2013 spring symposium & research conference

in Science, Technology, Engineering & Mathematics

CULTIVATING EXCELLENCE

*Reestablishing Preeminence in **STEM***

February 15th - 16th

Wyndham Lisle

Chicago Hotel & Executive Meeting Center · 3000 Warrenville Road · Lisle, IL 60532

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DEPARTMENT OF EDUCATION
UNITED STATES OF AMERICA
NSF
2013
Spring Symposium in STEM
Science, Technology, Engineering & Mathematics

Message from Senator Richard J. Durbin

State of Illinois

RICHARD J. DURBIN
ILLINOIS
ASSISTANT MAJORITY LEADER

United States Senate
Washington, DC 20510–1304

COMMITTEE ON APPROPRIATIONS
COMMITTEE ON FOREIGN RELATIONS
COMMITTEE ON THE JUDICIARY
COMMITTEE ON RULES AND ADMINISTRATION

February 15, 2013

Dear Friends:

Greetings! It gives me great pleasure to welcome all of you to the 2013 Spring Symposium and Student Research Conference in Science, Technology, Engineering, and Mathematics (STEM). As you gather for this year's conference, "Cultivating Excellence: Reestablishing Preeminence in STEM," faculty members and students have an opportunity to share results of research, information, and experiences.

For many years, The Illinois Louis Stokes Alliance for Minority Participation (ILSAMP) and the Center for STEM Education & Research have worked to increase the number of minority scholars earning degrees in the fields of Science, Technology, Engineering, and Mathematics. The central goals of ILSAMP are to provide programs to improve the academic preparation of STEM students, reinvent gateway courses to better educate students, and provide underrepresented students with more educational opportunities. The program achieves this goal by promoting comprehensive and multidisciplinary activities and focusing on enhancing student scholarship in 14 institutions throughout the state of Illinois. I applaud your commitment to increasing the number of minority scholars earning degrees in STEM disciplines.

Again, I would like to extend my warmest wishes to all attendees for your dedication to the goals of ILSAMP and this conference. Congratulations on all your work and achievements, and I wish you best of luck in your future endeavors.

Very truly yours,

Richard J. Durbin
United States Senator

711 HART SENATE OFFICE BUILDING
WASHINGTON, DC 20510–1304
(202) 224–2152
TTY (202) 224–8180

230 SOUTH DEARBORN, 38TH FLOOR
CHICAGO, IL 60604
(312) 353–4952

525 SOUTH EIGHTH STREET
SPRINGFIELD, IL 62703
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1504 THIRD AVENUE
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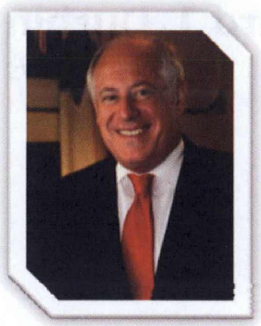
(309) 786–5173

PAUL SIMON FEDERAL BUILDING
250 W. CHERRY STREET
SUITE 115–D
CARBONDALE, IL 62901
(618) 351–1122

durbin.senate.gov



Message from Governor Pat Quinn

State of Illinois

STATE OF ILLINOIS
OFFICE OF THE GOVERNOR
SPRINGFIELD, ILLINOIS 62706

Pat Quinn
GOVERNOR

February 15-16, 2013

Dr. LeRoy Jones, II
Executive Director for STEM Initiatives
Chicago State University
Williams Science Center, Room 101A
9501 South King Drive
Chicago, Illinois 60628

Greetings!

As Governor of the State of Illinois, I am pleased to welcome everyone gathered for the 2013 Spring Symposium and Student Research Conference in Science, Technology, Engineering and Mathematics (STEM) sponsored by the Illinois Louis Stokes Alliance for Minority Participation (ILSAMP) and the Center for STEM Education & Research. This year's theme is *Cultivating Excellence: Reestablishing Preeminence in STEM.*

It is very important that we, as a state, work towards ensuring that everyone, regardless of race, ethnicity or gender, has access to the same opportunities for success. ILSAMP is committed to increasing the number of minority scholars earning degrees in the areas of science, technology, engineering and mathematics who are currently underrepresented in those fields. This two-day conference will serve to further that noble goal by bringing together an intergenerational group of minority students, professionals and academics.

I would like to congratulate each student who is participating in this year's symposium. It is evident that you are extremely dedicated students who place a high value on education and have a strong drive to succeed. I hope you enjoy the chance to showcase your hard work to your peers and to the professionals in the scientific and technical fields. This experience will serve as a great stepping-stone to whatever career path you choose in the future.

On behalf of the people of Illinois, I offer my best wishes for an enjoyable and rewarding conference.

