, decrease redundancy in sensed data, increase the lifetime of the sensor network, and decrease the number of transmissions across the network. But one major issue, that must be addressed, is security of sensed data, transmitted data, and communication channels between sensor nodes.

Due to the limited capabilities of sensor nodes, e.g. power, memory, transmission range, and processing power, designing security-based communication protocol presents a difficult challenge. The current commonly used encryption schemes require too much processing power and memory to be used by the sensor nodes. Security for WSNs requires a unique scheme and protocol to protect the data and functionality of the network.

The goal of this work is to develop a security system for HWSNs that features a security-oriented robust networking architecture and secure communication scheme. The robust networking architecture will take advantage of the benefits of heterogeneity in a WSN to aid in developing hierarchical cluster-based network architecture that governs the communication responsibility of each node and self-organize in presence of resource depletion, node failures and node compromise.

The secure communication scheme will feature a key management protocol for key pre-distribution and other features to revoke keys of compromised nodes and create keys for newly added nodes, symmetric and asymmetric cryptographic algorithms for multi-level security, and a secure routing protocol that governs the secure path encrypted data should follow when being transmitted from node to node.

The work will include: (1) establishing threat models, security goals and analysis approaches for heterogeneous WSNs; (2) developing robust networking architecture and routing protocols that can stably provide computing and communication resources specially needed for security usage; and (3) developing resource-efficient and low-latency security protocols including key infrastructure, integrity, authentication and key management under the above networking architecture and routing protocols. [This research is supported by the Defense Threat Reduction Agency.]

Grad. OA #38  
Development of an Autonomous and Intelligent Mobile Ground Sensor  
Kasongo F. Moma, Tennessee State University  

This paper discusses the development, design and implementation of an autonomous and intelligent tracking mobile ground sensor for dynamic perch able mini-UAV (Unmanned Air Vehicle) Data/Sensor hubs. This system design concept is based on a previous design known as: “Unmanned Vehicle Technology for Network Non-Line-of-Sight” exhibited at the 2009 Tech warrior exposition by the Air force research laboratory (AFRL) in collaboration with Tennessee State University and Louisiana Tech.

The present architecture is developed to address and offer solution(s) to the line-of-sight limitation of effective operations for mobile ground platforms. This new line-of-sight approach will be able to integrate an autonomous mobile sensor hub(s) with an existing layered sensing system to enable the generation of non-line-of-sight minimizing the control of the mobile sensor by the operator.

Therefore, a developed autonomous tracking mobile, with basic behaviors designed based on fuzzy control technique, will move the mobile intelligently and adapt to changes in its environment, an embedded camera vision system for object tracking as well as a developed chemical sensor to monitor the concentration of chemical smoke are developed and will allow the interaction with a mini- Unnamed Air Vehicle (UAV) equipped with sensors to collect data from the mobile sensor and retrieve field video in case of “Indirect (non-line-o-sight) control”.

Grad. OA #39  
Polymer Electrolyte Thin Films for Applications in μ-Sensors and μ-Fuel Cells  
Omar A. Movil, University of Puerto Rico, Mayaguez  
Agnes M. Padovania, University of Puerto Rico, Mayaguez  

Polymer thin films containing strong acidic groups are of particular interest for applications in electronic devices such as micro-sensors, actuators and, micro-fuel cells. The focus of this project is the development, characterization, and testing of sulfonated poly(styrene-isobutylene-styrene) (S-SIBS) block copolymer thin films for applications in H₂ gas microsensors and micro-fuel cells.

For the purpose of these studies, thin films were deposited onto various substrates via spin-coating and critical parameters such as spin-speed, solvent-type, and heating treatments were evaluated in order to understand morphological differences in the films. These, in turn, are important for the ultimate performance of the S-SIBS thin films as proton exchange membranes. The effects of other processing variables such as
sulfonation level, angular velocity, and polymer concentration are also being evaluated.

Various techniques have been used for the materials characterization including X-ray diffraction (XRD), profilometry, atomic force microscopy (AFM), dynamic light scattering (DLS), and nanoindentation. Preliminary results show that films spin-casted from a mixture of methylene chloride and hexyl alcohol as the primary solvent are approximately 10 times thicker as compared to films made with toluene and hexyl alcohol. In addition, surface analysis reveals that increasing the polymer concentration and the sulfonation level result in an increase of both, film thickness and surface roughness.

Preliminary XRD results show that the films exhibit amorphous behavior with small degrees of crystallinity. Result variations are observed as a function of the solvent system. Nanoindentation studies also suggest that the elastic modulus and hardness increase with sulfonation level. [This project was supported by the National Science Foundation (NSF) under Grant HRD 0833112 (CREST-UPRM).]

Grad. OA #40
An Idiosyncratic and Learned Process to Generate a Visual Representation of Hand Location from Somatosensory Signals

Liliana Rincon Gonzalez, Arizona State University
Stephen Helms Tillery, Arizona State University

Somatosensory and visual signals participate together in providing an estimate of the hand’s location in space. Understanding how several sensory modalities come together and are integrated by the brain is crucial to the design of more precise and accurate neuroprosthetic devices capable of providing sensory feedback.

Specifically, we are interested in understanding how the brain solves the problem of estimating the location of the hand in space if the target and response feedback are in two different sensory modalities (e.g. somatosensory and visual). Here, we constructed and analyzed the pattern of errors that resulted from the transformation of a somatosensory representation to a visual representation of hand location.

In this research, the experimenter passively moved either the right or left hand of the subject to a spatial location on a horizontal 2-D grid while the subject’s eyes were closed. The experimenter, then either a) applied tactile stimulation by allowing the index fingertip to touch the surface of the grid or b) as a control, left the fingertip 2cm above the grid. After returning the hand to a neutral position, we asked the subjects to open their eyes and verbally report the location of their fingertip.

We report three separate findings: First, the pattern of errors made when estimating hand location is a very idiosyncratic process. Second, individuals exhibited a significantly higher than chance similarity between the pattern of errors between hands and across tasks. Finally, tactile input led to a decrease in the overall error in estimating hand location. However, this effect is limited to the right hand and not dependent on handedness. These results indicate that each individual generates a unique but systematic solution and suggest the possibility of a neural region specialized for carrying out this transformation. Therefore, it is of interest to investigate where in the brain this transformation takes place and if this location is subject specific. [This study was supported, in part, by the WAESO LSAMP Bridges to the Doctorate program, and also by a grant from NIH (R01-NS063372) awarded to Dr. Stephen Helms Tillery.]

Grad. OA #41
Assessment of Hyoid Bone Density using Micro CT for Prediction of Fracture

Ozell P. Sanders, University of Maryland, Baltimore County

The hyoid bone is a U-shaped bone found in the neck that is fractured in a majority of homicidal strangulation cases when excessive force is applied to the neck region. Previous studies conducted by Smith et al. have demonstrated that older specimens are more susceptible to fracture due to effects from ossification. However, it is unknown whether the bone density in specimens with ossification contributes to the occurrence of fracture.

In this study, our goal is to determine whether or not a relationship between bone density and likelihood of fracture exists. Hyoid and thyroid bone specimens from cadavers were obtained from the Office of the Chief Medical Examiner for the State of Maryland. Each specimen was cut in half by transverse dissection resulting in a pair of hyoid halves.

Using three-dimensional reconstruction of Micro-CT scan images, we will be able to assess bone density for each specimen before and after the bending tests. The specimens will be cantilevered in polymer epoxy (BONDO®) and held in a test fixture, approximating their natural geometry. Upon completion, the bending test quantification of the fracture force will be determined using the load at fracture, the macroscopic nature of failure, the cross-sectional dimensions at the fracture point, and the bending moment arm distance. Bone density observed at the site of fracture will also be recorded for further analysis.

Results from the present study will be used to determine the likelihood of fracture in regions of low bone density in the hyoid bone. Future studies in this ongoing investigation involve the assessment of other factors such as age, disease, as well as the effects of soft connective tissue surrounding the bone, and their
influence on the occurrence of fracture. The contributions from the aforementioned studies will ultimately lead to the development of a risk factor which will be used to determine the chance of hyoid bone fracture. [This research was supported, in part, by the NSF LSAMP Bridge to the Doctorate Fellowship.]

**BIOLOGICAL SCIENCES**

**GP #1**  
Effect of Synergistic Potentiation of Cisplatin with Magnetic Fluid Hyperthermia (MFH) in Caco-2 Cells

Merlis Alvarez Berrios, University of Puerto Rico-Mayaguez Campus  
Karen A. Court-Pinto, Janet Mendez, Amalchi Castillo, Orlando Soto, Carlos Rinaldi, and Madeline Torres-Lugo, University of Puerto Rico, Mayaguez, PR

Studies aimed at understanding the mechanisms involved in the synergistic potentiation of cisplatin and magnetic fluid hyperthermia (MFH) treatment in Caco-2 cells have been performed. Clinical studies have demonstrated the effectiveness of combined hyperthermia and cisplatin treatment. However, challenges related to effective heat transfer have limited its clinical application.

Hypothesis: Magnetic fluid hyperthermia will produce thermal chemosensitization in Caco-2 cells.

Cells exposed to Cisplatin (5uM) and 30min of MFH or hot water at 41C were allowed further exposure to Cisplatin for an additional 2h. At the end of the treatment period, viability was determined by clonogenic assays. The same experiments were conducted with copper, which inhibits the active transport of cisplatin. Similar treatment was followed for uptake experiments, but at the end of the 2h incubation period cells were centrifuged, digested with pure nitric acid and the platinum content measured by inductively couple plasma mass spectrometry.

MFH is more effective in inducing cell death in combination treatment when compared to hot water hyperthermia under the same conditions. The presence of Cu plays a protective role in the presence and absence of HT or MFH. Data suggests that the potentiation mechanism by MFH is more complex than membrane permeabilization.

MFH appears to be an excellent candidate for the application of localized HT in combination with CIS. Synergistic potentiation of cisplatin and magnetic fluid hyperthermia (MFH) treatment in chemotherapy resistant cancer cell lines will be performed in further studies. [Acknowledgement: This work is supported by the National Science Foundation (CREST Program - 0701525).]

**GP #2**  
Assessment of Bacterial Effector Proteins for Prevention and Treatment of Colitis

Antoneicka Harris, Jackson State University  
Ki-Jong Rhee, University of Illinois at Chicago

The common host response to intestinal pathogens is intestinal inflammation. However, several bacterial pathogens have developed strategies to suppress the host inflammatory response. One strategy involves injection of bacterial effector proteins into the host cell cytoplasm through a syringe-like apparatus called the type III secretory system (T3SS). Enteropathogenic Escherichia coli (EPEC) are food-borne pathogens that causes diarrhea. EPEC stimulates the inflammatory response in intestinal epithelial cells but at the same time injects EPEC effector proteins into the cell to dampen the inflammatory response.

Preliminary data generated by Dr. Gail Hecht’s laboratory suggests that two EPEC effectors, NleH1 and NleH2 (NleH1/2), possess anti-inflammatory activity. The goal of this proposal is to determine if NleH1/2 can prevent or treat colitis using a mouse model of inflammatory bowel disease. If the results from the mouse studies are promising, then these anti-inflammatory effectors may offer a novel approach to treat inflammatory bowel diseases in humans. The aims of this proposal are: Aim 1: Determine if NleH1/2 prevents colitis in a mouse model; and Aim 2: Determine if NleH1/2 can treat colitis in a mouse model.

**GP #3**  
The Use of Topical Estrogen to Prevent HIV Infection in Men

Anthony Johnson, Wiley College, Marshall, TX

Sexually transmitted HIV targets the Langerhans cells, which are very prominent in the male foreskin. By removing the foreskin through circumcision, it can reduce the transmission rate of the virus by 60 percent. Since the Langerhans cells are the primary target of HIV entry, a thicker protective skin barrier is needed to prevent the entry of the virus. The utilization of topical estrogen has been proven (indirectly) to stimulate the epithelial thickening and keratinization in the vaginal mucosa of monkeys.
We hypothesize that estrogen applied topically to the foreskin will increase keratin on the inner layer, providing a thicker more protective barrier against HIV. To test our hypothesis a phase one clinical trial was conducted in Australia on 30 men who were previously scheduled for circumcision for unrelated reasons.

A pre-treatment punch-hole biopsy was taken from each patient. The men applied the cream daily for 14 days following which they were circumcised. After the circumcision, post treatment punch-hole biopsies were taken of the removed foreskin to compare between pre and post treatments. Biopsies were fixed overnight in 4% paraformaldehyde and processed into wax. Thin sections (8μm) were cut to observe the histology of the skin. The Ayoub-Shklar method was used to stain keratin brilliant red, epithelium grey-violet, connective tissue blue, erythrocytes (red blood cells) red and pre-keratin orange.

Images were captured on a Zeiss Axiosvert 200M Fluorescence Microscope/orca ER Camera after the Ayoub-Shklar staining. Two pictures per section are taken. Data analysis was performed with Image J to measure the keratin layer. Six measurements per picture were taken. After all measurements were collected, they were graphed and statistically analyzed using Microsoft Excel.

The graphs represent mean keratin thickness of pre (blue) and post (red) treatment biopsies from 10 different patients. In each graph, there was an increased thickness of the inner keratin layer of the foreskin post treatment.

Our findings suggest that topical estrogen increases the keratin on the inner layer of the foreskin, which creates a thicker, more protective barrier against HIV infection. This provides a stronger defense in preventing HIV from reaching the Langerhans cells. Less than half of the samples have been completed at this time, therefore the remaining samples must be analyzed before reaching a final conclusion.

GP #4
Identification and Characterization of Randomly Generated ClpX Mutants with Altered SsrA Recognition

Erica N. Jones-Foster, Howard University / National Cancer Institute
Michael R. Maurizi, National Institutes of Health / National Cancer Institute, Bethesda, MD

In recent years, we have become aware of the steady rise of antibiotic resistant bacteria and the necessity of developing drugs that have new targets to decrease the possibility of cross-resistance. Since proteases play an instrumental role in the life cycle of some bacteria, drugs designed to inhibit the functionality of proteases could be key in combating the never-ending growth of drug resistant bacteria.

The goal of this project is to shed light on where substrates bind on one of the ATPase complexes of the Escherichia coli ATP dependent proteases, ClpX. ClpX is an ATPase that associates with ClpP, a serine protease, to form the ATP-dependent protease complex, ClpXP. Proteolysis requires that substrates be bound, unfolded and translocated through ClpX into the proteolytic chamber of ClpP.

The objective of this study is to investigate ClpX binding activity in anticipation of understanding its enzymatic activities and providing structural information about potential substrate recognition sites in ClpX that can be targeted for drug development. Data generated by another lab suggests that the pore loops within ClpX determine substrate specificity. We aim to investigate this phenomenon using randomly generated ClpX mutants and selecting them based on their abilities to degrade an altered substrate. We hypothesize that randomly generated ClpX mutants with mutations within its pore loops will render it altered in substrate specificity. Furthermore, those ClpX mutants with relaxed specificity will be mutated distal to the pore loops.

We tested our hypothesis by first constructing a recombinant vector that contained a toxic protein fused to an altered or wildtype peptide. The toxic protein with the unaltered peptide was readily recognized by ClpX and degraded by ClpP, whereas the toxic protein with the altered peptide was not. We then constructed a recombinant vector that contained mutant variants of ClpX. The ClpX mutants that gained the ability to promote the degradation of the altered peptide allowed cells to survive. To fully characterize the ClpX mutants, we will check their ATPase, protein degradation and substrate binding activities in vitro. Thus far, we have isolated 63 mutants. One mutant has a mutation within one of its pore loops that appears to altered its substrate specificity. Additionally, several of the ClpX mutants that are mutated in regions other that the pore loops appear to exhibit relaxed specificity. We aim to discover more about their activities in vitro within the coming months.

In future projects, the mutants that are altered in activity will be probed for their abilities to degrade normal ClpX substrates, such as RpoS and UmuD. [This research was fully funded and conducted at the National Institutes of Health/ National Cancer Institute.]
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GP #5
Acute-phase Serum Amyloid A Causes Th1 Differentiation in Murine CD4+ T Lymphocytes
Asona Lui, Chicago State University
Rong He, Chicago State University

Serum Amyloid A (SAA) is an acute phase protein, released predominantly from the liver during large scale inflammation. As such, it is commonly used as a marker to measure the amount of inflammation in many conditions. High SAA levels, up to 1000 times normal, are often associated with autoimmune diseases like Rheumatoid Arthritis (RA). SAA is found in very high levels in the arthritic joints of patients, along with a high concentration of certain subsets of T lymphocytes, notably helper T cell type 1 (Th1). The marker for Th1 cells is production of the cytokine interferon gamma (IFNγ). IFNγ is a well-known mediator of inflammation that attracts other immune cells to the location, exacerbating the condition. This cytokine also acts in an autocrine fashion, promoting the proliferation of more Th1 cells.

The purpose of this study is to determine if SAA stimulation of murine T cells causes Th1 differentiation. CD4+ T-cells isolated from the spleens of wild type mice have been stimulated in vitro with SAA protein. IFNγ production was measured and compared to that of the known inducer of Th1 cells, interleukin-12 (IL-12). IL-12 served as a positive control for these experiments. Indeed, SAA stimulation induced IFNγ production with levels as high as 22,088 pg/mL, which is comparable to the 20,237 pg/mL induced by IL-12.

Interestingly, our data shows that SAA and IL-12 can also co-stimulate T cells and result in even higher levels of IFNγ secretion. Future experiments will confirm Th1 differentiation by detecting cell surface markers with flow cytometry and will also investigate the intracellular actions of SAA stimulation. We will look for the activation of molecules used in traditional IL-12 signaling since it seems SAA may use at least part of the same pathway. These results suggest that SAA and Th1 cells are found together in arthritic joints because SAA induces this T-cell subset’s production, and is perhaps a missing link in our understanding of RA. This has implications for the development of new therapies for RA and inflammation in general. [This study was supported, in part, by a pilot grant from NIH/NICHD awarded to Dr. Rong He PhD, assistant professor of Biological Sciences, Chicago State University, Chicago, IL 60628.]

GP #6
Identification of a Second Putative Receptor for Infectious Pancreatic Necrosis Virus
Krystal McGrant, North Carolina Agricultural & Technical State University

Infectious Pancreatic Necrosis Virus (IPNV) is a bi-segmented, double stranded RNA virus that causes high mortality in young salmonid fish worldwide. As an obligate intracellular parasite, the first stage of the IPNV infectious cycle is the binding of the virus to a receptor in the host cell membrane. Recently, research has focused on identifying the IPNV receptor, and several scientists have reported binding of IPNV to a protein of approximately 220-250 kDa.

The focus of this research was to investigate and reaffirm the identity of the IPNV receptor(s) for IPNV serotypes VR-299, and Sp in Chinook Salmon Embryonic Cells (CHSE-214) and Rainbow Trout Gonad (RTG-2). We hypothesized that both serotypes VR-299 and Sp utilize the same receptor. Membrane proteins from CHSE and RTG-2 cells were extracted using the Calbiochem Proteo Extract Native Membrane Protein Extraction Kit. The Virus Overlay Protein Binding Assay (VOPBA) was used to identify IPNV-protein interactions.

Our results confirmed the binding of IPNV to a protein approximately 220-250 kDa; however, our results also revealed binding of both IPNV-Sp and IPNV-VR-299 to a second protein of approximately 60 kDa. Future studies are planned to generate polyclonal antibodies to the 220-250 kDa and the 60 kDa proteins to be utilized in competitive binding assays to confirm that IPNV uses both proteins as receptors. [Funding for this project was supported by NC-OPT-ED.]

GP #7
Stimulation of Intact Brain Circuits in Awake Behaving Mice with Transcranial Pulsed Ultrasound
Yusuf Z. Tufail, Arizona State University
William J. Tyler, Arizona State University

Many brain stimulation technologies have been shown to be effective and safe. Transcranial magnetic stimulation (TMS) and transcranial direct current stimulation (tDCS) are the most widely used brain stimulation interventions for humans, but have certain physical limitations and are still being assessed for efficacy in disease and cognitive models.

Using transcranial pulsed ultrasound as a neurostimulation technique has now been well demonstrated both in vitro and in vivo. As an alternative method, ultrasound provides an advantageous technique over TMS and tDCS as it has better spatial resolutions and greater access to deeper brain circuits. Based on our prior observations, we hypothesize that ultrasound induced neurostimulation may be followed by particular metabolic and/or morphological changes resulting with modulation in neuronal plasticity. The observation of ultrasound induced neuromodulation may lead us to inquire about the potential for therapeutic applications as it additionally serves as a noninvasive technique.
In this series of investigations we employed electrophysiological methods to observe ultrasound induced neuronal activity. Additionally, imaging techniques such as confocal laser scanning microscopy were implemented to assay cellular markers after utilizing immuno-fluorescent techniques. Other molecular techniques such as Enzyme Linked Immuno-sorbent Assay (ELISA) were used to quantify expression of neuromodulators. Finally, we assayed functional output by conducting spatial memory behavioral tasks using the Morris Water Maze.

Results indicate that it is indeed possible to elicit neuronal activity in intact rodent circuits as monitored by local field potentials (LFP) and multi-unit activity (MUA). Furthermore, we have observed that ultrasound can increase the expression of brain-derived neurotrophic factor (BDNF), a potent neuromodulator in the central nervous system. This insight led us to believe that plastic modifications may be occurring at the site(s) where ultrasound exerted its effect. Initial data observing spatial memory tasks in rodents may suggest that modifications in the hippocampal formation may manifest a behavioral output that is reminiscent of saturated learning.

We conclude that neural excitation via ultrasound is capable of inducing activity dependent expression of neuromodulators such as BDNF, lending support to our hypothesis. The motivation to translate this technique as a clinical therapeutic arises as we foresee the requirement to stimulate sub-cortical structures, such as the hippocampus. These results may implicate the use of ultrasound in diseased circuits such as epilepsy and Parkinson’s. [Funding was provided by BtD, LSAMP -WAESO, ASU start up funds and a department of defense grant to WJT from the US Army Research, Development, and Engineering Command (RDECOMW911NF-09-0431).]

GP #8
Uncovering Hidden Diversity in a Unique Island Ecosystem: Phylogeography and Conservation of Anchialine Shrimp in the Pacific Basin

David A. Weese, Auburn University, AL
Yoshihisa Fujita and Michio Hidaka, University of the Ryukyus, Okinawa Japan
Scott R. Santos, Auburn University

Anchialine habitats are land-locked bodies of water with no surface connection to the ocean yet contain salt or brackish water that fluctuate with the tides due to subterranean connections to the sea. These habitats are reported from around the world, including Bermuda, the Caribbean, Hawaii, the South Pacific, the Philippines, and the Ryukyu Islands.

Unfortunately, this unique ecosystem has received little attention while experiencing significant negative impacts from anthropogenic activities such as urbanization, groundwater extraction/contamination, and the introduction of invasive species. This is alarming since the biology of only a few of the species from this ecosystem have been examined to date. Given the ongoing threats anchialine habitats face, there is now an urgency to accelerate research into this ecosystem and its biota before both are lost forever.

In this regard, it is hypothesized that understanding the genetic and geographic relationships of taxa endemic to these habitats may help illuminate the processes driving the evolution of anchialine organisms. Such knowledge has important implications in developing sound conservation strategies for these organisms and their imperiled ecosystem in the future.

To address this, genetic analyses were conducted on six anchialine Caridean shrimp species possessing different life history traits (i.e., reproductive modes) and sampled from around the Pacific (i.e., Hawaii and the Ryukyu Islands, Japan). Patterns of genetic differentiation revealed “cryptic species” complexes with varying levels of population structure that are apparently influenced by geologic and hydrologic features acting as mechanisms of isolation and diversification.

These results highlight how interactions among extrinsic (i.e., geologic history and ocean currents) barriers and intrinsic (i.e., reproductive traits) properties can have a dramatic effect on the distribution, ecology, and evolution of anchialine organisms. In this respect, the biodiversity of anchialine habitats in the Pacific Basin may be grossly underestimated and represents a unique opportunity to further test hypotheses regarding the ecological and evolutionary processes acting on organisms from these habitats as well as provide critical information in developing effective management strategies for the preservation of this unique ecosystem. [This study was supported, in part, by a Cellular and Molecular Biology fellowship from Auburn University, an EAPS fellowship from NSF/JSPS, as well as the NSF-AASD STEM scholarship all awarded to David A. Weese, Auburn University, Auburn AL.]

GP #9
Functional Anotation Analytics of University Stress Proteins in Bacillus Genomes

Baraka S. Williams, Jackson State University, MS
Hari H. P. Cohly, Wellington K. Ayensu, Bianca Garner, and Raphael D. Isokpehi, Jackson State University

Bacillus, a gram-positive, rod shaped bacteria with aerobic and facultative anaerobic characteristics is a contaminant frequently isolated from soil and processed foods such as rice, dairy products and vegetables. Bacillus organisms are capable of producing highly resistant dormant endospores in response to nutritional or environmental stresses. Furthermore, it has been determined that genes encoding the universal stress protein...
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(USP) domain (PF00582) enables organisms to survive the impact of environmental stressors such as temperature changes, contaminated sediments, toxic metals, nutrient starvation, high and low pH levels and salinity.

We hypothesize that the abundance of genes encoding universal stress protein domain in Bacillus genomes will reveal novel observation on survival of Bacillus species in extreme conditions. We used computational tools available on the Integrated Microbial Genome (IMG) database to compare genomes and identify genes that encode the USP domain in finished and draft genomes of Bacillus. According to the IMG system, as of October 13, 2010, there are 79 draft, 30 finished and 1 permanent draft genome sequencing projects with Bacillus cereus displaying the highest number of species.

Our analysis revealed a total of 327 USP genes distributed among 110 Bacillus genomes. Amino acid sequence lengths range from 89aa (Bacillus cereus AH1134) to 905aa (Bacillus tuscae DSM 2912). We discovered a high abundance of 3 USP genes in Bacillus strains. The three genes which include: the universal stress protein, the universal stress protein family and uspA warrant further studies. We selected two Bacillus cereus strains that contained an abundance of 3 USP genes for investigation.

Currently, we are using molecular and biochemical approaches to examine gene expression in stressed exposed Bacillus strains: ATCC 14579 and ATCC 10876. Due to the fact that several strategies employed to prevent food poisoning may be contributing factors in causing the organism to be more robust (Burgos et al. 2009), a thorough annotation analytic study and determination of gene expression of the universal stress protein domain in Bacillus strains is imperative to better understand function and regulation of these genes under adverse stress conditions. [Acknowledgements: (EPS-0903787; DBI-0958179); (NSF Grant #HRD- 0115807); (T36 GM00879); (DHS Grant #2007-ST-104-000007; 2009- ST-062-000014; 2009-ST-104-00021); and (NIH-NCCR G12RR13459).]

GP #10
Altered Habitation and Synaptic Properties in Drosophila AKAP (rugose) Mutants

Alexandria Wise, City College of New York and The Graduate Center, City University of New York

Habitation is a form of non-associative conditioning in which there is a reduction in response to a specific stimulus presented repetitively over time. Components of the cAMP mediated signaling pathway have been previously shown to be important for normal habitation. A kinase anchoring proteins (AKAPS) are a large family of proteins originally identified in mammals which modulate the specificity of protein kinase A (PKA) function by targeting and compartmentalizing PKA to various sub-cellular structures. rugose (rg) encodes a Drosophila A kinase anchor protein (DAKAP550) which has been previously shown to be required normal pattern formation in the developing eye (Shamloolu et al. 2002). We present data which show mutations in rugose (rg), which encodes a (DAKAP550) alter habitation and synaptic properties. Data from behavioral, electrophysiological and cell biological studies on the adult as well as the larval neuromuscular junction are presented here.

CHEMISTRY & CHEMICAL SCIENCES

GP #11
Molecular Dynamics of the RNA-dependent RNA Polymerase of HCV

Brittny Davis, University of Maryland-Baltimore County
Dr. Ian Thorpe, University of Maryland-Baltimore County

The Hepatitis C Virus (HCV) affects approximately 170 million people throughout the world. About 25% of individuals with HCV will eventually contract chronic liver ailments, such as cirrhosis or liver cancer. Currently, there is no cure for this disease and there are few effective treatments.

The HCV RNA-dependent RNA polymerase (RdRp) is an enzyme that is presently a target protein for drug discovery because of its importance for viral replication. It is believed that a conformational change is necessary for RdRp to initiate the replication process. There is evidence that this conformational change is facilitated by the presence of magnesium ions and crystallographic data indicates the location of two magnesium-binding sites in the palm domain of the enzyme.

We employ molecular simulations and Principal Component Analysis to demonstrate, at a molecular level of detail, that the presence of magnesium ions alters the internal motion of RdRp. Particularly large fluctuations observed in the thumb domain of the enzyme may play a role in mediating the conformational change necessary for RdRp activity.

By observing the structural coupling that occurs as a result of enzyme dynamics, we hope to understand the link between the dynamic properties of RdRp and its functional attributes. In addition to providing insight into RdRp function, this study illuminates fundamental questions regarding the role that external effectors may play in altering internal enzyme dynamics. [This research was supported, in part, by the NSF Bridge to the Doctorate Fellowship and the NIH Chemistry Biology Interface Program at the University of Maryland, Baltimore County.]
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GP #12
Nuclear Forensics: Isotopic Signatures of Nuclear Reprocessing Solvents

April Gillens, Los Alamos National Laboratory, Los Alamos, New Mexico

Nuclear forensics serves to attribute signatures of nuclear materials involved in pre- and post-detonation events. Signature identification of pre-detonation events is critical in preventing weapons proliferation. The following study focuses on isotopic signatures of solvents used in nuclear fuel reprocessing. Secondary signatures may elucidate different steps in reprocessing upon measuring the stable isotope composition of manipulated solvents. The stable isotope value indicates the ratio of a heavy to light isotope and reports the value as the per mil deviation from the Pee Dee belemnite (PDB) standard.

Current experiments include bench-top simulations of common nuclear reprocessing techniques. Following experiments will include simulating industrial processes that use nuclear reprocessing solvents to distinguish the two. Analyzing bench-top simulations of common nuclear reprocessing techniques for carbon isotopes (δ13C) have apprehended that carbon isotopic signatures are capable of defining the origin of the solvent. Measurements of oxygen (δ18O) and hydrogen (δD) isotopes of similar experiments have shown significant fractionations between pure solvent and solvent exposure to water and nitric acid (HNO3), indicating that these signatures may be used to communicate different processes the solvent undergoes.

Several steps within nuclear reprocessing may impart different signatures, i.e. radiolysis, high temperature, complexation, and solvent evaporation and degradation. By identifying if, how, and when signatures change throughout reprocessing, it is possible to trace solvent origin and use for forensics efforts. This study seeks to determine if the use of stable isotopes is a valid method to distinguish solvent use in nuclear reprocessing from industrial uses (i.e. plasticizer, hydraulic fluids, pesticides, and paints).

A proposed continuation of this project is to collect samples from plutonium and uranium facilities in the United States (i.e. Savannah River Site, Oak Ridge National Laboratory, and Pacific Northwest National Laboratory) to determine the validity of bench-top experiments and to establish a catalog of solvent signatures present in actual nuclear fuel reprocessing. In response to President Obama’s speech on nuclear weapons in Prague last year, nuclear forensics is needed to ensure a reduction of nuclear weapons. In order to develop new signature analysis and detection methods, much knowledge is needed to understand the behavior of nuclear materials in certain events and how these materials enter, persist, and degrade in the environment. [This research was performed under an appointment to the U.S. Department of Homeland Security (DHS) Scholarship and Fellowship Program, administered by the Oak Ridge Institute for Science and Education (ORISE) through an interagency agreement between the U.S. Department of Energy (DOE) and DHS. ORISE is managed by Oak Ridge Associated Universities (ORAU) under DOE contract number DEAC05-06OR23100. All opinions expressed in this poster are the author’s and do not necessarily reflect the policies and views of DHS, DOE, or ORAU/ORISE. This research was facilitated by Los Alamos National Laboratory, Earth and Environmental Science Division, Group 14, Los Alamos, NM.]

GP #13
The Synthesis of Spiro-isoxazolines via Intramolecular Cyclization

Jillian K. Jackson, Jackson State University, MS
Ashton T. Hamme, IL, Jackson State University

Psammallysins A-E are a family of natural products that were isolated from marine sponges of the order Verongida. Many of these natural products display antiviral and antineoplastic activities. The most interesting structural motifs of the psammallysins are the oxipin and isoxazoline ring systems which are connected in a spirocyclic array.