Sincerely,

Pat Quinn

Pat Quinn
Governor

Message from Mayor Rahm Emanuel

City of Chicago, Illinois

OFFICE OF THE MAYOR
CITY OF CHICAGO

RAHM EMANUEL
MAYOR

February 15, 2013

Dear Friends:

As Mayor and on behalf of the City of Chicago, I offer my warmest greetings to all of those attending the Illinois Louis Stokes Alliance for Minority Participation and STEM Education & Research's Annual Spring Symposium & Student Research Conference themed, *Cultivating Excellence: Reestablishing Preeminence in STEM.*

The Illinois Louis Stokes Alliance for Minority Participation and the Center for STEM Education & Research were formed in response to a nationally mandated request to increase the number of underrepresented minorities in STEM (science, technology, engineering, and mathematics) areas. The programs provide intellectually stimulating projects to enhance the scholarship of STEM students. The Annual Symposium provides a forum for students to share their research and serves as a way to bring together students and professionals in these areas from an array of institutions.

With over 400 participants, this year's conference is proof of the programs' overall success. It represents the continuing need for multifaceted education and access for all of our students. I commend the work of the Illinois Louis Stokes Alliance for Minority Participation and the Center for STEM Education & Research.

On behalf of the people of Chicago, I hope you have an enjoyable event and best wishes for much continued success in the future.

Sincerely,

Rahm Emanuel

Mayor

Message from Mayor Joseph J. Broda

City of Lisle, Illinois

Lisle
THE ARBORETUM VILLAGE

Mayor
Joseph J. Broda

Trustees
Mark Boyle
Catheryn Cawiezel
Brad Hettich
Lee LaFond
Ken Modaff
Ed Young

Village Clerk
Timothy J. Seeden

Business Office/General
630-271-4100
630-271-4104 Fax
630-271-4142 TDD

Community Development
630-271-4150

Economic Development
630-271-4148

Police Administration
630-271-4200

Public Works
Administration/Engineering
630-271-4170
Operations
630-271-4180

WELCOME TO THE VILLAGE OF LISLE!

As Mayor of our great community, I am proud to welcome the Illinois Louis Stokes Alliance for Minority Participation (ILSAMP) & The Center for STEM Education & Research (CSER) to the 2013 Annual Student Research Symposium being held at the Wyndham Hotel in Lisle, Illinois February 15 – 16, 2013.

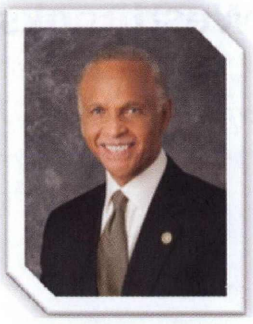
I understand your organization is a support program for minority students majoring in Biology, Chemistry, Computer Science, Math, or any other STEM program and I hope those that come together find support in helping to reach their goals during this symposium, *Cultivating Excellence: Reestablishing Preeminence in STEM.*

I hope that you will have some time during your stay here to enjoy our community. We are known as the Arboretum Village, with the internationally acclaimed Morton Arboretum offering a wonderful escape to nature. Our downtown has undergone a major transformation recently with the addition of PrairieWalk Pond and a children's play area, Dragonfly Landing. We are pleased to provide a small town ambiance in a suburban setting only 30 minutes from downtown Chicago.

I think you'll like our community and we are proud that you have chosen Lisle for your Annual Student Research Symposium.

Sincerely,

Joseph J. Broda
Mayor



Message from Dr. Wayne D. Watson

President, Chicago State University

Wayne Watson, Ph.D.
President

Telephone: 773 / 995-2400
Fax: 773 / 995-3849
E-mail: wwatson@csu.edu

9501 S. King Drive / ADM 313
Chicago, Illinois 60628-1598

February 15, 2013

Welcome Symposium Participants:

I am pleased to welcome you to the 2013 Spring Symposium & Student Research Conference in Science, Technology, Engineering, and Mathematics (STEM). The Illinois Louis Stokes Alliance for Minority Participation (ILSAMP) and the Center for STEM Education & Research (CSER) programs play an integral part in developing educational programs to enhance the recruitment, retention and graduation rates of underrepresented minority students in STEM.

The critical importance of research and teaching must go hand in hand. The more relevant research opportunities afforded our students as part of their academic preparation, the greater our retention and graduate rate will be. The ILSAMP students have accomplished this level of achievement and have demonstrated insurmountable academic challenges. The conference theme, *Cultivating Excellence: Reestablishing Preeminence in STEM* is an important way to highlight the need for more theoretical frameworks that ensure a steady pipeline of STEM-capable graduates.

On behalf of Chicago State University, the lead institution for the ILSAMP and CSER programs, I am pleased to thank all of the many supportive professionals who have gathered for this praiseworthy occasion. It is your commitment and hard work that has enriched the lives of those to whom we dedicate our service, namely, our students.

Sincerely,

Wayne D. Watson
President

Message from Dr. Sandra Westbrooks

Principal Investigator, Illinois LSAMP Program

Provost & Senior Vice President for Academic Affairs, CSU

Office of the Provost &
Senior Vice President for Academic Affairs

9501 S. King Drive/ADM 306
Chicago, IL 60628
T 773.995.2411
F 773.995.3584

February 15, 2013

Dear Symposium Attendees:

As principal investigator for the Illinois LSAMP program, I am pleased to welcome you to the 2013 Spring Symposium and Student Research Conference in STEM. Programs such as the Illinois Louis Stokes Alliance for Minority Participation and the Center for STEM Education and Research provide our undergraduate students an opportunity to elevate their expectations as scholars, meet unexpected challenges and advance their overall understanding of and contributions to the STEM disciplines.