This research will focus on synthesis of the isoxazole motif, which is highlighted above. The synthesis of this type of ring system is accomplished in two steps. These synthetic processes involve a 1,3-dipolar cycloaddition and an intramolecular ring closure of a pendant alcohol or carboxylic acid onto an activated isoxazole. The 1,3-dipolar cycloaddition of an alkyne with an -chlorobenzaldimine afforded the desired isoxazole.

Intramolecular cyclization was achieved through the reaction of the isoxazole ring with an electrophilic source of bromine.

The proposed mechanism of intramolecular cyclization involves the activation of the isoxazoline ring with bromine to form a bromonium ion. Neighboring group participation of the oxygen can cause opening of the bromonium ion intermediate and thereby give rise to an oxonium ion. Intramolecular attack of the alcohol or carboxylic acid oxygen onto the oxonium ring system and loss of a proton should then afford the spiro-isoxazolone. The intramolecular cyclization occurs in a very stereoselective manner whereby the bromine atom and the newly formed spiro -isoxazoline ring oxygen have an anti relationship. The synthesis and mechanistic details for the synthesis of our spiro-isoxazoline compounds will be discussed.
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GP #14
Theoretical Calculations of the Ionization Potentials and Electron Affinities of Guanine and Methyl Derivatives

Noel Matthews-Gardner, Jackson State University, MS

The relative abundances of the ion radicals produced in DNA are dependent upon electron affinities of bases for anions, the ionization energies of the bases for cations, and subsequent proton-transfer reactions between base pairs. A number of reports have focused on the ionization energies of DNA bases and indicated guanine as the most likely site for the hole in irradiated DNA. Yet, few investigators have considered the effects of ionizing radiation on the tautomers of guanine or methylated DNA bases despite their confirmed importance in mutagenic activity.

In this work, the energetic and structural properties of DNA have been investigated by examining the electron affinities (EA) and ionization potentials (IP) of guanine and several related compounds using the B3LYP density functional hybrid. We tested the hypothesis that electron attachment and removal play key roles in stability, structure and dipole moments of the guanine tautomers.

Using the 6-311++G(df,pd) basis set, the vertical and adiabatic ionization potentials for the keto form of N9H guanine are found to be 8.00 and 7.68 eV, respectively, and are in nice accord with experimental data. At this level, all non-methylated guanine structures show slightly negative adiabatic electron affinities whereas the methylated guanine compounds are relatively stable with respect to dissociation. All density functional (DFT) quantum-chemical calculations were accomplished using the Gaussian-03 software. Geometries of the eight model compounds were established by full optimization of all geometric parameters in the following order of level/basis sets: B3LYP/6-311G(d,p) > B3LYP/6-311+G(d,p) > B3LYP/6-311++G(df,pd).

Single point calculations were carried out on the cation, anion, and neutral radicals with the geometries obtained from the aforementioned optimizations at the corresponding basis set. The adiabatic and vertical electron affinities of the methylated guanine tautomers show a major difference in susceptibility due to electron attachment than that of the guanine tautomers. In addition, structural and electronic distribution changes upon electron removal and attachment lead to decreased and increased dipole moments, respectively.

Our goal in this study is to determine which tautomers remain structurally sound with the removal and addition of an electron to further our research by stacking and pairing DNA bases. [This study is supported by a grant funded by Title III and CREST awarded to Dr. Glake Hill.]

GP #15
Combined Effects of 17β-estradiol and Estrogenic Activity in Local Surface Water on the Gene Expression of Estrogen and Dopamine Receptor Sub-types

DeLauren McCauley, North Carolina Central University
Porche Spence, PhD, Gulf Ecology Division, US EPA Gulf Breeze, FL
Krystal Dempsey and Tonya M. Gerald, Ph.D. North Carolina Central University

Estrogen maintains homeostatic balance by affecting cellular responses in different organs (i.e., changes in gene expression.) Recently, there have been concerns about the presence of molecules with estrogenic activity in local surface water sources and their effects on the environment. In our present study, we are evaluating the combined effects of 17β-estradiol and local surface water estrogenic activity (LSEA) isolated from local surface water samples.

We hypothesize that the combined effects of 17-beta estradiol and LSEA will modulate the gene expression of estrogen and dopamine receptor sub-types; genes associated with bipolar disorder and substance abuse co-morbidity. Human neuroblastoma cell line, SH-SY5Y, were exposed for two weeks to concentrated estrogenic molecules isolated from nine different surface water sample sites. Cell viability assays, E-Screen assays and real-time PCR (to evaluate gene expression changes) were performed.

Preliminary results suggest a 3-4 fold increase in dopamine and estrogen receptor subtype gene expression, as well as the induction of estrogen receptor alpha. Future studies will include GC-MS analysis to determine the concentration of the estrogenic molecules and SDS-PAGE to evaluate estrogen and dopamine receptor protein levels in SH-SY5Y after long-term exposure. [Funded provided by the following: Louis Stokes Alliance for Minority Participation (LS-AMP/# NSF HRD0217571).]

GP #16
Enhancement of Singlet Oxygen (SO) Formation from Photosensitizers as a Function of the Potency of Different Light Sources

Sandra Pena, University of Puerto Rico-Mayaguez
Luis A Rivera, Surinder Singh, Oscar Perales, and Maharaj Tomar, University of Puerto Rico-Mayaguez

The generation of SO from semiconductor quantum dots and its application in photodynamic therapy is of great interest for treatment of various cancer types without using surgery, chemotherapy or radiation. SO generation studies were performed at laboratory level prior to in vitro studies to identify factors for enhancement of SO production from photo-
sensitizers (PSs). SO quantum yield (QY) were determined by photo-oxidation of chemical quencher by monitoring the disappearance of quencher in the presence of PS (rose bengal (RB), methylene blue (MB)).

We hypothesized that increasing potency of different light sources (white light, white LED light and monochromatic red and green LED lasers) could enhance the SO production from PSs. Three quenchers (N,N-dimethyl-4-nitrosoaniline (RNO) plus imidazole or L-histidine, 2,5-diphenylfuran, and 1,3-diphenylisobenzofuran (DPBF)) were used. The effect on SO production of use of a specific wavelength tuned to the absorption characteristics of the PS and potency of the specific light source were evaluated.

To assess the potential instability of different PS and quenchers used, control runs were performed at the same photooxidation conditions as for the standards and PSs. A control sample was prepared by taking two mLs of PS and one mL of quencher, each of about 1.0 x 10⁻⁵ M concentration and mixing them in a quartz cuvette in the dark before irradiation with light source and the mixture analyzed by UV-vis.

Then, once the reaction was started by irradiation, the reaction mixture was again analyzed after unit time intervals. The kinetics of photooxidation of quenchers was evaluated by plotting ln(Ao/At) versus irradiation time (t) of various PS/quencher/light source combination experiments. Formula \( \Phi = \Phi_{\text{std}} \left( \frac{k_{\text{sample}}}{k_{\text{std}}} \right) \), where \( k_{\text{sample}} \) and \( k_{\text{std}} \) are the slopes of the plot ln(Ao/At) vs. t of standard PS and measured sample, respectively, was used to calculate SO QY. Good first order plots were obtained and the relative slopes then used to determine β values and reaction constants for oxygenations performed with DPBF as quencher using a white light fluorescent light bulb in methanol.

The corresponding QYs of SO formation were 0.54 for MB, 0.28 for Fe₃O₄/ZnO core-shell nanoparticles and 0.71 for RB. It can be concluded that significant enhancements in SO production for PSs can be achieved increasing the potency of some light sources.

**GP #17**
**Iron-Oxo Pyrazolato Clusters Containing a Redox-Active Fe4O4 Cubane Core**

Kennett I. Rivero, University of Puerto Rico, Rio Piedras
Raphael G. Raptis, University of Puerto Rico, Rio Piedras

Iron cubane-type clusters have drawn much attention in bioinorganic chemistry due to their role in biological electron-transfer pathways, and model complexes containing Fe₄S₄ cores have been studied for a long time. Their ability to cycle between two or more oxidation states with minimal change in structure, allows for the rapid transfer of electrons in ferredoxins.

Polynuclear oxo-ferric complexes self-assemble with bridging ligands in diverse structures. A unique iron-oxygen cluster \([\text{Fe}_8(\mu_4-O)_4(\mu_2-pz)_2\text{Cl}_4]\) \(\text{[1]}\) \(\text{(pz=} \text{pyrazolato anion, C}_4\text{H}_4\text{N}_2\text{)}\) containing an all-ferric \(\text{Fe}^{III}\) cubane core has been synthesized, which can reversibly accept four electrons within a potential window of \(\sim 1.1\) V forming the mixed-valence \(\text{[1]}^{2/3/4}\) species. Tunability of the redox processes is achieved by substitution of the terminal ligands as shown by cyclic voltammetry.

Preliminary data are consistent with a first one-electron reduction step that is localized largely in the cubane core, rather than the peripheral iron centers. The site of subsequent reductions is not clear at all. Our initial assertion of a cubane-based reduction in \(^1\) relies heavily on our assignment of two Mössbauer doublets to core and peripheral iron centers. The reaction between the simple indium complex \(\text{mer-InCl}_3(pzH)_3\) and an iron salt in the presence of a base yields a mixed-metal cluster \([\text{In}_4\text{Fe}_4(\mu_4-O)_4(\mu-pz)_2\text{Cl}_4]\) where the core is a \(\text{Fe}_4\text{O}_4\) cube surrounded by four \([\text{In}(pz)_3\text{Cl}]\) peripheral units.

The energies of different electronic configurations have been computed using spin-unrestricted density functional theory. Calculations reveal weak antiferromagnetic coupling between the iron centers, mediated by the \(\mu_4-O\) bridges. This cluster represents the first example of a redox-active \(\text{Fe}_4\text{O}_4\) magnetically isolated cubane in which every iron is in the ferric state and the periphery is redox-inert. Such complex offers the possibility of gaining a better understanding of the redox processes that occur in the parent cluster \([\text{Fe}_8(\mu_4-O)_4(\mu-pz)_2\text{Cl}_4]\), substitution of the peripheral metals also minimizes some of the factors that affect the interpretation of the magnetic susceptibility studies.

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**GP #18**
**Detection and Analysis of Ambient Ozone Concentrations Using Passive Sampling Method**

Selisa Rollins, Arizona State University
Dr. Arnaolo A. Cardoso, São Paulo State University, Araraquara, SP, BR

When monitoring the ambient environment for nitrogen oxides, ground level ozone, and other common atmospheric pollutants, various techniques such as active and passive sampling may be employed. Of these two methods, passive sampling provides the convenience of easy maintenance, portability, and the ability to obtain long-term data trends at multiple sites.

This research sought to develop a novel analytical technique for determination of short-term ozone fluctuations in ambient air. Employing the passive sampler method, ambient samples at
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three sites, varying in elevation, on the São Paulo State University campus in Araraquara were obtained. An indigotrisulfonate solution was used as the sorbent; wherein the concentration of ozone was to be determined from the magnitude of fluorescence intensity of the exposed samples.

The hypothesis in question was whether there existed a linear correlation between the relative fluorescence of the samples and the actual ambient ozone concentrations. Results from a constructed calibration curve yielded a correlation coefficient of 0.506, exhibiting a precise, but inaccurate account of ozone concentrations among corresponding passive sampling measurements. Nonetheless, similar variation trends among the three sampling sites at the campus were established, indicating that significantly higher ozone concentration values were acquired at higher elevations.

Future work will encompass the implementation of more passive sampling at varying indigotrisulfonate reagent concentrations and sampling elevations. Executing these steps will assist in the development of an improved analytical curve capable of linearly correlating relative fluorescence of ambient-exposed indigotrisulfonate -impregnated samples with ambient ozone concentrations. [This research is supported by the WAESO LSAMP Bridges to the Doctorate at Arizona State University, a grant from NSF awarded to the University of Florida Department of Chemistry REU Program, FAPESP, and the Institute of Chemistry at São Paulo State University, Araraquara, SP, Brazil.]

GP #19
The Threat of Biofuels to Food Security: A Case Study of Ghana

Emmanuella Rony, Florida Agriculture and Mechanical University

Alternative energy sources have gained increased attention in recent years due to the rising price of oil in the midst of a global economic downfall, due to concerns regarding CO2 and other greenhouse gas contributions to climate change, as well as numerous other factors. Biofuels produced from renewable biomass material are possible alternative sources of energy because of the large quantity of feedstock and the potential to provide a new end market for agricultural commodities. Like most developing countries, Ghana is beginning to consider the production of biofuels as an alternative for crude with a clear understanding that the country’s dependence on crude oil is unsustainable for its economy.

On the other hand there exists counter arguments against the development of biofuels, especially in developing countries. The biggest of such arguments is focused on the impact of biofuel development on food security. The aim of this research is to evaluate biofuels as an alternative energy source to oil, mainly focusing on how biofuels can threaten Ghana’s food security.

The research began with the review of academic literature (online documents, books and more), business reports and available statistics on the biofuel in Ghana and global environment. Due to time constraints, research on-the-ground was only carried out over a period of two weeks. Tools utilized on the field study included: interviews and surveys of local producers, farmers, intermediaries, service providers, export agencies, and Ghanaian government officials to determine the capacity of Ghana to participate in a potential biofuel industry and evaluate the potential impact of these biofuels productions on the Ghanaian economy, food security, and livelihoods. Even though biofuels seems to be a promising avenue for economic growth, a country like Ghana is not ready for such technology. It was found that biofuels production required more energy than they can produce.

Like any other technology, biofuel has its pros and cons. The government of Ghana needs to develop and effectively enforce environmental and social standards and regulation to prevent destruction of livelihoods and ecosystem of the Ghanaian people by these biofuels productions. There is no quick fix, the key strategy for reducing dependence on fossil fuels is conservation. [This research was supported by the Center for Global Security & International Affairs (CGSIA). The center is a unit of the Center for Academic Excellence-the Intelligence Community (CAE IC) at Florida A&M University.]

GP #20
Biophysical Characterization of a Transcriptional Control PreQ1 Riboswitch from B. Subtilis

Nakesha Smith, University at Albany, NY

Riboswitches are naturally occurring regulatory RNA structures typically found in the 5’ untranslated regions of certain bacterial (and some eukaryotic) messenger RNAs. The preQ1 riboswitch regulates gene expression in response to preQ1, the biosynthetic precursor of queosine, an essential hypermodified guanine nucleotide in the trRNAs of a number of amino acids.

In this study, the B. subtilis preQ1 riboswitch was investigated using biophysical techniques, such as optical melting, NMR spectroscopy, and native gel electrophoresis on native transcribed as well as denatured and refolded RNA in order to examine the overall structure-function-stability relationships of the entire riboswitch. We seek to gain a better understanding of the effect of purification method on the RNA structure in the context of a transcriptional control riboswitch.
GP #21
Screening of Tenofovir Liposomal Formulations for the Treatment of HIV/AIDS Using a Plackett-Burman Design

Crystal Spinks, Howard University, Washington, DC

The aim of this experiment was to screen the important factors that affect the characteristics of tenofovir liposomal formulations prepared by the thin film method. Independent variables studied were phospholipid weight (mg) (X1), cholesterol weight (mg) (X2), stearylamine weight (mg) (X3), drug concentration (mg/ml) (X4), particle size (nm) (X5), washing cycles (X6), and hydration time (min) (X7). Each level was selected based on preliminary experiment. The liposomal properties evaluated were EFF (Y1), particle size (Y2), zeta potential (Y3), conductivity (Y4), and percentage released (Y5).

The statistical analysis of the results allowed the determination of the most significant factors. The factors showed variability of entrapment efficiency (Y1), particle size (Y2), zeta potential (Y3), conductivity (Y4), and percentage released (Y5) from 15.38% to 60.12%, 14.867 nm to 94.49 nm, 4.49 mv to 36.5 mv, 0.22 S/m to 1.31 S/m, and 1.44% to 29.11% up to 24 hours, respectively. In conclusion, this study demonstrated the capabilities of quality by design (Qbd) in revealing the effects of formulation and process variables on the characteristics on novel tenofovir liposomal formulations.

GP #22
Understanding Basic Genetic Diseases from Computer Based Methods

Patrina Thompson Harris, Jackson State University, MS
Glake A. Hill, Jackson State University

To understand the underlying chemistry by studying the basic part of the interaction, the nucleoside and the amino acids so that we may be able to determine the specific structure of proteins made from amino acids to help medical scientists make technical advances needed to detect human diseases and cancer successfully and design new drugs and treatment therapies.

In this research, we are modeling the interaction between keto9 guanine and aspartic acid at the B3LYP/6-31+G(d) (Becke, three-parameter, Lee-Yang-Parr) level. We hypothesize that if the amino acid bonds on the major groove of the guanine, it will be the most stable isomer and it can yield answers to medical questions. We used GaussView 3.0 visualization program to build the molecules, and the Gaussian 03 Computational package to perform geometry optimizations, frequency calculations and others such as ionization potential, electron affinity energies and interaction energies. We also used the Moller-Plesset perturbation theory to improve our electronic energies.

At the B3LYP level with all three basis sets, we find one consistent isomer, however, at the same level, the addition of an electron changes the order of relative stability of the isomers. An increase of the basis set size had no discernible effect on the geometries, B3LYP is highly favorable for the study of intermolecular interactions and knowing what shape the amino acid forms to fit into the major groove will yield many answers to the medical scientists. [Research supported by NSF-EPSCoR Grant #R829421E01 at Jackson State University.]

COMPUTER SCIENCES & INFORMATION MANAGEMENT

GP #23
Social Networking Teaching Tools: A Computer Supported Collaborative Interactive Learning Environment for K-12

Curtis Cain, The Pennsylvania State University
Justus Nyagwancha, Auburn University, AL

Computer Supported Collaborative Learning (CSCL) is a broad area, which is to investigate using technology to facilitate collaboration in educational environments. This research is to investigate and develop a collaborative educational environment as a tool to aid teachers in grades K-12 in the STEM, Science, Technology, Engineering and Mathematics, disciplines.

There are many different methods of attempting to engage the learner through online learning environments, however many of them are for older learners outside of elementary and middle school aged children. Many of these technologies are structured in such a way that younger learners lose interest relatively easily and miss concepts that should have been learned. This lack of technology utilization places younger adolescents at a disadvantage when compared to their older counterparts. This also places educators at a disadvantage resorting back to older teaching methods for teaching material to younger students.

The primary objectives of this research were to: 1) Design an educational learning environment to provide educators and younger learners the ability to use an online system that is interactive and open to younger learners and easy for educators to use to post their content; 2) Investigate educational tools currently available to facilitate and supplement traditional classroom learning for their effectiveness; and 3) Determine if the educational prototype environment will improve the effectiveness of educators.

The main hypotheses of this study is that teachers embrace computer aided learning that is interactive in a setting inside and outside of the traditional classroom and educators would use the environment if it engaged students and was not difficult for them to use and required no technical programming skill.
Another hypothesis is that an informal learning environment better supports students as opposed to structural educational environments.

The resulting model will be used as a component of a larger learning environment that will remove the social networking taboo stigma currently associated with social networking sites. The model will extend beyond that of traditional social networking by supplementing class lectures in a fun, engaging and thought-provoking manner instead of the typical classroom lectures. The final product will be a web-based collaborative educational tool for online interactive tool development. Surveys were used to analyze the perceived effectiveness and receptiveness to the proposed educational tool as determined by K-12 teachers. This paper seeks to gauge teacher’s receptiveness and willingness to utilize an online educational forum to supplement traditional classroom lectures.

Initial results indicate there are uses for informal educational environments in the classrooms that serve as content management systems as well as incorporate some of the social networking community features that students are accustomed to today. Content management systems such as Blackboard are great tools for education, but their effectiveness diminishes outside of the professional and collegiate classroom settings thus an effective method of educating K-12 in a way that is not strictly static is necessary. We believe this tool balances the creation of interactive content to support both students and their teacher.

Future research would involve further development and testing in small programs to gauge student receptiveness towards the online environment. Also, work needs to be done with teachers to familiarize them with the benefits of technology and ease of utilizing technology in classrooms.

GP #24
Capturing Expert Knowledge About Scientific Data Assessment Processes Using Cyberinfrastructure

Irbis Gallegos, The University of Texas at El Paso

Environmental scientists collect sensor data at remote locations, and they use their knowledge and expertise in the field to assess the quality of the collected data. The processes used for data assessment are rarely shared with other scientists due to lack of a well-defined methodology and tool support. This poster presents the Cyberinfrastructure that has been developed, which is based on software engineering techniques, to assist scientists in capturing tacit and explicit knowledge about data assessment processes that can be shared and reused by other scientists.

The approach introduces the specification of data properties to capture expected values and relationships associated with the data, which can then be used to identify anomalies due to environmental variability or instrument malfunctioning. Tool support for the specification and validation of data properties is provided to scientists. To build the data properties, the specification and pattern system (D-SPS) uses the data property categorization that was derived from analysis of numerous scientific projects, which use sensors to collect environmental data, as reported in the literature. Through the D-SPS, scientists are guided through a sequence of steps and series of decisions to specify data properties. Disciplined Natural Language (DNL) templates are used to state the specified property in the DNL. The scientist can then validate that the categories used to define the property capture the intended meaning. The specified properties can be used to check if the collected data satisfy the properties. If the scientist uses a fault tree analysis technique to identify data properties, it will be possible to document the data assessment process used by the scientist.

The tool support has been used successfully to assess data collected by a robotic tram cart collecting reflectance data in a field station located within the Barrow Environmental Observatory in Barrow, Alaska, and to assess data collected by an Eddy Covariance tower in a field side station located within the Jornada Experimental Range.

GP #25
Real-Time Detection of Stepping-Stones Using Neural Networks

Brian White, Jr., University of Maryland Baltimore County

Network intruders do not launch attacks directly from their computer to their target’s computer. To avoid being discovered, these intruders launch their attacks through a chain of intermediaries called stepping-stones. One common way to detect stepping-stones is by analyzing the TCP/IP packets of the connection. This is done by finding the time interval of the SEND and ECHO packets or the round-trip time. However, intruders have found ways to avoid detection by adding additional packets to the connection chain or by initiating inter-packet delay.

These methods of avoidance can lead current detection methods to false positives when confirming if that computer is part of a stepping-stone connection chain. Prior work has shown that neural networks are capable of detecting the length of these connection chains. A combination of TCP/IP packet-matching and the use of neural networks will lead to the development of a more accurate, real-time algorithm for the detection of stepping-stones. This method should still prove correct when the intruder injects additional packets or delay into the connection chain. The network traffic of Host i will be collected and used as training data for the neural network.
In this experiment, the Host 0 will use Host i as the first hop of the connection chain, created using SSH or Telnet. This connection chain will consist of a minimum of three computers between the intruder and the target computer. Then, the network traffic will be collected again and used as the test data for the neural network. A significant, uniform increase in the round-trip times as each member of the chain is added should determine that Host i is being used as a stepping-stone. The results from the neural network should quickly and accurately make this determination. Once it has been determined a computer has been compromised, next we attempt to determinate of the origin of these attacks from one of the intermediary computers. [This research was supported, in part, by the NSF LSAMP Bridge to the Doctorate Fellowship.]

ECOLOGY, ENVIRONMENTAL & EARTH SCIENCES

GP #26
Bacterial Community Structure of Two Freshwater Springs Impacted by Hydrilla

Nadine Bradley, Florida A&M University

One of the most highly invasive aquatic plant species is Hydrilla verticillata. Since its introduction into Florida fresh water bodies 25 years ago, hydrilla has become a major ecological and economical problem. We will test the hypothesis that hydrilla alters the normal bacterial community by investigating bacterial populations in two freshwater springs impacted with different levels of hydrilla. Wakulla Springs undergoes yearly treatments with the aquatic herbicide, Aquatol K, to control hydrilla, resulting in reduced levels. Sally Ward Spring receives no herbicide treatment and is fully infested. This study is important because alteration in the bacterial community could result in a shift in the normal ecosystem functions.

Approximately 1.5 liters of water samples were collected in duplicate from 3 sites in Wakulla Springs and 2 sites in Sally Ward Spring during the summer and fall of 2010. One liter was filtered through 0.2 μm filters and stored at -20°C for further processing on denaturing gradient gel electrophoresis (DGGE). Culturable bacteria were enumerated by the spread plate method using R2A medium. One hundred micro-liters were taken from 10-fold serial dilutions of water samples from both sites and spread-plated onto duplicate R2A agar culture plates. The plates were incubated at room temperature for up to one week and total number of colony-forming units (CFU) enumerated.

Representative colonies from each sample site were amplified with universal bacterial primers and sequenced for phylogenetic analysis and identification. For the culture independent method, total DNA was extracted from the bacteria captured on the 0.2 μm filters from both springs, followed by PCR amplification utilizing universal 16S rRNA gene primers. The amplified products were separated by DGGE and prominent bands were excised, reamplified and sequenced to yield a phylogenetic profile.

The results showed some differences in the DGGE profiles between the two freshwater springs. Sequencing data for excised bands are currently being analyzed for phylogenetic identification of the species. The plate count results showed differences in the total CFU by sampling date and springs. The Sally Ward Spring, infested with hydrilla, had a higher count of CFU for the July sample compared to the Wakulla site with little hydrilla. Some differences in the bacteria species between the two springs were found. Flavobacteria and Actinobacteria were recovered from the Sally Ward Spring but not Wakulla Springs.

The results suggest that hydrilla may alter the dominant bacterial community resulting in a shift in the normal ecological functioning of these freshwater springs. Future questions include shifts in the bacterial population over an annual cycle and effect of the herbicide on the bacteria. [This study was supported by a grant from NSF HBCU-RISE awarded to Henry N. Williams, Ph.D., Florida A&M University, Tallahassee, FL, 32307.]

GP #27
An Event-Driven Constructed Wetland Model to Treat Stormwater in the Arroyo Colorado River Watershed, TX

Daisy Cantu, Texas A&M University-Kingsville

Stormwater runoff is unfiltered rainwater that does not percolate into the ground. In areas without storm sewer drainage networks, it will find its way to a lake, stream, river, wetland, or coastal water. If the stormwater is left untreated, it may carry discarded garbage, chemical residuals, dirt, and other pollutants (e.g. biochemical oxygen demand, total suspended solids, phosphorous, and nitrogen) and contaminate the surface water body it flows into. Therefore, it is important to treat stormwater runoff before it reaches a body of water, to protect the environment and drinking water sources. Constructed wetlands have been proposed to treat stormwater runoff as they offer significant cost advantages and a wide range of ecological benefits.

The main goal of this study is to develop a mathematical modeling-based decision support system (DSS) for designing wetlands to treat stormwater runoff. The developed model is applied to study the utility of such constructed wetlands in the Arroyo Colorado River watershed in the Rio Grande Valley area of Texas along the rapidly urbanizing US-Mexico border. The free water surface (FWS) wetland technology is modeled using the tanks-in-series reactor theory assuming unsteady state flow and transport conditions.
Abstracts

The model considers major runoff pollutants including biochemical oxygen demand (BOD), particulate organic nitrogen (PON), ammonia nitrogen (NH3-N), and nitrate nitrogen (NO3-N). The utility of the model to design event-driven stormwater treatment wetlands under different urbanization scenarios will be illustrated. [The research is supported by the Center for Research Excellence in Science and Technology / Research on Environmental Sustainability in Semi-Arid Coastal Areas (CREST-RESSACA).]

GP #28
Palynomorphs of the Clayton Formation, Southeastern Missouri, as an Indication of Time Through the K/T Mass Extinction Event

Natalie R. Distas, Brooklyn College, NY
John A. Chamberlain, Jr., and Matthew P. Garb, Brooklyn College

A sequence of Upper Cretaceous to Lower Tertiary deposits are exposed in the Mississippi Embayment in the southeast region of Missouri’s boot-heel. The sequence is composed of three main units, the Owl Creek, Clayton and Porters Creek Formations which are evidence in support of the K/T extinction event. The deposition of the Clayton Formation was believed to have formed after the Earth experienced a devastating impact by an asteroid approximately 65.5 million year resulting in a mass extinction event at the end of the Cretaceous. The Clayton Formation lies unconformably above the Owl Creek Formation and below the Porter’s Creek Formation.

This research project will try and resolve the timing and process related to the deposition of the coquinite zone at the base of the Clayton Formation. Campbell et al. (2007) has postulated that the coquinite represents reworking due to a tsunami produced by the impact. In this circumstance, all of the fossils within the coquinite layer, including the microfauna and microflora, should be Cretaceous in age.

A second hypothesis relates the coquinite to long term reworking of the underlying Owl Creek Formation, forming a lag deposit during an early Tertiary sea level rise. Cretaceous macrofossils with Tertiary microfossils might suggest this scenario. A third possibility is that some of the Cretaceous fauna, such as ammonites, survived for a time after the impact. Ammonites with Tertiary microfossils preserved in the phragmacone of a baculite and scaphite discovered at the site. The analysis hopes to provide evidence for the cause of deposition of the Clayton Formation. The goal is to provide clarity as to whether deposition was caused by a megatsunami or a transgressive lag deposit. Palynological analysis will be used to correlate and establish relative ages of rock strata using fossil assemblages.

GP #29
Effects of Proximity to Forest Fragments on Hymenoptera Diversity and Yield in a Costa Rican Coffee Agro-ecosystem

Lisa M. Hannon, University of Washington

The landscape in the Tarraz region of Costa Rica is a mosaic of coffee plantations and natural vegetation patches or forest fragments. Recent studies conducted in agroecosystems suggest that conserving nearby forest fragments can boost populations of native hymenoptera. Although coffee (Coffea Arabica) is normally a self-fertilizing plant, it may benefit from insect pollinator visits; in recent studies, yield increases of 20% have been documented in coffee farms within 1km of forest fragments.

We measured the biodiversity of hymenopteran pollinators and parasitoids across a gradient of distances between the coffee plantations and forest edge in farms operated by growers belonging to the CoopeTarrazu farmers’ cooperative. Through a series of manipulative and observational studies, we determined the actual value of these forest fragments to farmers throughout the Tarraz region in terms of “natural services.” Our results will enable us to quantify the benefits of conservation as it relates to production for CoopeTarrazu growers.

We hypothesize that coffee plants that are (i) closer to forest fragments, and (ii) surrounded by larger areas of forest will have larger yields, compared with farms farther away from natural areas and/or surrounded by less natural habitat.

Fieldwork began in March 2010 dry season during the coffee flowering period to collect hymenoptera present in the fields during pollination. In July and August 2010, sites were revisited during the wet season in order to discern the effects seasonality upon hymenopteran community dynamics. Transects of 50m and/or 250m were measured from the farms’ edges. For farms that were isolated from any natural area, only a 50 m transect was measured. Measurements of yields and hymenoptera biodiversity were taken in 20m X 20m plots at these distances using clusters of five randomly selected experimental plants chosen within the experimental areas.

In March 2010, all flowers were counted and mesh exclusion bags were placed around six branches on the experimental plants. Yield was measured in July and August 2010, by counting
the number of fruits present on the tagged treatment branches of the designated focal plants.

Insect populations were determined by both direct observations and collection methods. Within the study plots, hymenoptera were counted for three 20-minute observation periods; coffee visiting hymenopterans were netted during three 5-minute catch periods. Pan traps were placed along transect lines measured from the farm edge. If the farm was adjacent to a natural area, a corresponding transect was also run in the abutting natural zone.

This study will be replicated during the 2011-2013 field seasons with an added experimental treatment to examine species elevational gradient stratification. [This project was funded by the Earthwatch Institute, UW Tacoma Founders' Endowment Fund, CoopeTarraz, and the Starbucks Coffee Company.]

GP #30
Urban Ecology and Human Health: The Connection through Urban Tree Cover

Viniece Jennings, Environmental Sciences Institute, Florida A&M University
R. Gragg and E. Johnson, Environmental Sciences Institute, Florida A&M University
C. Brown, Institute of Public Health, Florida A&M University
W. Zipperer, USDA Forest Service Southern Research Station, Gainesville, FL

Urban tree cover provides essential ecosystem services that impact human health and welfare. We hypothesize that tree cover and income are risk factors for respiratory health in urban populations in Tampa, Florida. Insight from this project and other areas of urban ecology can inform strategies to reduce environmental health disparities and promote sustainable communities.

Secondary data, categorized by respiratory health status, percent poverty level and percent tree cover were analyzed for correlation using regression analysis. Emergency room data, obtained from the Florida Agency of Health Care Administration for the years of 2005-2008, was filtered by the principal diagnosis under the Ninth International Classification of Diseases (ICD) codes: asthma (493.00 – 493.2; 493.92), bronchitis (490.0 – 491.9), and wheezing (786.07). The socioeconomic status of the emergency room patients characterized percent poverty: low (<9%), middle (9-19%), and high (>20%) with data obtained from the Census Bureau. Tree cover was obtained from the Tampa Urban Ecological Analysis that used randomly distributed plots to characterize the percentage of tree cover. For the purpose of this study, plots were grouped by their respective zip codes.