The amazing role we serve as mentors and the collaborative problem solving activities we engage have helped to transform our student scholars into STEM professionals. I hope that this meeting will encourage and inspire you to continue the important work you do in moving the Nation toward a STEM workforce that reflects our nation's multicultural and diverse populations.

On behalf of the Illinois LSAMP community, I thank the many supportive professionals who have gathered to participate in this weekend of scholarly exchanges. It is through your collaboration that we have advanced the participation of students in STEM. Please know that you have enriched the lives of many students who once thought being a scientist, mathematician and engineer impossible. Take this opportunity to celebrate the dreams fulfilled. I applaud you!

Sincerely,

Sandra Westbrooks

Sandra Westbrooks, Ph.D.
Provost and Senior Vice President
Academic Affairs

Message from Dr. LeRoy Jones, II

Director for STEM Initiatives
Illinois LSAMP Program and the
Center for STEM Education & Research

LeRoy Jones II, Ph.D.
Project Director

Tel/Fax: 773.995.3296/2966
E-mail: ljones27@csu.edu

9501 S. King Drive / SCI 101A
Chicago, Illinois 60628-1598

15 February 2013

Greetings Symposium Participants,

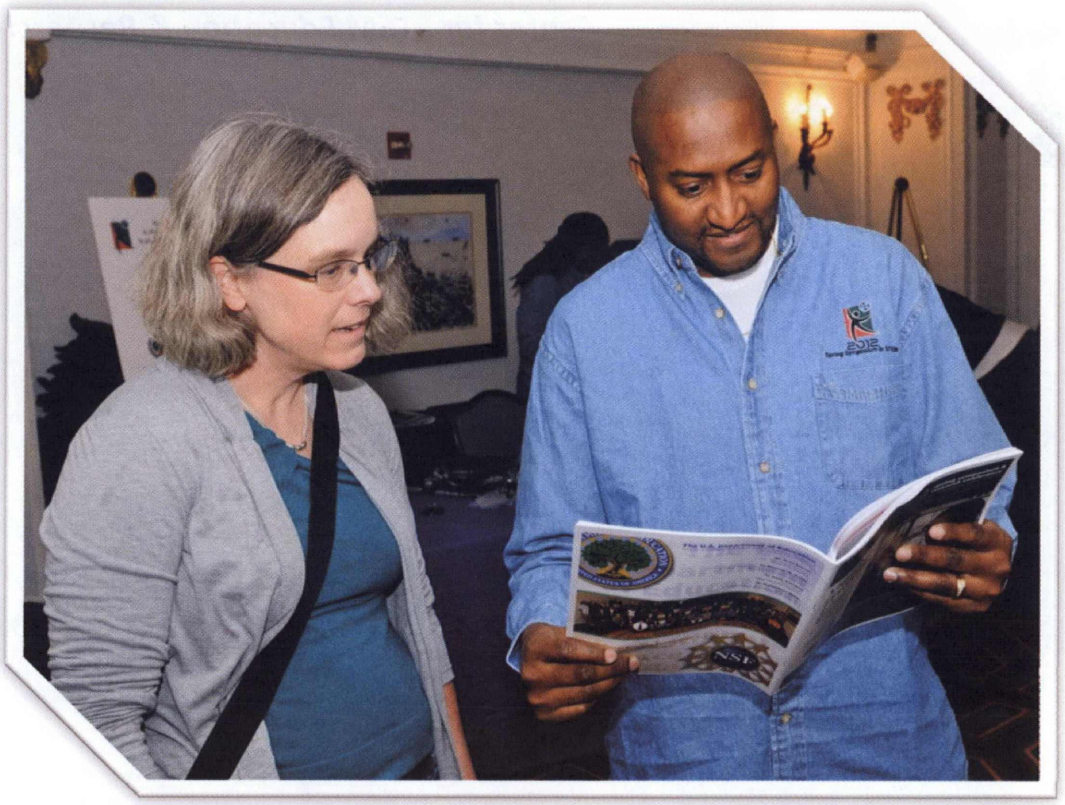
Welcome to the 2013 Spring Symposium & Research Conference in STEM! Our theme, "*Cultivating Excellence: Reestablishing Preeminence in STEM*," emphasizes the importance of developing initiatives to recruit, retain and graduate underrepresented minorities in science, technology, engineering, and mathematics (STEM) disciplines to ensure American competitiveness in the 21st century.

The Illinois Louis Stokes Alliance for Minority Participation and the Center for STEM Education & Research initiatives give particular attention to student persistence toward the B.S. degree and matriculation into graduate studies; institutionalizing successful policies and procedures for attainment of the B.S. degree; reaffirming community college associations; and developing relevant international activities. In support of these goals, this symposium will provide a dynamic environment for students, faculty, staff and guests to share their research experiences, present their scholarly findings, attend information workshops, and hear motivational speakers. They will be applauded for their commitment to STEM excellence.

As Director, I would like to personally thank the Alliance coordinators, faculty and dedicated staff of the Illinois LSAMP program and the Center for STEM Education & Research for their tireless efforts in ensuring the success of this symposium. I would also encourage students to avail themselves of the numerous opportunities that this weekend will offer and to use the experiences as a launching pad for future aspirations.