In this preliminary study, no correlation was observed \( r^2 = 0.08 \) between percent poverty, respiratory health, and percent tree cover. An inverse trend was observed between the percentage of tree cover and respiratory outcomes for low (<9%) and high (>20%) poverty areas. The average percentage of tree cover was lower among zip codes with a high percentage of residents below the poverty line. This population also had greater visits to the emergency room for respiratory conditions. Socioeconomic variation may suggest disproportionate impacts amongst the designated groups.

While the results are not conclusive, the interaction between percent poverty, tree cover and respiratory health indicate that further investigation including tree cover characteristics (i.e. condition, allergenic index, pollutant uptake capacity) and other confounding factors would provide a robust analysis. [Funding Source: U.S. Department of Education, Title III Programs.]

GP #31
Natural Gases Released from the BP Deepwater Horizon Oil Spill: A Source of Food for Marine Bacteria

Stephanie D. Mendes, University of California Santa Barbara
David L. Valentine, University of California Santa Barbara

On April 20, 2010, the United States was faced with one of the greatest environmental disasters of all time, the BP Deepwater Horizon oil spill in the Gulf of Mexico. This disaster released approximately 4.4 million barrels of oil and 300,000 tons of natural gas into the ocean. Most of this natural gas, consisting primarily of methane, ethane, and propane, dissolved in the deep ocean to form layered plumes that fueled intense bacterial respiration and led to a decrease in oxygen throughout the region.

This work targeted the water column to quantify the maximum rate of bacterial respiration of the natural gas plume. A novel method using uniformly 13C-labeled substrates as tracers was applied to determine the rate of microbial consumption of these gases in water surrounding the impacted area.

Experiments were performed on board the R/V Cape Hatteras (July 12-20, 2010) and the NOAA vessel Pisces (September 7-17, 2010); samples were analyzed using an isotope ratio mass spectrometer (IRMS). By measuring respiration rates in younger versus older plumes revealed that marine bacteria preferentially consumed propane, ethane, and methane, in that order, and were responsible for the depletion of natural gas released from the spill. [This research was supported by the National Science Foundation, the Department of Energy, and the National Oceanic and Atmospheric Administration Inc.]
Abstracts

GP #32
Prevalence of Indicator Bacteria and Bdellovibrio and like Organisms (BALOs) in a Polluted Florida Municipal Stream

Shanterial Young, Florida A&M University
Henry N. Williams, Florida A&M University

The pollution of municipal streams in cities is an increasing problem. It is not uncommon for signs to be posted warning the public not to swim, fish, or drink from the streams. Although streams are one of our valuable natural resources, they are being impacted by contaminants and rendered a hazard. Typical sources of contamination in polluted streams include storm water runoff, sewage overflows, industrial discharges and feces from wild and domestic animals. Coliform and other indicator organisms of fecal contamination are not necessarily pathogenic but their presence indicates or suggests recent contamination, which may result in human illness.

The St. Augustine Branch in Tallahassee, Florida, is an impaired stream known to be polluted by sewage overflows etc. The aim of this study was to estimate the numbers of indicator bacteria and their correlation with the predatory bacteria, Bdellovibrio and like organisms (BALOs). The samples were collected during the month of July and August from St. Augustine Branch. Heterotrophic plate count (HPC) was done using the R2A agar. The most probable number (MPN) procedure was used for detection of total coliform and fecal coliforms in lauryl tryptose broth and in A-1 medium, respectively. BALOs were estimated by the double-layer agar method using NB/200 medium with E.coli (ML-35) as prey. Denaturing Gradient Gel Electrophoresis (DGGE) use for the study of microbial community structure.

In the July samples, the results revealed that the heterotrophic bacteria spread plate count was 38,000 colony-forming units (CFUs) per ml, whereas the total coliform bacteria were 11,000 per ml, the fecal coliform bacteria were >24,000 per ml. BALO counts were too numerous to count (TNTC). From the August samples the total heterotrophic bacteria recovered was 197,000 CFUs per ml, the total coliform bacteria was >24,000 per ml, the fecal coliform bacteria >24,000 per ml, and BALOs were 13 plaque-forming units (PFUs) per ml.

The July HPC results yielded higher bacteria counts than the August samples. The lower counts may have been due to temperature change and more rainfall. This could explain the high counts of the BALOs in the month of July as compared to August counts. The difference observed in the bacterial counts is probably due to the change in the temperature between two sampling time points. The BALOs numbers appeared to correlate with the numbers of total bacteria detected at that time point.

In conclusion the numbers of indicator bacteria exceeded the standards and is the basis for the posting of warnings around the streams. Since many of the fecal coliforms are gram-negative bacteria that the BALOs prey on a correlation between the two would be expected. The sampling of the streams is continuing on a monthly basis. [This material is based upon work supported by National Science Foundation and HBCU-RISE. Awarded to Henry N. Williams at Florida A&M University, Tallahassee, FL 32307.]

MATHEMATICS & STATISTICS

GP #33
Influenza Vaccination Strategies When Supply is Limited

Romarie Morales, Arizona State University

The aim of this work is to find alternatives that mitigate the transmission of influenza via vaccination in a finite time period. To understand the dynamics of transmission we will use an extension of the SIR model with data from the 1918-19 Pandemic Influenza. Previous work has shown that the pandemic influenza transmission model with control can be used to better understand the spread of the virus in a population that has full or limited access to vaccination.

We use optimal control techniques to explore these constraints and provide a more realistic approach that public health Policy makers can work with when trying to meet the highly difficult task that comes from having a limited vaccine supply. Given that previous studies did not include an asymptomatic class, and the ramifications of this subpopulation on disease transmission, we will focus our attention on understanding the impact and how to minimize transmission, when this class is added to the epidemiological model.

Also, previous research did not fully analyze the vaccine time production and deployment after the virus has been identified. To make our analysis more realistic, we intend to add a time delay on the supply of the vaccines, and utilize optimal control theory to provide a more realistic approach, that public health policy makers can work with when trying to meet the highly difficult task that comes from having a limited vaccination supply. [Funded by ‘WAESO LSAMP Bridges to the Doctorate’ program.]

GP #34
Transmissibility of H5N1 Avian Influenza in Nigeria: The 2006 Epidemic

Emmanuel J. Morales-Butler, Arizona State University

The current worldwide transmission of the highly pathogenic avian influenza virus subtype H5N1 (HPAI H5N1), which affects poultry, primarily, also represents a pandemic threat for human populations. In this study, we evaluate the net effectiveness of control measures, namely, depopulation of infected premises,
movement restrictions, and biosecurity measures in reducing virus transmissibility.

Assuming gamma-distributed incubation and infectious periods within infected poultry farms, we apply a deterministic non-spatial multi-stage compartmental model with classes of poultry farms. Further, we use a least-square approximation to estimate the pre and post-intervention transmission rates between premises of the HPAI H5N1 epidemic in Nigeria in 2006, where 113 premises were reported as infected.

The basic reproduction number $R_0$ was estimated to be 2.10 (95% CI: 2.03, 2.17). We analyze numerical uncertainty on the estimates of $R_0$ due to various model formulations and give a bound for $R_0$ of [1.98, 3.1]. The post-intervention reproduction number ($R_p$), which captured the effects of interventions on reducing transmissibility, was estimated to be 0.57 (95% CI: 0.48, 0.66).

These estimates lead to an approximate percent reduction of the reproduction number ($R_t$) between 66.6% and 84.3%. A stochastic model was used to compute the empirical distributions of the peak epidemic size and epidemic size at week ten, with and without interventions. The approximate percent reduction of the mean of peak epidemic size and epidemic size at week ten due to interventions were 98.4% and 98.2%, respectively.

Our study confirmed the between-premise transmissibility ranges of the HPAI H5N1 previously reported for virus subtype H5N1 outbreaks in other continents and the effectiveness of the intervention strategies. Lastly, we describe potential ways that spatial information about the spread of influenza between poultry farms could be used in future investigations. [Funding: WAESO LSAMP Bridges to the Doctorate.]

**GP #35**

**A Cable Equation Model for the Effects of Tissue Deformation on Transmission of Electrical Signals in Single Nerve Cells**

Anarina Murillo, Arizona State University

The presence of a cerebral aneurysm, tumor, or other abnormality may cause structural deformation to surrounding neurons that could affect voltage propagation. To better understand how abnormal growth may affect the flow of electrical signals in single cells, we modify the cable equation to include a spatially-dependent radius.

If the radius changes as a linear function of $x$, the cable equation takes the form of Lommel’s equation, which yields solutions consisting of modified Bessel functions. A more realistic representation of deformation includes hyperbolic functions for the radius and results in an adapted form of Ince’s equation. For the cases of the cylinder and frustum, steady state solutions are found analytically with boundary and initial conditions, then verified numerically. The modified Ince’s equation is solved with numerical methods.

The three methods presented are combined to examine the effects of damage on voltage propagation through a larger dendrite segment. Implications of this research can be further applied to gain insight on the physiological properties of a deformed dendrite. [Acknowledgement of funders: WAESO LSAMP Bridges to the Doctorate program. This project has been supported by grants from the National Science Foundation (NSF - Grant DMPS-0838705), the National Security Agency (NSA - Grant H98230-09-1-0104), the Alfred P. Sloan Foundation; and the President and Provost Offices at Arizona State University. The Mathematical and Theoretical Biology Institute is now hosted at the Mathematical, Computational and Modeling Science Center at ASU.]

**GP #36**

**Immigration Laws and Immigrant Health: Modeling the Spread of Tuberculosis in Arizona**

Dustin Grijalva Padilla, Arizona State University

The United States has observed a steady decline in the number of reported Tuberculosis (TB) cases in the past fifty years, but many states, such as Arizona, have had rates consistently above the national average.

TB has been regarded as a disease of the disadvantaged, where poverty, overcrowding, and malnourishment are responsible for much of the continued spread. Accordingly, the majority of TB cases in Arizona occur in the foreign-born population, whose households usually fall below the poverty line and have less access to adequate health care. Within this population, undocumented immigrants are the most socially and economically disadvantaged.

Therefore, immigration laws, including some of the provisions in SB 1070, are likely to cause further marginalization, as the increased fear of deportation will discourage undocumented individuals from seeking work and healthcare. Such laws could potentially exacerbate the spread of TB among undocumented immigrants and the low-income communities in which they reside, eventually advancing into all socioeconomic classes. In order to characterize the transmission dynamics of TB in Arizona, and to concentrate on the undocumented inhabitants, this paper divides the population of Arizona into a low-income and a high-income group. The low-income group comprises residents who earn $30,000 or less annually, as this approximates the poverty line in Arizona during the years in consideration. The high-income group consists of all other residents.
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The poverty line is used as the threshold because it is high enough to encompass the undocumented population, yet low enough that a sufficient amount of interaction occurs between the two income groups. This, in turn, allows more contact between infectious and susceptible individuals. The model also accounts for varying degrees of interaction within income groups.

Based on census data and previous TB models, the model parameters are adjusted to simulate probable behavioral changes in undocumented immigrants before and after the implementation of an immigration law, such as SB 1070. The simulations revealed that over a relatively brief amount of time, the disease’s prevalence in both income groups will significantly increase, as expected, and dramatically more in the low-income group.

Ultimately, we investigate just one of the many repercussions of an immigration law, such as SB 1070. Though TB is of interest because of the direct increase of foreign-born TB cases, TB is not the necessarily the greatest health threat. Furthermore, this model may be adapted to other communicable diseases ranging from measles to influenza. [This project has been supported by grants from WAESO LSAMP Bridges to the Doctorate, the National Science Foundation (NSF-Grant DMPS-0838705), the National Security Agency (NSA - Grant H98230-09-10104), the Alfred P. Sloan Foundation; and the President and Provost Oces at Arizona State University.]

GP #37
The Immersed Boundary/Interface Method for the 1-D Poisson Equation

Ashley Sanders, Jackson State University, MS
E. Aspinwall, R. Cooper, and P. Kuberry, Jackson State University

Interface problems in the form of ordinary and partial differential equations can be solved using finite difference or finite element methods. These problems have many applications in biological mathematics and can be quite challenging. Specifically, this presentation will focus on one-dimensional problems where there are discontinuities and singularities in the equations. The discontinuities arise in the parameters of the equation while singularities arise when a delta-function is added.

In this presentation, we will explore both theoretical and numerical analysis for 1D interface problems. We study how delta functions in a simple differential equation will affect the solution and what kinds of biological implications such additions have. We will also explore how the addition of a discontinuous parameter to one of the terms affects the equation and examine the cases when the interface moves to the boundary and the relations of the delta function with the boundary conditions. We will then apply the immersed boundary, immersed interface methods, harmonic averaging and other discretize techniques to the equation to analyze the solution numerically.

NANOSCIENCE

GP #38
Growth and Optical Properties of Indium Selenide Nanowires

Adeyemo Adetogun, North Carolina Central University

Indium selenide nanowires are promising candidates for use in advanced optoelectronic applications including high-density phase change memory, high efficiency photovoltaic cells and fast photodetectors. InSe nanowires were produced through the vapor – liquid – solid mechanism by thermal evaporation of InSe powder, using Au nanoparticles to catalyze growth. Adjustment of the substrate temperature, gas flow rate and gas pressure resulted in production of nanowires with diameters ranging from 50 nm to 100 nm. Electron backscattered diffraction measurements of single nanowires showed a mixture of layered and defect wurtzite phases, with growth predominantly along the (0001) axis. The presence of both layered and wurtzite phases was confirmed over larger areas by Raman spectroscopy. Stoichiometry of the nanowires, as measured by energy dispersive x-ray spectroscopy, was maintained within experimental uncertainty at lower substrate temperatures. Photoluminescence spectra exhibited a strong peak attributed to band edge emission near 1.9 eV and a broad emission peak of unknown origin at lower photon energies.

GP #39
UV-Enhanced Cytotoxicity of Cu-doped ZnSe@ZnS Quantum Dots in Human Pancreatic Carcinoma Cells

Sonia Bailon-Ruiz, University of Puerto Rico at Mayagüez
Oscar Perales-Perez, University of Puerto Rico at Mayagüez

Due to their particular physico-chemical and optical properties semiconductor quantum dots, QDs, are considered very promising materials for cell imaging, cancer nanomedicine and related bio-medical applications. The present work is focused on the development of a microwave-assisted synthesis method to produce water-soluble and stable Cu-doped ZnSe@ZnS core-shell QDs and the evaluation of their UV-enhanced cytotoxicity in human pancreatic cells (PANC-1).

For this purpose, an 8 Watt- UV lamp was used. Desired nanostructures were produced from starting zinc chloride and selenide aqueous solutions in presence of 3-Mercaptopropionic acid (MPA) at 140°C. The dopant (Cu2+) concentration was 0.1% w/w. The formation of the 4nm-6nm QDs was confirmed by X-ray diffraction, HRTEM, UV-Vis spectroscopy, PL spectroscopy...
and ICP-MS analyses. Human pancreatic carcinoma cells (PANC-1) were cultured in DMEM medium containing 10% (v/v) fetal bovine serum and Gentamicin 50µg/mL at 37°C in air containing 5% CO2. Cells were seeded in 96-well plates and grown to about 80% confluence. The cytotoxicity of Cu-doped QDs in absence of UV-irradiation was studied as a function of their concentration (0ppm-500ppm) when contacted for 48 hours to targeted cells. The cytotoxicity under continuous UV irradiation -302 nm - was assessed at different exposure times. Cancer cells UV-irradiated at different exposure times were used as controls. The viability percentage was determined in triplicate using the trypan blue exclusion assay in a cellometer.

The viability percentage in absence of UV irradiation decreased from 70.0% 3.6% down to 44.8% 9.1% using 100 ppm and 200 ppm of QDs, respectively, after 48 hours of contact. Massive cell death was observed at QDs concentrations above 200 ppm. The cytotoxicity of QDs was enhanced under UV-irradiation as a function of the exposure time. The viability of PANC-1 in presence of 50ppm of QDs decreased from 79.7% 9.2% (0 minutes of irradiation) down to 25.5% 2.0% (60 minutes of irradiation). UV illumination alone, (control-test), decreased the viability of PANC-1 from 98.3% 1.7% (0 minutes) to 66.8% 7.9% after 60 minutes of exposure. Our results evidence the feasibility of using UV radiation and selected QDs as a platform to generate cytotoxic species. [Acknowledgements: The National Science Foundation under Grant No. HRD 0833112 (CREST program).]