Best Wishes,

LeRoy Jones, II
Project Director



AGENDA-AT-A-GLANCE

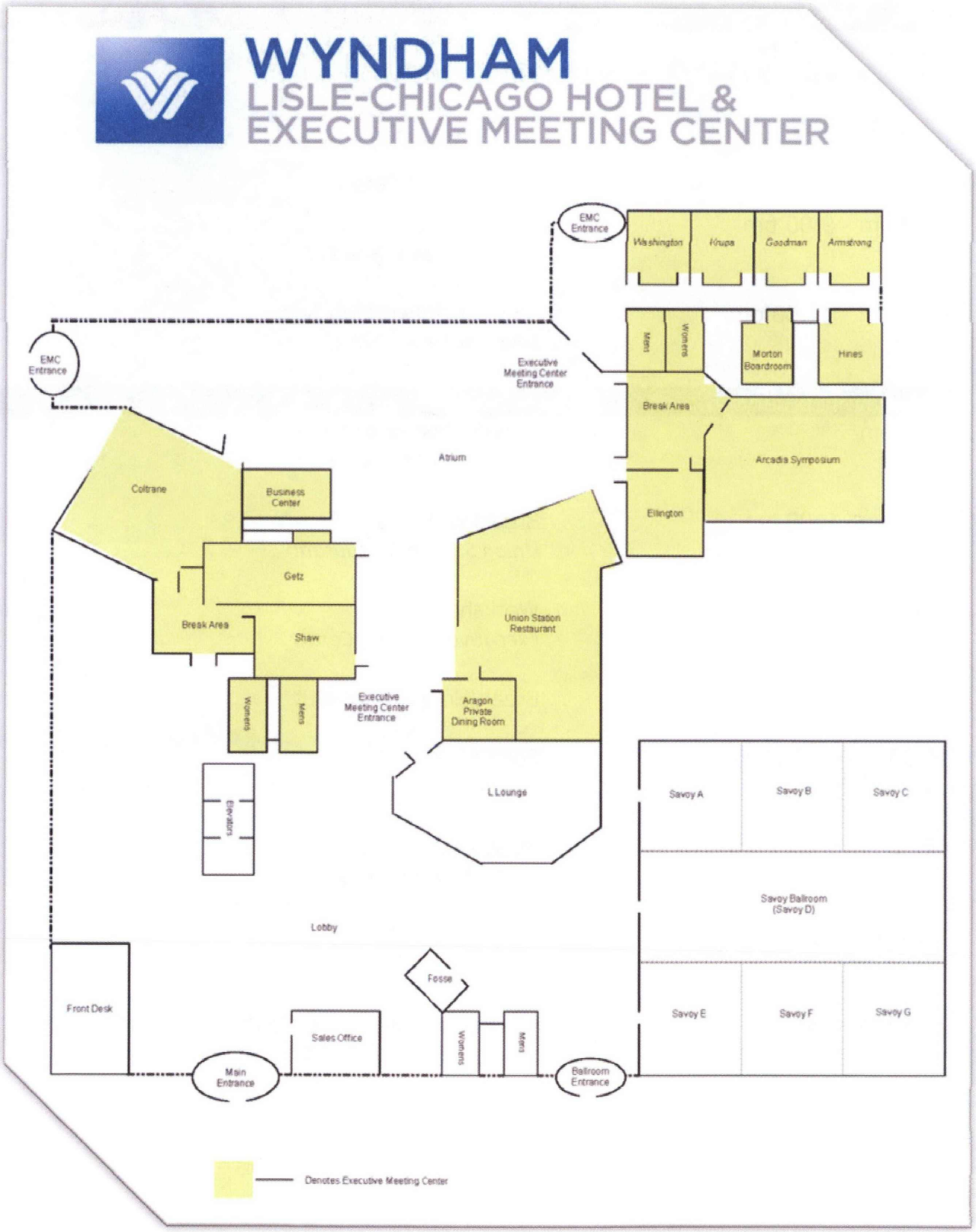
Friday, February 15th

3:00 pm - 7:00 pm	Registration & Hotel Check-In *Ballroom Lobby Foyer*
	Poster Set-Up *Atrium*
7:00 pm - 9:00 pm	Dinner & Keynote Speaker *Savoy Ballroom A/B/C/D*
9:00 pm - 11:00 pm	Student Networking Social *Savoy Ballroom E/F/G*

Saturday, February 16th

7:00 am	Registration Opens *Ballroom Lobby Foyer*
7:00 am - 9:00 am	Breakfast Buffet *Union Station Restaurant*
9:00 am - 10:00 am	Workshops *Executive Meeting Center*
10:00 am - 10:30 am	Break/Hotel Check-Out
10:30 am - 12:00 pm	Poster Session *Atrium*
12:00 pm - 1:15 pm	Networking Luncheon *Savoy Ballroom A/B/C/D*
1:15 pm - 2:45 pm	Oral Presentations *Executive Meeting Center*
2:45 pm - 4:00 pm	Research Experiences Abroad Plenary Session *Savoy Ballroom A/B/C/D*
4:00 pm - 5:00 pm	Closing Award Ceremony *Savoy Ballroom A/B/C/D*