GP #40
Separation of Nanocrystalline Cellulose at Low Concentrations in Water

Jabari Calliste, Howard University, Washington, DC
James W. Mitchell, Howard University

The ever-increasing research, production and wider use of nanoparticles today, potentially introduce and increase the amount of nanoparticles present in the environment. The domino effect of this is the increasing interaction of humans, wildlife and plants with nanoparticles. As a result, nanoparticles may be present in our surface and groundwater sources, and there is little information on the amount of synthetic and naturally occurring nanoparticles present in the environment.

The objective of this research project is to investigate the use of electrophoretic deposition to separate cellulose nanoparticles in water systems at low concentrations. Cellulose nanoparticles were selected in view of the fact that cellulose is ubiquitous and is utilized by a number of industries. The nanocrystalline cellulose (NCC) particles utilized in the experiments were synthesized by the sulfuric acid hydrolysis of microcrystalline cellulose (MCC).

The size readings of the resultant particles were measured using a transmission electron microscope (TEM) and the dynamic light scattering method (DLS). The lengths of the NCC whiskers ranged from 70 nm - 300 nm, and widths from 15 nm - 30nm. Zeta potential and electrophoretic mobility were also measured using a Malvern Zetasizer and values ranged from -15 mV to -25 mV and -1.1 µmcm/Vs to -2.2 µmcm/Vs respectively. The stable suspension was then used in electrophoretic deposition experiments firstly keeping time constant and altering the voltages for each deposition, and then keeping the voltage constant and varying time. The surface of the substrate was examined using a scanning electron microscope (SEM) and atomic force microscope to observe the coverage of the surface. A thin film was observed with areas of high concentrations of nanocrystalline cellulose. Infrared and Ramon Spectroscopy were used to characterize the deposited film.

The resulting spectra were synonymous with cellulose. The data indicates that stable NCC can exist in water systems at neutral pHs and electrophoretic deposition is a viable way of separating nanoparticles from the water. This technology can be used to develop on-line separation of nanoparticles from water to facilitate direct detection of the nanoparticles. Silver nanoparticles are also being investigated as a gettering agent to enhance the separation of low levels of cellulose. [This study was supported, in part, by grants from NSF/CREST #0833127 and NSF/CEIN # 0830093 awarded to Dr. James W. Mitchell Ph.D., Director for the Center for Research Excellence in Science and Technology (CREST), Howard University, Washington, DC 20059.]

GP #41
Study of Supported Ruthenium Catalysts for the Conversion of Cellulose to Sugar Alcohols

Darlene Z. Galloza Lorenzo, University of Puerto Rico, Mayaguez, PR

The increase in the green house gas emissions, due in part to the accumulation of CO2 gases in the atmosphere and the increasing world’s energy needs, combined with diminishing petroleum resources, have caused a renewed interest of finding alternative ways to produce fuels, such as the conversion of lignocellulosic biomass by a bifunctional catalyst into sugar alcohols.

This work is focused on the study of the effect of the support acid-base properties on the catalytic performance during the conversion of cellulose into sugar alcohols, which can be used as renewable biorefinery feedstock for the production of fuels and high value chemicals. The series of metal oxide supports studied includes MgO, ZrO2, TiO2, Nb2O5, Al2O3, and SiO2. Furthermore binary and ternary metal oxides were also analyzed like SiO2-TiO2, TiO2-WO3 and SiO2-TiO2-WO3.
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This set of materials displays a wide range of acid-base properties. Ru was supported using evaporative deposition. The catalytic activity of the support materials appears to have a correlation with the Sanderson electronegativity of the metal oxide passing through a maximum for Ru/Nb_2O_5 for the supported catalyst and through ZrO_2 for the supports. The catalytic materials were characterized using nitrogen adsorption, X-Ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Energy Dispersive Spectroscopy (EDAX) and Fourier Transform Infrared Spectroscopy (FTIR). Ru/Nb_2O_5 has a significantly lower surface area than Ru/SBA-15 but displays higher activity. The selectivity of the mesoporous material is better than that of Ru/Nb_2O_5. The binary metal oxide TiO_2-WO_3 had a better activity and selectivity than SBA-15, probably due to its more acidic character. Ru/TiO_2-WO_3 displayed the best cellulose conversion; on the other hand Ru/SiO_2-TiO_2-WO_3 shows better selectivity to sugar alcohols. [We wish to acknowledge CREST Nanotechnology Center for Biomedical and Energy-Driven Systems and Applications (HRD-0833112) for the financial support.]

GP #42
A Mole Ratio Investigation of Ag Nanoparticles with an Enhanced Plasmon Resonance

Felicia A. McClary, Howard University, Washington DC
James W. Mitchell, PhD, and Shauna Gaye-Campbell, Howard University

Ag nanoparticle technology, as a result of a wide array of practical applications, is one of the most rapidly developing areas in nanoscience. Exploiting applications of silver nanoparticles requires an efficient synthetic technique resulting in reproducible physical and chemical properties. In order to elucidate the nature of the chemical composition of silver nanoparticles stabilized by citrate, in the present study, Ag+ to-citrate mole ratio is investigated as a function of the localized surface plasmon resonance (LSPR).

Varying the molar ratio of the citrate reactant is expected to result in a linear increase in the plasmon resonance absorbance as a result of the increased formation of silver nanoparticles. A microwave irradiation chemical reduction method generated citrate-terminated Ag nanoparticles (Ag NPs ~ 44 nm via dynamic light scattering) prepared at molar ratios of Ag+ to-citrate ranging from 1:1-to-1:11. A time dependent study of Ag nanoparticle stability at this range of molar ratios was also conducted.

The long term stability of Ag nanoparticles, purified by extraction, is verified by LSPR measurements. Ultraviolet-Visible (UV-Vis) spectroscopy shows a linear and sharply increasing LSPR band for Ag nanoparticles at molar ratios of 1:1 to 1:5 while at larger ratios, 1: >5, the LSPR decreases.

The increase in citrate concentration, up to 1:5, results in coordinative saturation at the molecular level and an increase in electrostatic stabilization at the surface of silver nanoparticles due to the presence of free negatively charged carboxyl groups at the nanoparticle surface. Zeta-potential measurements of extracted Ag nanoparticles were used to further confirm the change in the surface negative charge as a function of the molar ratio.

The observed decrease in LSPR and stability is evidenced by the appearance of two distinct and chemically different phases each yielding different absorption properties. This observation of conditions for the generation of Ag nanoparticles with enhanced LSPR may provide for more efficient applications in bioimaging, and surface enhanced detection in analytical chemistry. In addition, the bonding interaction of Ag nanoparticles to citrate ions will be elucidated further. [This research is funded by the NSF-CREST Grant # 0833127 awarded to Dr. James W. Mitchell, Ph.D., Director of the CREST Center for Nanomaterials Characterization Science and Processing Technology, Howard University, Washington, DC 20059.]

GP #43
Ag Nanoparticle Inhibition Of E.coli Growth In Aquatic Media

Mandy Mitchell, Howard University, Washington, DC

Escherichia coli (E.coli), a bacterium commonly monitored as an indicator of the quality of freshwaters, is a gram negative rod-shaped bacterium that is commonly found in the lower intestine of warm blooded organisms. Thus the presence of E.coli in drinking water indicates the potential for transmission of waterborne disease. This results in the current stipulation by the Environmental Protection Agency (EPA) guidelines that E.coli levels are required to be zero in potable water. Based on the known biocidal properties of Ag nanoparticles (Ag NP’s) an investigation was conducted to determine the efficiency of citrate and cellulose stabilized Ag NP’s was conducted.

Citrate and cellulose stabilized Ag NP’s were first investigated to determine the percentage completion of the reactions producing the nanoparticles. Further comparisons were made to determine the Minimum Inhibitory Concentration (MIC) of the respective Ag NP’s on E.coli. Additionally, common water purification practices were employed to remove E.coli residue and excess Ag NP’s from the treated water. At all stages of experiment the pH was monitored and adjusted in the exit stream to ensure that a pH level of 7 was maintained.

The aforementioned comparisons were made to test the hypothesis that water disinfection can be achieved through treatment with Ag nanoparticles to generate product water that is non toxic after being subjected to subsequent common water purification processes.
Initially percent completion reactions for citrate and cellulose stabilized Ag NP’s were determined to be over 95%, through separation techniques and sensitive UV-Vis spectrophotometric analysis. Subsequently, the MIC was determined to be 6 ppm for citrate stabilized Ag NP’s and 4ppm for the cellulose stabilized NP’s upon introduction of 108 CFU’s of E.coli into the aquatic environment.

Following the MIC determinations the complete absence of E.coli was confirmed by plating and UV-Vis absorption spectrometry. Additionally the effective removal of E.coli residues and excess Ag NP’s was effected by coagulant aids. Further quantitative testing of the filtered product water will be investigated to assure the absence of Ag NP residue in conjunction with toxicological characterization techniques using cell viability procedures. [This study was supported, by a grant from NSF/CREST #0833127 awarded to Dr. J. W. Mitchell Ph.D., Dean of the College of Engineering, Architecture and Computer Science, Howard University, Washington, DC 20059.]

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**GP #44**

**Synthesis of Polymer Coated Magnetic Nanoparticles for Delivery of Hydrophobic Drugs**

Roberto Olayo-Valles, University of Puerto Rico at Mayaguez
Carlos Rinaldi, University of Puerto Rico at Mayaguez

Wide interest exists in the use of magnetic nanoparticles for biomedical applications such as MRI contrast enhancement, magnetic fluid hyperthermia, and drug delivery. The development of drug delivery vehicles is especially important for the treatment of cancer, since some of the more effective chemotherapeutic agents are highly toxic and hydrophobic (e.g. paclitaxel, camptothecin).

We are synthesizing polymer coated magnetic nanoparticles to be used for the delivery of hydrophobic drugs. The composite nanoparticles are prepared by coating iron oxide nanoparticles (IONP) with poly(e-caprolactone) (PCL). PCL is a biocompatible and biodegradable polymer that has hydrophobic character. It is within this shell that the drug will be loaded.

The PCL coating is prepared by polymerizing e-caprolactone from the IONP surface. To this end, the surface of the IONP is first modified with 3-aminopropyltriethoxysilane to obtain amine groups on the surface. The polymerization is initiated at the surface amine groups. The polymerization procedure involves the use of hydrochloric acid to activate the monomer which polymerizes in a controlled manner.

The composite nanoparticles are analyzed by FTIR, dynamic light scattering, and thermogravimetric analysis. In this manner, composite nanoparticles with low polydispersity have been obtained. For the intended application, the particles must be suspended in buffers; an outer hydrophilic shell is thus needed.

We are currently working on the grafting of poly(ethylene glycol), a biocompatible and hydrophilic polymer, to the PCL shell in order to obtain a composite nanoparticle consisting of an IONP core, a PCL hydrophobic intermediate shell, and a PEG hydrophilic outer shell. When combined with a hydrophobic compound, we expect the compound to preferentially partition into the PCL shell. The delivery of the drug may be activated through the application of a magnetic field as in magnetic fluid hyperthermia or by the degradation of the PCL shell. [The authors acknowledge funding from the NSF-CREST program award 0833112.]

**PHYSICS**

**GP #45**

$^9\text{Be}$ Resonances: Search with Pade Approximants

Adewale Akinfaderin, North Carolina Central University
I. Filikhin and B. Vlahovic, North Carolina Central University

The $^9\text{Be}$ hypernucleus can provide useful information on hyperon - nucleon interaction, in particular, for spin-orbit component [1]. The cluster structure of $^9\text{Be}$ allows applying well established few-body physics methods. The $^9\text{Be}$ bound states have been studied within the $\alpha + \alpha + \Lambda$ model in a number of works, while there are fewer theoretical studies for resonance states giving only qualitative description of the $^9\text{Be}$ spectrum.

In this work, the structure of the $^9\text{Be}$ low-lying spectrum is studied within the cluster model $\alpha + \alpha + \Lambda$ based on the configuration space Faddeev equations. A variant of the method of analytical continuation in coupling constant is applied to calculate the parameters of resonances. To realize this method, a three-body potential is added to the Hamiltonian of the equations. A proper choice of strength parameter of the potential converts a resonance state into a bound state and an energy trajectory of these bound states is obtained by variations of this parameter. To fulfill the analytical continuation of this trajectory as a function of the strength parameter onto the complex plane, the Pade approximation is used. We evaluated the energy and width of first $^1\text{S}_0$ resonance state of $^9\text{Be}$. It is an example of so called “genuine hypernuclear states” [2] which is absent in “regular” nuclear matter (the $^9\text{Be}$ nucleus, for example). We show details of applying the method and evaluate accuracy of the energy and width of the resonance obtained.

We conclude that the proposed method allows evaluating energies of low-lying resonances. Our computer codes were tested by the $^9\text{Be}$ $^1\text{S}_0$ resonance calculations. Our calculations correlates well with the experimental data for excitation energies of this resonance state. We demonstrated that the proposed set of the inter-cluster potentials is justified by successful application to other systems as well as $\alpha + \alpha + \alpha, \alpha + n + \Lambda$. This work will be continued in future. [This work is...]

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GP #46
Nano-structures Enhance Optical Absorption Efficiency
Todor Antonijevic, North Carolina Central University
Yongan Tang and Bransilav Vlahovic, North Carolina Central University

The thin film photovoltaics solar cell’s optical absorption efficiency is to be enhanced by implement nano-metallic structures on the top surface or on the bottom reflector. Surface plasmons (SP) are electromagnetic waves propagating along the surface of a metal; they are trapped on the surface owing to the interaction between the light wave and the free electrons of the metal; the free electrons respond collectively by oscillating in resonance with the light wave. This resonant interaction between the surface charge and the electromagnetic field constitutes the SP and gives rise to its unique properties: the momentum of the SP mode, \( h k_{SP} \), being greater than that of a free-space photon of the same frequency, \( h k_0 \), where \( k_0 = \omega / c \) is the free-space wave-vector. Solving Maxwell’s equations under the appropriate boundary conditions yields the SP dispersion relation[4], that is, the frequency-dependent SP wave-vector, \( k_{SP} \):

\[
k_{SP} = k_0 \sqrt{\frac{\varepsilon_d \varepsilon_m}{\varepsilon_d + \varepsilon_m}}
\]

Where \( \varepsilon_d \) and \( \varepsilon_m \) are the permittivities of the dielectric material and metal respectively. This means that the SP wave-vector \( k_{SP} \) is larger than the incoming free-space wave-vector \( k_0 \). There are a few techniques that can compensate the increased momentum to induce the SPs on a metal surface, the first is the prism coupling to enhance the momentum of the incident light, it’s a well known and an efficient method; The second is use of a periodic corrugation in the metal’s surface; The third involves scattering from a topological defect on the surface, such as a sub-wavelength hole, which provides a convenient way to generate SPs locally. In this paper we’ll focus on the technique of inducing SP with sub-wavelength-hole array.

The absorption enhancement is carried out by FDTD simulation. Figure 1 shows that the electric field is significant trapped under the nano-structures. The spectrum of this nano structure for optical absorption enhancement is programmable. It is very important to improve the absorption efficiency in the longer wavelength region for a thin film photovoltaics solar cell. We set the period of the simulation as 300nm, this enhance the absorption at 600nm-700nm.

Our near future research will focus on fabrication this kind of nano-structures, meanwhile we’ll explore more parameters to improve the optical absorptions, eg. Implement nano-structures on the back reflector of the solar cells. [Authors would like to thank the support from NSF: HRD-0833184.]

GP #47
Evaluation of Tm Doped Solids for Laser Cooling Applications
Herbert B. Brown, Hampton University, VA

There has been a great deal of interest in the area of laser cooling of solids within the last decade. Laser cooling by means of anti-stokes fluorescence can be achieved using rare-earth doped solids. An optical refrigerator built on this principle can be an alternative to many present day coolers, because of its compact size, non-moving parts and less maintenance being required. Laser cooling has been demonstrated in ytterbium-doped fluoride glass (ZBLAN:Yb\(^{3+}\)) down to temperatures as low as 208 K.

In this work thulium doped potassium lead chloride, Tm:K\(_{2}\)Cl\(_{5}\) (KPC), was evaluated as a potential new solid-state material for laser cooling applications. In addition, a comparative spectroscopic study of Tm:Y\(_{2}\)Al\(_{2}\)O\(_{12}\) (YAG), Tm:BaY\(_{2}\)F\(_{8}\) (BYF), Tm:KY\(_{2}\)F\(_{15}\) (KYF), Tm:LiY\(_{2}\)F\(_{8}\) (LYF), and Tm: KPC was performed. Commercial starting materials of PbCl\(_{2}\) and KCl were synthesized and purified through horizontal zone refinement. TmCl\(_{3}\) was further purified through a chlorination process to reduce oxide impurities. Purified TmCl\(_{3}\) (0.5wt %) was then mixed with purified KPC. The Tm:KPC was grown with the horizontal Bridgman Technique. Absorption studies were performed on the polished Tm:KPC crystal.

Following 1907nm excitation, all samples showed infrared emission with center wavelengths of \( \sim 1.8 \) \( \mu \)m. Under 1907nm pumping conditions, it was calculated that an emission quantum efficiency of \( \sim 95\% \) quantum is needed to obtain a positive cooling efficiency for Tm:KPC. Based on temperature dependent decay time studies the emission quantum efficiencies of Tm: KPC was estimated to be only \( \sim 65-75\% \). Since non-radiative decay via multi-phonon relaxation is negligible small in Tm: KPC, energy transfer processes to hydroxyl (OH-) impurities and other defects seem to be the most likely cause for the low emission quantum efficiency. Further purification of host and dopant materials are needed to optimize the quality and emission quantum efficiency of Tm:KPC. [This research was supported by the NSF CREST Center for Laser Science and Spectroscopy at Hampton University (HRD#0630372)].

GP #48
Nanobubbles on Hydrophobic Substrates: A Molecular Dynamics Study
Daniel Casimir, Howard University, Washington, DC
Silvina Gatica and Prabhakar Misra, Howard University
My research involves trying to account for the unusually long, stable lifetimes of nano-sized gas bubbles that form on hydrophobic solids submerged in water. This phenomenon contradicts existing macroscopic thermodynamic theory that predicts a rapid dissolution of gas bubbles of such small dimensions according to the Laplace-Young expression for the pressure gradient of a gas confined between curved interfaces. Nanobubbles also hold promise for both medical and industrial applications, such as drug delivery methods, and greater efficiency in pipeline transmission of fluids.

One of the leading suspected causes of this phenomenon is the effects of solution super-saturation, on the liquid-vapor surface tension. The computational technique I am using to test this hypothesis is Molecular Dynamics Simulation, specifically the MD simulation program LAMMPS provided by Sandia National Laboratories.

First imaged with atomic force microscopy (AFM) of hydrophobic surfaces in water that were covered with closely spaced soft domains, the radii of curvature of these features are of the order of 100nm and their height above the substrate ranges from 20-30nm. The response of these objects to the AFM tip under a variety of conditions lead to the consensus in the interpretation of these features as nano-sized gas bubbles that are formed on the substrate after immersion.

Initially, our numerical investigation of the stability of surface nanobubbles examined the effects of the adsorption potential strength and temperature of the bulk fluid (water), on bubble shape, and stability, based primarily on the contact angle. Through a modification of Young’s equation, that essentially approximates the gas-substrate interaction energy in terms of the bulk fluid density, the contact angle dependence on the bulk water temperature, and adsorbate potential was established.

This study showed that for adsorbate potential parameters corresponding to graphite, at a temperature of about 500K there is a wetting transition, where water partially wets the surface for lower temperatures, and completely wets the surface for higher temperatures. Extending the previously discussed study through the use of molecular dynamics simulation offers a greater level of detail. The molecular structure of the substrate and the water molecules can be included through various models of the water-water and water-substrate potential. Interactions between the water and substrate other than Van der Waals interactions can also be explicitly accounted for.

**GP #49**  
Development of Gas Electron Multiplier (GEM) Detectors  
Bernaice Gakpo, University, North Carolina

The main research goal is development of the high-energy photon polarimeter for astrophysics studies based on pair production. The polarimeter will be used to measure polarization of photons of intermediate energies in the range from about 100 MeV to 250MeV.

A polarimeter that we developed for Jefferson National Laboratory was based on the microstrip detectors, which may not be the best solution for the space applications. This research is focused to explore a possibility of replacing the microstrip detectors by GEM detectors. Two GEM prototypes with 20 micron wires and 2mm and 1 mm wire distances were prepared and successfully tested. Two other prototypes are already prepared. One with hybrid mesh and other one with SS mesh with 0.5mm opening. The circuit board to protect GEM from breakdown is also prepared and tested. To complete GEM detector project our next step is development of software package for GEM detector system. This will include development of software for DAQ system for GEM chamber and software package for online and offline analysis of collected GEM data.

After the GEM detectors is developed the research focus will be to implement them in the polarimeter and to optimize the polarimeter. However, there are specific requirements for a space instrument dedicated to the astrophysics studies. One of the major requirements comes from the difference of the flux and the energy spectrum of the photons. The analysis of the catalog of the celestial gamma-ray sources reveals that the polarimeter for observation of polarization of photons with energies between 100 and 250 MeV should be sensitive to the gamma-ray flux of order of 10^-5 (photons cm^-2 s^-1 sr^-1). This may require completely different design of the polarimeter.

**GP #50**  
Light in Subwavelength-hole Array  
Ochije Henry, North Carolina Central University  
Yongan Tang and Branislav Vlahovic, North Carolina Central University

A plane wave impinges on the sub-wavelength-hole array with an incident angle of $\theta$. The orientation of the incidence plane is located by the azimuthally angle measured from x-axis. In the simulation, the metallic array is illuminated with the plane wave normal to the metal film. The optical transmission is greatly dependent on the polarization of the electric field of the plane wave. When the polarization is parallel to the short ridge of the rectangle hole the optical transmission is much higher than that the other case, in which the polarization is perpendicular to the short ridge of the hole. It also is true the transmission spectrum of the sub-wavelength array is greatly dependent on the periodicity of the array.

The localized SPs by the sub-wavelength holes propagate on the metal surface and into the holes, then these SPs or electric filed experience the difference of the refractive index at the exit of
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the holes, some SPs emit from the holes and couple to light, and some SPs are reflected back to the holes, as a result, Fabry-Perot kind of cavities are formed due to the difference of the refractive index at the exit of the holes. The role of the Fabry-Perot cavity of these sub-wavelength hole array is important to the application of these metallic structures. This Fabry-Perot cavity effect is investigated by varying the thickness of the metal film (from 100nm to 500nm) analog to the cavity length, while keeping the periodicity of D=350nm) and the feature of the rectangular hole of 250nm*50nm as constants.

In conclusion, there are more modes appear in the holes for a thickness of 200nm gold film, and even more modes for a thickness of 500nm. Our computations of the optical transmission show that the peak is dependent on the periodicities of the array. The hole aspects are very important to the transmission, too. The length (longer side of a rectangular hole) is decisive to the magnitude and band width of the transmission; and the width (shorter side) of the hole has little effect on the peak magnitude, but has effect on the peak location.

We also investigate the role of the metal film thickness in the ELT process. The simulations that the thickness of the metal film can be treated as the length of a Fabry-Perot cavity; multi-modes of light from these metallic structures can be obtained by increasing the metal film thickness.

As a final point, these investigations are carried out in the wavelength of visible light and near infrared region, but these conclusions about light propagating sub-wavelength-hole array also stand in the far infrared or microwave regions. [Authors would like to thank the support from NSF: HRD-0833184.]

GP #51
Semiconductor Optical Amplifier for Wavelength Conversion

Ayodeji Kuponiyi, North Carolina Central University
Yongan Tang and Branislav Vlahovic, North Carolina Central University

A theoretical model is developed for the SOA wavelength conversion. The input optical signal operates at wavelength λs, and the target signal at wavelength λc. We assume that the optical input power of the system is Pin, the total optical power at the input port of the SOA is P0, the optical power at wavelength λc after the SOA amplification and the filter of the fiber ring loop is P1, and the optical output power at wavelength λc of the wavelength converter is Pout.

We assume that the coupling coefficient from Pin to P0 is k, and then from Pin to Pout, it is 1−k; similarly, the coupling coefficient from P1 to Pout is k, and from P1 to P0, it is 1−k; and there is no loss in the coupler. The optical signal of Pin partially (e.g. k, where 0 < k < 1) couples to the fiber ring loop and partially (e.g. 1−k) couples to the output port. The optical signal P0 consists of two components: one is part of the input optical power (k * Pin), and the other is part of the optical power [(1−k) * P0)] of the fiber ring loop. The optical signal PL as the optical power at wavelength λc is amplified by the SOA and accumulated as the resonance of the fiber ring loop. The signal from the coupler has two components: (1−k)Pin, part of the input signal (λs); and kP0, part of P1 (λc).

The simulation of this wavelength converter is carried out. The output power of the optical signal (at wavelength λc) as a function of the input power of the optical signal (at wavelength λs) is investigated. We increase the input optical power by a very small increment of 0.1 dB; the gain saturation effect is observed in the simulation.

When the optical power of the input signal (λs) is less than −1 dBm, the power of the output signal (λc) is relatively high (~0 dBm), but when the input optical (λs) power is larger than −1dBm, the output optical (λc) power drops dramatically to ~50 dBm. A sinusoidal modulated input optical signal (λs) at a frequency of 20MHz with amplitude of 3mW is utilized to inject into the SOA fiber ring loop. The converted signal of wavelength λc is accumulated as a resonance by the fiber ring loop system at the time when the input optical power is low.

The simulation of the SOA wavelength conversion show that the power of the output optical signal is dependent on the SOA, the modulation frequency of the optical signal is dependent on the loop length; this indicate that high frequency modulation optical signal can be obtained for a shorter length, and it is possible for the application in the optical communication if the SOA loop is replaced by an integrated Quantum well device. Our near future research will focus on the experimental realize this quantum device. [Authors would like to thank the support from NSF: HRD-0833184.]

GP #52
Detection of Protein in Solution using Laser Induced Breakdown Spectroscopy

Leon Taleh, Delaware State University
Poopalasingam Sivakumar, Yuri Markushin, and Noureddine Melikechi, Delaware State University

Laser Induced Breakdown Spectroscopy (LIBS) is a reliable and rapid analytical technique for performing elemental analysis of different materials. Several applications have been reported in the literature, notably in the biomedicine fields. Measurements were performed on two LIBS systems. The first system was equipped with 7 channels Ocean Optics spectrometer and the second one included an Mechelle Andor spectrometer made up of a grating (80 orders) with a single channel, and an Intensified Charge Coupled Device (ICCD) iStar camera with a digital delay generator. The data in this work was produced using a 10 ns pulsed Nd:YAG laser.
In this work, we describe technical progress toward the characterization of filtration test tubes design for biological sample LIBS analysis. The filtration test tubes were designed with a computer program AutoCAD® and then series of LIBS optimization tests relatively to the stage height, focal length and delay time of acquisition of the ICCD was performed to characterize the performance of the test tubes.

Biotinylation of IgG antibodies was performed and the yield of attached biotin molecules was estimated using the Thermo Scientific NanoDrop 2000 spectrophotometer. We also analyzed the bio-chemical interaction of micrometer size particles (Si, Fe) with the avidin-biotin pair of molecules. Emission line intensity from Carbon (C) at 247.847 nm was used as a reference during the optimization tests.

It appears that the signal recorded from the plasma plume was strongly depending on the sample characteristics and focal length. For the samples we analyzed in air, we observed an optimum signal-to-noise ratio of the intensity for the C line at 247.847 nm when the gate pulse delay and gate pulse width were set to 300 ns and 700 μs respectively. Calibration curve plotted for the model protein avidin indicated the presence of protein at the level of 6ng/ml.

Also, a Limit of Detection of 1ng was achieved for 1.5 μm iron oxide particles. It revealed that very low concentration of proteins or particles can be detected by a LIBS system with suitable optimization. Future research goal is to achieve better detection limit by using a femtosecond-LIBS system, especially for the detection of ovarian cancer biomarkers. [This study was supported by a grant from National Science Foundation CREST program (Grant # 0630388) awarded to PI: Dr. Noureddine Melikechi D.Phil., Director for the Center of Research and Education in Optical Sciences and Applications (CREOSA), Delaware State University, Dover, DE 19901.]

**SOCIAL & BEHAVIORAL SCIENCES**

**GP #53**

**Distance Learning: Enhancing Awareness of Exceptionalities Across Cultures**

**Brenda Barrio, University of North Texas**  
**Amber Ellison, University of North Texas**

To meet the ever-growing need for special educators across cultures, the current project was funded by the Global Challenge Initiative at the University of North Texas (UNT). UNT seeks to provide four 'globally enhanced' on-line courses for prospective teachers in special education. The courses provide: lectures in Spanish as well as English, including best practices across cultures.

For this project, UNT has partnered with Universidad Casa Grande (UCG) in Ecuador. The courses provided in the four course sequence include: Introduction to Special Education, Assistive Technology, Assessment of Special Learners, and Authentic Assessment. All four courses in the sequence have been taught.

The objectives of the collaborative, bilingual courses include documenting the: 1) effectiveness of the collaborative distance learning initiative in four special education master’s level courses that are taught in a bilingual setting (Spanish and English simultaneously), 2) students’ views and perspectives of the course, and 3) student views on inclusion as compared across the two countries.

Using an existing survey created by Tyler-Wood (2005) measuring the skill level of beginning teachers in special education concerning inclusive settings, collaboration among professionals, and the roles in the educational system (Factor Analysis of the Teacher Efficacy Scale, 2005) and summative design, data is collected from students at the beginning and end of the first course.

A total of 48 surveys were collected through the distance learning introductory special education course. Results show the significant difference between the students from Ecuador and students from the United States in 11 of the 25 statements. For qualitative data collection, student performance on case study assignments, student grades, and discussion postings within each course are reviewed.

Comparing the end of course grades for four of the courses, no significant differences were noted. Discussion postings were analyzed using Henri’s (1992) analytical framework. Results of the analyzed data will be further explored. In conclusion, the performance between these two groups was similar. This leads us to continue exploring the interaction and effectiveness of bilingual on-line courses for prospective teachers in special education across cultures and countries. [Special appreciation is granted to the Global Challenge Initiative at the University of North Texas for their funding opportunities.]

**GP #54**

**Family Factors and Cognitive Skill Gains in African American High School Students**

**Yi-Ching Lin, Virginia State University**  
**Zewelanji Serpell and Oliver Hill, Jr., Virginia State University**

It is well established that family factors such as socioeconomic status, parental education, and cohesion have a significant impact on young children’s development of cognitive and academic skills. However, results of research comparing outcomes for students from single and two parent families are mixed, particularly in African American samples.
Furthermore, few studies examine the impact of family factors on cognitive skills among high school students. This study extends previous research by testing two main hypotheses: (1) family structure and family disengagement interact to influence a set of cognitive skills including visual memory, auditory memory, short-term memory and long-term memory; and (2) different levels of family disengagement result in significant differences in the change in cognitive skills post-intervention.

Participants were 283 high school students (mean age=16.55 years, 96% African American and 62% female) attending summer enrichment programs on a college campus that included 45 minutes of online cognitive-skills training administered four times a week for 3 weeks. Before and after the intervention students completed the Gibson Cognitive Skills Test. Prior to the intervention, students also completed a background questionnaire and the FACES IV (Olson et al., 2006), which assesses family cohesion and disengagement.

Preliminary analyses revealed significantly improved cognitive outcomes post intervention. A two-way MANOVA was used to test Hypothesis 1. The overall model was significant. However, a significant multivariate main effect was evident only for level of family disengagement, Wilks’ $\lambda = .019$, $F (5, 234) = 3.88$, $p = .002$, partial eta squared = .03. Power to detect the effect was .847.

Given the significance of the overall test, the univariate main effects were examined. There was no significant interaction effect, however significant univariate main effects for family disengagement were obtained for visual memory $F (5, 248) =4.00$, $p=.02$, partial eta square = .031, power = .742; auditory memory $F (5, 248) =5.95$, $p=.003$, partial eta square = .046, power =.876, short-term memory $F (5, 248) =6.17$, $p=.002$, partial eta square = .047, power = .888, and long-term memory $F (5, 248) =4.75$, $p=.009$, partial eta square = .037 power = .789. A second MANOVA was used to test hypothesis 2. The overall model was not significant—level of disengagement did not significantly impact cognitive skills gains.

Results challenge previous findings that family status (single versus two parent) impacts academic and related cognitive skills among African American students. Findings of the current study also suggest that cognitive intervention significantly enhances students’ basic cognitive skills regardless of their family structure or level of family disengagement.