HOTEL FLOOR PLAN



DETAILED PROGRAM AGENDA

Friday, February 15th		
TIME	TOPIC	ROOM
3:00 pm - 7:00 pm	REGISTRATION & HOTEL CHECK-IN	Ballroom Lobby Foyer
	POSTER SET-UP	Atrium
7:00 pm - 9:00 pm	DINNER	Savoy Ballroom A/B/C/D
	OPENING AND INTRODUCTION *Dr. LeRoy Jones, II* *Director for STEM Initiatives* *Illinois LSAMP Program and the Center for STEM Education & Research*	
	WELCOME AND GREETINGS *Dr. Sandra Westbrooks* *Principal Investigator, Illinois Louis Stokes Alliance for Minority Participation* *Provost & Senior Vice President for Academic Affairs, Chicago State University*	
	KEYNOTE SPEAKER INTRODUCTION *Dr. Austin Harton* *Assistant Professor of Physics & Director of the Engineering Studies Program* *Chicago State University*	
	KEYNOTE SPEAKER *Dr. Enrico J. Ramirez-Ruiz* *The Sophie and Tycho Brahe Professor at the Niels Bohr Institute & Associate Professor of Astronomy* *University of California at Santa Cruz*	
	SERVICE AND LEADERSHIP AWARDS *Dr. Christopher Botanga* *Assistant Professor of Biology* *Chicago State University*	

CLOSING REMARKS
Dr. LeRoy Jones, II
Executive Director for STEM Initiatives
Illinois LSAMP Program and the Center for STEM Education & Research

9:00 pm - 11:00 pm STUDENT NETWORKING SOCIAL Savoy Ballroom E/F/G

Saturday, February 16th

TIME	TOPIC	ROOM
7:00 am	REGISTRATION OPENS	Ballroom Lobby Foyer
7:00 am - 9:00 am	BREAKFAST BUFFET	Union Station Restaurant
9:00 am - 10:00 am	STUDENT WORKSHOP WITH DR. ENRICO J. RAMIREZ-RUIZ	Arcadia Symposium

Conversation with the Speaker

As Chair of the Committee for Career Development at UCSC, Dr. Ramirez-Ruiz routinely organizes various career development programs that promote the advancement of trainees, women, and minorities in science. In this workshop, Dr. Ramirez-Ruiz will talk about career pathways in science as well as his own trajectory from an undergraduate student in Mexico to a position as a faculty member at the University of California at Santa Cruz. In addition, the many and varied elements of his life which have allowed him to successfully make this journey to Santa Cruz will be discussed.

	UNDERGRADUATE STUDENT WORKSHOP WITH MS. RENEE LOPEZ-SMITH AND MS. AMELIA MERCED	Washington

So, You Want to Go to Graduate School?

The purpose of this workshop is to discuss the transition from undergraduate to graduate education from a graduate's perspective. A panel of graduate students pursuing graduate degrees in various STEM-related fields will share their experiences about getting into graduate school and making it work. Topics to discuss will include: How to choose a graduate school and advisor that's right for you; research funding and financial aid; how to manage your time; coping with the stress and the personal challenges that accompany the graduate school transition; networking and establishing professional relationships; and the research environment including attending meetings and publishing. We encourage students and educators at all academic levels to attend and share their experiences and perspectives on the value and rigors of pursuing an advanced degree.

Saturday, February 16th continued

TIME	TOPIC	ROOM
	FACULTY AND STAFF WORKSHOP WITH DR. RODRIGO CARRAMINANA	Goodman

Successfully Engaging Students in Undergraduate Research

This workshop aims to open a discussion about the purpose, faculty and student engagement and effective running of an undergraduate research (UR) program. The presenter will share his vision of and experiences with UR programs particularly incorporating UR in the classroom, promoting UR among faculties and students and records keeping. This workshop will allow the participants to have dialog about using UR as means to getting students to four-year institutions or graduate schools.

	CENTER FOR STEM EDUCATION & RESEARCH BOARD MEETING (*for External/Internal Advisory Board and Steering Committee)*	Ellington
10:00 am - 10:30 am	BREAK/HOTEL CHECK-OUT	
10:30 am - 12:00 pm	POSTER SESSION	Atrium

Saturday, February 16th continued

TIME	TOPIC	ROOM
12:00 pm - 1:15 pm	NETWORKING LUNCHEON	Savoy Ballroom A/B/C/D
1:15 pm - 2:45 pm	ORAL PRESENTATIONS - GROUP A Moderator: Dr. Eric M. Brey Associate Professor of Biomedical Engineering Illinois Institute of Technology	Washington
	ORAL PRESENTATIONS - GROUP B Moderator: Dr. Soon-Ok Park Professor of Computer Science Governors State University	Krupa
	ORAL PRESENTATIONS - GROUP C Moderator: Dr. Gurung K. Mahesh Professor of Biology & Biotechnology Harry S Truman College	Goodman
	ORAL PRESENTATIONS - GROUP D Moderator: Dr. Karen Renzaglia Professor of Plant Biology Southern Illinois University at Carbondale	Armstrong
	ORAL PRESENTATIONS - GROUP E Moderator: Dr. William Hunter Professor of Chemical Education and Director of the Center for Mathematics, Science, and Technology Illinois State University	Ellington
	ORAL PRESENTATIONS - GROUP F Moderator: Dr. David Rutschman Professor of Mathematics and Associate Dean for the College of Arts & Sciences Northeastern Illinois University	Arcadia Symposium

Saturday, February 16th continued

TIME	TOPIC	ROOM
2:45 pm - 4:00 pm	RESEARCH EXPERIENCES ABROAD PLENARY	Savoy Ballroom A/B/C/D

Illinois LSAMP and CSER students will discuss their research and cultural experiences while abroad in Ireland, Serbia and Switzerland. They will share how their experiences allowed them to learn about other cultures, make new friends, and develop tangible career benefits.

Moderator:
Ms. Rhonda Harley (Ireland)
STEM Program Coordinator, Chicago Initiative for Research & Recruitment in Undergraduate Science
DePaul University

Student Panel:
Mr. Bernard Boston (Ireland)
Engineering Physics Undergraduate Student
Chicago State University

Mr. Brian Elwood (Switzerland)
Physics Undergraduate Student
Chicago State University

Mr. Trevor GrandPre (Ireland)
Physics Undergraduate Student
DePaul University

Ms. Tawanda Hitchcock (Switzerland)
Industrial Engineering Undergraduate Student
University of Illinois at Chicago

Mr. Edward Nash III (Serbia)
Computer Science Undergraduate Student
Chicago State University

Ms. Carolina Verdial (Serbia)
Architecture Undergraduate Student
Illinois Institute of Technology

Saturday, February 16th continued

TIME	TOPIC	ROOM
4:00 pm - 5:00 pm	CLOSING AWARD CEREMONY AWARD PRESENTATIONS *Ms. Lezlie Thompson* *Associate Director* *Illinois LSAMP Program and the Center for STEM Education & Research* CLOSING REMARKS *Dr. LeRoy Jones, II* *Director for STEM Initiatives* *Illinois LSAMP Program and the Center for STEM Education & Research*	Savoy Ballroom A/B/C/D
6:00 pm - 8:00 pm	CENTER FOR STEM EDUCATION & RESEARCH POST-EVALUATION MEETING (*for External Evaluation Team and ILSAMP/CSER Staff)*	Union Station Private


WELCOME TO
BLACKSTONE HOTEL
TUDIO

HONOREE BIOGRAPHIES

Dr. Carolyn Narasimhan
Professor, Department of Mathematical Sciences
Director, Interdisciplinary Science & Technology Center
DePaul University
Chicago, Illinois

Carolyn Narasimhan, Ph.D. is Professor of Mathematics at DePaul University and Director of the university's STEM Center. In her thirty plus years at DePaul, she has enjoyed a career defined by a deep interest in mathematics and science and in systems that promote the teaching and learning of these disciplines.

Dr. Narasimhan's early research was in the field of dynamical systems, the study of mathematical systems that change over time. Her work focused on the classification of certain classes of mappings of two-dimensional surfaces that are structurally stable. Over time, and after teaching over thirty different courses offered by DePaul's Department of Mathematical Sciences, she became deeply interested in how people learn mathematics and how we can use research on learning to make mathematics more accessible. Her current research interests are in the scholarship of teaching and learning, especially in the disciplines of mathematics and science, and in the systems that support or hinder that learning.

Dr. Narasimhan has collaborated in numerous efforts to enhance opportunities for mathematics and science students in the Chicago area during the past twenty years. She contributed significantly to the task force that successfully advocated for an increase in mathematics requirements in the Chicago Public Schools and collaborated with UIC in the College Preparatory Mathematics Program, one of whose goals was to increase the number of minority students taking AP Calculus in Chicago. For ten years, she directed DePaul's Space Science Center for Education and Outreach, a $2,745,000 initiative funded by NASA whose goal was to broker partnerships between educators and NASA space scientists. She has also received funding from the U.S. Department of Education, the National Science Foundation, the Illinois Board of Higher Education, the Illinois State Board of Education, and other external agencies to support mathematics and science education, both at the undergraduate level and for K-12 students and teachers.

Most recently, Dr. Narasimhan has served on the Algebra Initiative Task Force of the Chicago Public Schools for which she has contributed to the development and teaching of a sequence of courses to prepare middle schools to offer a rigorous high school algebra course for qualified eighth graders. She is currently the Project Director on a

grant from the Chicago Community Trust to partner with the Chicago Public Schools on the implementation of the Common Core State Standards for Mathematics.

In addition to her work in mathematics and science education outreach, Dr. Narasimhan has served in administrative positions at DePaul, including Chair of the Department of Mathematical Sciences, 1987-1989, Associate Dean, College of Liberal Arts and Sciences, 1989-2011, and currently, Chair, Department of STEM Studies and Director of the STEM Center, the administrative home of DePaul's mathematics and science outreach programs.

DePaul has recognized Dr. Narasimhan's contributions to the university and its students by awarding her an Excellence in Teaching award in 1992, and a Spirit of DePaul award in 2011.