[This study was supported by an NSF HBCU-UP grant awarded to Dr. Oliver Hill, Jr. Virginia State University, VA 23806.]
GP #56
How Does a Monogamous Mammal Form a Memory of His Mate? A Neurocognitive Study in Prairie Voles

Jamie Parker, Lehman College, NY

Episodic memory is a human ability to consciously recall where, when or in what context a personally-experienced event took place. Several studies have shown that other animals also have episodic-like memory. I used prairie voles as a model of monogamous mammals to test two hypotheses: 1) physical interaction with a female influences episodic-like memory in males; 2) the mate’s chemosensory cues stimulate a unique pattern of neuronal activation in the male’s brain.

I chose to study prairie voles because like humans they are social, monogamous and biparental. The first hypothesis was tested in three experiments. In each experiment, the male prairie vole had different types of interactions with two unrelated females. The male was then tested for his preference to visit each female and for his memory of the spatial location of each female.

In experiment 1, the male was exposed to the distal cues of two sexually-naive females. In experiment 2, the male had physical contact without mating with one of the two sexually-naive females while being simultaneously exposed to the distal cues of the second female. In experiment 3, the male mated with one of the two sexually-naive females while being simultaneously exposed to the distal cues of the second female.

To test the second hypothesis, the males in experiments 1, 2 and 3 were exposed to clean bedding, bedding soiled by their female partner or bedding soiled by the female partner of an unfamiliar male. After two hours, the male’s brains were extracted and stained immunocytochemically for Fos protein. For phase 1 of the experiment, there was a significant group effect for the proportion of time males spent investigating the box containing the focal female versus the box containing the control female ($F_{2,33} = 3.73, P = 0.03$). Males in the Mated-Contact group spent more time investigating the box containing the control female versus the box containing the focal female ($Z = 2.24, P = 0.02$). The total amount of time the Mated-Contact males spent in the cage of the control female was significantly higher than that spent in the cage of the focal female ($Z = 2.0, P = 0.04$).

In phase 2 of the experiment, males in Mated-Contact group showed a tendency to visit the cage previously occupied by the control female before the cage previously occupied by the focal female ($P = 0.07$). Males in phase 2 of the experiment spent a higher percentage of their time away from the female cages exploring the neutral areas of the apparatus ($Z = 4.0, P = 0.0005$).

The data confirms our hypothesis that mating and post-mating cohabitation with a female changes the male prairie vole’s perception of female cues. However, rather than becoming more attentive to their mate, the mated males appear to become more attentive to a novel female and may remember her location. Results from the Fos study will indicate whether changes in perception and memory of mated males are accompanied by alterations in their neural activity. [Special Thanks to Dr. Bamshad, NSF and LSAMP.]

GP #57
Avatars in Virtual Classroom for Training Teachers - Comparing Real Kids with their Virtual Avatars

Sita Periathiruvadi, University of North Texas
Tandra Tyler-Wood, University of North Texas

This poster will showcase the findings of the third year of our research project Simulation Enhanced Training for Science Teachers (SETS) funded by the National Science Foundation Research in Disabilities Education grant. The research aimed to improve teaching effectiveness of pre-service and inservice science and special education teachers to improve the science achievement of their students especially students with disabilities.

The poster will describe a simulated classroom called simSchool, where teachers can practice their teaching skills on avatars of their students and get instant feedback on how their teaching impacted their students’ learning, to help them to think critically about teaching students with varying strengths and needs.

The main purpose of the poster is to showcase our research findings on validation of the simulated classroom for training new teachers by comparing real students with their avatars, based on their academic, personality and physical attributes. The poster will also highlight our findings on what attributes need to be considered for creating students with disabilities in the simulated classroom.

The participants for the third year were six students with special needs who participated in a summer program in a large university. A science module on “Life of a pond” was taught to these students to assess the effectiveness of the science lesson on the science achievement of students with disabilities. A qualitative observation in the summer science program allowed us to collect data on their academic performance, personality attributes, behavior and student/teacher initiated discussions.

Virtual students were built in the simulation using data collected on the students and the same lesson tasks were administered to
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them. The output of the simulation was compared with the data collected on the real students with disabilities who participated in the summer science program. We compared the academic performance, personality characteristics, behaviors, and interaction of students in the real classroom with that of virtual students in the simulation.

Our main findings include; a) students without disabilities showed comparable gains as students without disabilities after participating in the summer program; and b) a comparison of a real student with hearing challenges, with his virtual avatar showed that the student with hearing challenges performed better than his avatar, when the lesson expected lower auditory and kinesthetic attributes.

The simulation exaggerated the off-task behavior of the student with disability. A comparison of the personality characteristics showed that except for the intellect attribute, the real and virtual students were comparable in other personality characteristics. The simulation did not include student-initiated discussions in the different levels of the Bloom’s taxonomy. Future research should address these differences between the real and virtual student, especially for students with disabilities. This research has great educational importance to address the shortage of highly qualified teachers in science and special education, design a virtual practicum for preservice teachers as part of e-learning programs for training teachers, and prepare teachers to adapt their teaching to match the students’ learning, especially for students with disabilities. [We would like to acknowledge the NSF-RDE for funding this research project (grant #07266701).]

GP #58
Exploration of Underrepresented Minority Engineering Student Engagement

Mycah J. Wilson, University of Maryland Baltimore County
Dr. Anne Spence, University of Maryland Baltimore County

African American, Latino/Hispanic American and American Indian/Alaskan Native students in the United States have lower retention and graduation rates in science, technology, engineering and mathematics as compared to White and Asian-American students. Student retention theories focus on the role student and institutional engagement play on these rates and advocate the importance of engagement on increasing student success, especially among traditionally underrepresented students. In particular, the engagement experiences surrounding student-faculty interactions and the role of the campus environment has been noted as influential in the retention and graduation rates of these students.

At UMBC, first year engineering students enrolled in ENES 101: Introductory Engineering Science, have the option of enrolling in a special Introduction to Honors University (IHU) section that allows for an extra lecture focusing on strategies that are important for student success in engineering. This study will develop a research proposal that will examine the role, if any, that the IHU section, plays on the engagement experiences of the student-faculty interaction and the perception of support of the campus environment.

Within the research proposal, a secondary data set from the National Survey of Student Engagement (NSSE) will be used to gather information about the self-reported student engagement experience at UMBC. This study poses the following research question: Are there mean differences in the NSSE benchmarks (and constituent items) of: (a) Student-Faculty Interaction and (b) Supportive Campus Environment between first-year ENES 101 underrepresented minority students enrolled in the IHU section as compared to those that are not enrolled?

In light of the research question, this study posits two a priori hypotheses: Hypothesis 1: The mean scores of first year ENES 101 underrepresented minority students enrolled in the IHU section (Group 1) will be higher than the mean scores of first year ENES 101 underrepresented minority students not enrolled in the IHU section (Group 2) within the NSSE Student-Faculty Interaction Benchmark; and Hypothesis 2: The mean scores of first year ENES 101 underrepresented minority students enrolled in the IHU section (Group 1) will be higher than the mean scores of first year ENES 101 underrepresented minority students not enrolled in the IHU section (Group 2) within the NSSE Supportive Campus Environment Benchmark.

Proposed methodology will include a statistical t-test. Predicted results as well as future areas of research will be presented with this poster presentation.

TECHNOLOGY & ENGINEERING

GP #59
Characterization of Semiconductor Optical Waveguides

Brice Cannon, University of Maryland Baltimore County
Gary Carter, University of Maryland Baltimore County
Paveen Apiratikul, William Astar, John Hryniewicz, Laboratory for Physical Sciences

The characterization of low propagation loss (<1.5 dB), and nonlinear effects [with the absence of two-photon-absorption (TPA)], of semiconductor AlxGa1-xAs optical waveguides at the optical communication wavelength of 1550 nm are explored for the potential of all-optical wavelength conversion. Since the waveguides will be used for optical signal processing in optical communication systems, it is important to have well-defined loss values.
Fabry-Pérot interferometry techniques and curve-fitting were used for the propagation loss measurements. The accuracy of these techniques mainly depend on fringe contrast and facet reflectivity, which are easily measured or estimated, unlike many other techniques which require knowledge of precisely known, repeatable optical coupling efficiencies.

The waveguides have polarization-dependent loss, therefore TE and TM polarization propagation loss measurements were performed for several waveguides, and as expected TE-modes always had a lower loss than TM-modes, for the low-loss waveguides. After the loss is well-characterized, the waveguides will be anti-reflection (AR) coated, and nonlinear optical experiments will be conducted to better understand the nonlinear behavior in the absence of TPA.

Then format conversion will be explored for the conversion of on-off-keying (OOK) to binary phase-shift-keying (BPSK). The absence of TPA is expected to eliminate cross-absorption modulation (XAM), which would strongly impair the converted BPSK signal. [This research was supported, in part, by the NSF LSAMP Bridge to the Doctorate Fellowship.]

GP #60
Cured-In-Place Pipe

Eric Hollman, Jackson State University
Dr. Tom Iseley and Behnam Hashemi, Indiana University-Purdue University Indianapolis

When it comes to replacing or rehabilitating a pipeline system, there are several ways or processes to go about correcting a broken, cracked or deteriorated pipeline but there has risen a new proven technology, Cured-In-Place Pipe. The purpose of this research is to encourage the use of Cured-In-Place Pipe (CIPP) and to develop and enhance the process of this new technology, through new testing involving calculations of mathematical equations to perfect the thickness of the CIPP depending on the issue or situation.

The direction of the research will be concentrated toward the fully deteriorated gravity pipe conditions and the equations that will be used to evaluate the conditions. This project will focus on a structural trenchless technology solely designed for the water distribution system in which produces low emissions of carbon dioxide.

In contrast to the traditional method of open-cut, which requires unearthing and replacing the inadequate pipe, trenchless pipe rehabilitation methods use the existing collection system piping as a conduit or host for replacing or rehabilitating the system.

This technology provides a method of correcting pipe deficiencies with economical and environmental impacts as well as less disturbance and restoration. Using these mathematical equations, there can be significant changes in the design of the CIPP involving exact thickness, pressures, and lifetime of the CIPP and other factors.

GP #61
Effect of Excess BaSO4 on Mechanical Properties of PMMA in Treatment of VCF

Natasha Joseph, University of Maryland, Baltimore County
L. D. Timmie Topoleski, PhD, University of Maryland, Baltimore County

Polymethylmethacrylate (PMMA) bone cement is a material widely used to fix (or hold) artificial joint materials in the bone. PMMA is often used in kyphoplasty, a minimally invasive spinal surgery procedure used to treat painful, progressive vertebral compression fractures (VCFs). A VCF is a fracture in the body of a vertebra that causes it to collapse. Kyphoplasty begins with a needle introduced into the fractured vertebral body and the insertion of a small tube over the needle.

Through this tube, a balloon tipped catheter is inserted into the broken vertebra and is slowly inflated. With new fractures, inflation of the balloon raises the collapsed vertebrae to its normal height. The balloon creates a space in the bone as it inflates. This space allows the bone cement to be inserted at low pressure with thicker, putty like consistency. However, in order to differentiate the PMMA from the actual bone on a scan, the normal amount of barium sulfate (BaSO4) in the cement is tripled. Currently, there are no FDA regulations dictating the amount of BaSO4 that can be altered in the PMMA mixture.

This study was undertaken to identify the effects that large amounts of barium sulfate have on the mechanical properties of PMMA and to test the hypothesis that the mechanical properties of PMMA are negatively affected by excess amounts of BaSO4.

Using three PMMA-based bone cements, tests, such as static tensile, compressive testing, and fully reversed fatigue testing were performed. Static tensile and compressive testing were performed in accordance with ASTM F451-99a. Fatigue testing was conducted in accordance with ASTM F2118-01a under fully reversed, 10-, 15-, and 20-MPa stress ranges. The addition of barium sulfate decreased the tensile strength, but did not affect the fracture toughness and improved the crack propagation resistance.

Future works will look into alternative additives, including mixtures of BaSO4, Zirconium dioxide (ZrO2), and 2,5-diiodo-8-quinolyl methacrylate (IHQM). [This research was supported, in part, by the NSF LSAMP Bridge to the Doctorate Fellowship.]
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GP #62
Design and Implementation of Test-bed for Path Planning and Formation Control of Cooperative Robotic Agents
Mike Majedi, University of New Mexico

Robots are primary candidates for performing extremely dangerous but controlled missions. For example, they carry cameras, surveillance instruments and sensors in order to collect information and relay their findings to other agents or their human operators. Robot data collection allows for an operator to obtain data in environments where it is unsafe for humans. It also allows humans to perform inconvenient, tedious tasks such as waiting and collecting information over long time periods. In this work a multi-agent test-bed platform is designed and implemented for data collection and research. These robotic platforms are essentially motorized differential drive systems, which are equipped with proximity sensors, as well as processing power of a laptop computer including internet and wireless capabilities.

The feasibility study and design process for construction of a robotic platform is discussed. Basic behaviors (e.g., path-to-goal, avoid-obstacle, etc.) are discussed, along with algorithms that implement them. Furthermore the forward and inverse kinematic model of a differential steering system and its use in implementation of any arbitrary trajectory (within the physical constrains of the system) are explained.

The main objective of this research was to construct several nonholonomic test-beds for experimental use by researchers. We used a potential function for agent coordination. This approach specified the behavior of each of the agents around its fellow agents, and obstacles. We then addressed various aspects in the construction of a working, autonomous mobile robot including electrical and mechanical modules. We used the constructed mobile robot to apply the principles in control system design using system identification to obtain PID controllers.

In the last part of our work, we performed different set of path-planning configurations, which involved the development of the kinematics model of the test-bed, obtaining the inverse kinematics formula, and finally the algorithms needed for trajectory planning. As described in our research there are no theoretical results available in the case of the controller input, therefore our future effort should be aimed to obtaining theoretical results in the case of presence of obstacles and a virtual leader. [This study was supported, in part, by a grant from NSF awarded to Chaouki Abdallah PhD, Department Chair, Professor, Electrical and Computer Engineering, University of New Mexico, New Mexico.]

GP #63
Development of a Land Use Regression Model to Predict Nitrogen Dioxide Concentrations
Teresa Sosa, University of Texas at El Paso
Wen-Whai Li, University of Texas at El Paso

Air pollution is a major environmental concern in the El Paso-Ciudad Juárez border region. According to the Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT), Ciudad Juárez is one of the cities in México with serious air pollution problems because of its accelerated and unplanned urban growth. Exposure to airborne nitrogen dioxide (NO2) is of particular concern to the public due to its detrimental health effects that have been associated with airway inflammation in healthy people and increased respiratory symptoms in people with asthma. Land-use regression modeling is a GIS based approach that predicts pollution concentrations at a given site based on surrounding land use, traffic characteristics, and other geographic variables in a multivariate regression model.

This type of model has been applied successfully to predict intra-urban variations of NO2 concentrations in several cities in North America. A land-used regression model was developed in this study for estimating NO2 levels at various locations in the El Paso-Ciudad Juárez border region using a set of integrated 7-day averaged NO2 concentration data previously collected at 27 locations in Ciudad Juárez, including 22 schools and 5 homes, between December 2002 and September 2003.

Major point sources for NO2 emissions in the region include international ports of entry, cement plants, electric engine factories, and petroleum refineries. Distances to major point sources as well as traffic volume and traffic density for major streets near the monitoring locations were determined utilizing ArcGIS 9.3.1 and were used as predictor variables. Significant Pearson correlations with NO2 concentrations were found with the following predictive variables: distance to a cement plant (DIST_CP), traffic density within the 1,000 meter buffer zone (TD_1000), distance to an oil refinery (DIST_OR), distance to electric engine factories (DIST_EE), and distance to a major street with the second highest traffic volume (DIST_2nd).

Most of the significant correlations found were consistent with the findings in previous studies conducted in the El Paso-Ciudad Juárez area by Gonzales, et al. (2005) and Smith, et al. (2006). A model built through a stepwise multivariate regression analysis revealed that the three main variables for NO2 variations include distance to a cement plant (DIST_CP), distance to a major street with the second highest traffic volume (DIST_2nd), and distance to an oil refinery (DIST_OR), predicting 59 percent of the variation in NO2 concentration.

A bootstrapping analysis of 1,000 iterations evaluated and verified the robustness of the model. Recommendations for
future analysis on this pollutant include a closer look into the
effect of distance to a cement plant in the variation of NO₂
concentrations, and perhaps the inclusion of other variables
that could increase the predictability of the model, such as
elevation above sea level. [This study was supported in part by
an NSF/BD fellowship awarded to Teresa Sosa, University of
Texas at El Paso, El Paso, TX.]
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