HONOREE BIOGRAPHIES continued

Dr. Marian Wilson Comer

Professor Emerita, Department of Biological Sciences
Former Executive Director, Illinois LSAMP Program
Chicago State University
Chicago, Illinois

Dr. Marian Wilson Comer, Ph.D. has solid credentials as a biology professor, science researcher, university administrator and program manager. She completed a Baccalaureate degree in Biology/Chemistry from Roosevelt University, a Master of Arts degree in Teaching Biology from Indiana University in Bloomington, and a Doctor of Philosophy degree in Botanical Sciences from the University of Illinois, Urbana. She was awarded a post-doctoral Rockefeller grant and studied Higher Education Policy and Practices for a year as a Fellow of the American Council on Education and she also received a National Institutes of Health Extramural Associate Research Development Award permitting in-depth study of the grant processes at various government agencies in Washington D.C.

She briefly taught biology in high school in Gary, Indiana and at Indiana University Northwest before beginning her career at Chicago State University (CSU) in 1974. Initially Dr. Comer combined teaching activities with experimental research in the field of botanical science concentrating on the development of ultrastructure tissues in fern plants. Later research interests included studies in Economic Botany and Environmental Science. In addition to teaching and research she has held management and leadership positions within the Academic Affairs Division at CSU. Among these positions were: Assistant to Provost & Academic Vice-President; Assistant Dean in the College of Arts & Sciences; Dean of Students; Chairman of Biological Sciences; and, Executive Director of Illinois Louis Stokes Alliance for Minority Participation.

Her leadership in developing innovative educational programs is nationally recognized. Dr. Comer has administered major comprehensive and cooperative grants under the auspices of the National Science Foundation, the U.S. Department of Education, U.S. Department of Labor, National Institutes of Health, National Aeronautics and Space Administration, and the State of Illinois. Having acquired more than 11 million dollars in external funding for the support of student development programs, she has had a major impact on the quality of university program offerings and institutional enhancement.

Dr. Comer has been extremely effective in motivating students and colleagues to high

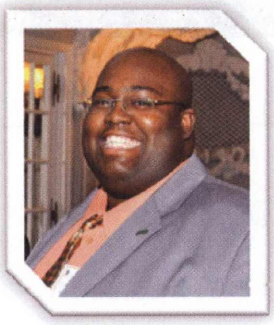
levels of achievement. Encouraging the professional development of students, Dr. Comer started the CSU Biological Society, a student chapter of the American Institute of Biological Sciences and the TriBeta Biology Honor Society. The NIH Extramural Associate program presented Dr. Comer with an award recognizing her success as a mentor (2002) and she has been cited a number of times for excellence as a science teacher.

Dr. Comer has published articles on scientific and technical topics in biology and program development and has been a speaker on a variety of topics on science education best-practices and program development. She is, or has been, involved in a number of professional organizations: the American Institute of Biological Science; American Association for the Advancement of Science; American Botanical Society; American Council of Education; Midwest Tree Keepers; National Association of Biology Teachers; Extramural Associates of National Institutes of Health; and Tri Beta Biology Honor Society.

In addition to her professional involvements, Dr. Comer has provided service to the community through various organizations: the Board of Trustees of Gary Public Library, the Board of Directors of Trade Winds Rehabilitation Center, as a consultant to the Gary Public School District, Master Gardner program in Lake County Indiana, and the Save the Dunes Council. She spearheaded the development of a neighborhood garden on CSU campus, and was a founder and board member of the Illinois Committee on Black Concerns in Higher Education. In addition, Dr. Comer is a life member of Alpha Kappa Alpha Sorority, Inc.

In 2007, she retired after thirty-three years from the tenured position of Professor of Biological Sciences including thirteen years as Executive Director of the Illinois Louis Stokes Alliance for Minority Participation, a collaborative of 19 statewide institutions including universities, colleges and Argonne National Laboratory. Upon her retirement, she was awarded "Professor Emerita" status, a "Dr. Marian Wilson Comer Endowed Scholarship" for biology students was established in her name, and a native Sycamore Tree was planted on campus to honor her distinguished career. Dr. Comer is a life-long resident of Gary, Indiana. In retirement she continues involvement with the Illinois LSAMP, enjoys oil and water painting, traveling with her husband, *Richard*, and interacting with her children and grandchildren.

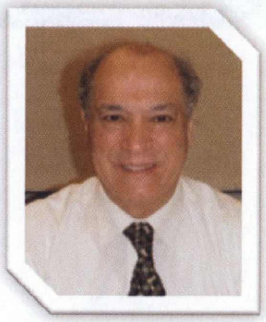
SPEAKER BIOGRAPHIES



Mr. Bernard Boston
Engineering Physics Undergraduate Student
Chicago State University
Chicago, Illinois

Bernard Boston is a junior at Chicago State University. He will be graduating in the spring of 2014 with a bachelor of science degree in engineering physics. He plans on continuing his education by attaining a Ph.D in nuclear physics. He also plans on getting his post doctoral position in nanotechnology. During his undergraduate career he has been a part of the summer USTEP and the Illinois LSAMP programs. He also does student research throughout the academic year in particle physics with Professor Edmundo Garcia. This past summer he was a part of an undergraduate Euroscience Open Forum in Dublin, Ireland.

SPEAKER BIOGRAPHIES continued



Dr. Rodrigo Carramiñana

Associate Professor of Mathematics
St. Augustine College
Chicago, Illinois

Rodrigo Carramiñana, Ph.D. got his doctorate in Mathematics at the University of Iowa under Prof. Norman Johnson, one of the most well know geometers in the world, in the area of Finite Geometry. He had previously earned Bachelor and Master degrees in Chile, his native country. He taught at the University level in Chile as well in four U.S Universities including the University of Illinois at Chicago (UIC) from 1994 to 2010. He is currently working at St. Augustine College.

At UIC Prof. Carramiñana held several positions:

- Director of the Latino Cultural Center
- Associate Professor in the Mathematics Department
- Co-Director of the Emerging Scholar Program and Co-PI of the Illinois LSAMP Program (NSF grant to increase minority students in STEM careers)
- Senior Researcher at the Center of Mathematics Education for Latina/os (CEMELA, NSF grant to do research in math education)

At St. Augustine College:

- Associate Professor
- Math Tutoring Coordinator
- PI ILSAMP
- Pre-Algebra Coordinator

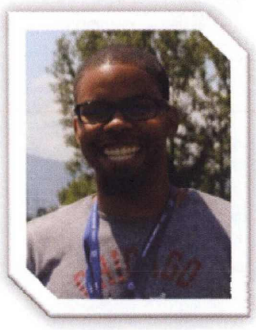
In the last few years he has been working on The Philosophical Aspects of the Cultural Differences, particularly how they affect teaching and learning.

During his tenure at UIC the number of minority students majoring in mathematics quadruplicated.

Lately, one of his major efforts has been to reduce the gap in performance of minority students at every level of the educational system.

He is running a program at St. Augustine College that increased the retention of students taking the first developmental math course from 60% to 90%.

SPEAKER BIOGRAPHIES continued



Mr. Brian Elwood
Physics Undergraduate Student
Chicago State University
Chicago, Illinois

Brian Elwood obtained his Bachelor of Science in Physics at Chicago State University with an interest in Astronomy. He is a three-time recipient of the Illinois Space Grant Scholarship. During his undergraduate career, he participated in multiple observational astronomy projects as a research assistant. In the summer of 2010, he worked on a hazardous asteroid project in Anchorage, Alaska; searching for dangerous asteroids using astronomical images. Since then, he has presented his research at various conferences as well as the 2010 American Astronomical Society Conference. During the summer of 2012, he conducted research with ALICE (A Large Ion Collider Experiment) identifying electron and positron pairs to find the J/ψ signal with the pair's invariant mass; then identified the characteristics of the J/ψ associated jets for proton-proton and relativistic heavy ion collisions at CERN. He is looking forward to pursuing a Doctor of Philosophy in Astrophysics.

SPEAKER BIOGRAPHIES continued

Mr. Trevor GrandPre
Physics and Mathematics Undergraduate Student
DePaul University
Chicago, Illinois

Trevor GrandPre is a junior majoring in Physics and Mathematics at DePaul University. This past fall Trevor expressed his passion for science and graduate study by being accepted into the McNair Scholars program. From attending and presenting research at professional and student oriented science conferences, he was influenced to become a part of and up-build the science community at DePaul University. He was accepted into the CIRRUS program and later was elected CIRRUS president. As CIRRUS president, Trevor has hosted workshops on networking, making and maintaining relationships. After he graduates he hopes to go to graduate school to obtain a Ph.D. in Physics

SPEAKER BIOGRAPHIES continued

Ms. Rhonda Harley
STEM Program Coordinator
Chicago Initiative for Research & Recruitment in Undergraduate Science (CIRRUS)
DePaul University
Chicago, Illinois

Rhonda Harley, M.S. is the STEM Program Coordinator in the College of Science and Health at DePaul University. She works directly with the Chicago Initiative for Research and Recruitment in Undergraduate Science (CIRRUS) Scholars Program which provides academic support and research opportunities for science and mathematics students at DePaul University, Harold Washington College and Truman College. Rhonda also co-advises the DePaul University SACNAS chapter and works to support students within the Illinois LSAMP program.

SPEAKER BIOGRAPHIES continued

Ms. Tawanda Hitchcock
Industrial Engineering Undergraduate Student
University of Illinois at Chicago
Chicago, Illinois

Tawanda Hitchcock is a junior at University of Illinois at Chicago. She will be graduating in the fall 2014 with a baccalaureate degree in Industrial Engineering. During her undergraduate career she has been a part of the summer RISE TILT and the Illinois LSAMP programs. While attending Chicago State University she also has been involved in student research throughout the school year in particle physics with Professors Edmundo Garcia and Austin Harton. She is also an active member of National Society of Black Engineers (NSBE), and strongly believes in the power of partnerships and collaborative efforts that can enrich a student undergraduate career. This past summer she was a part of an undergraduate international research program where she worked with physicists at Lawrence Berkeley National Laboratory in California and at the CERN Laboratory in Geneva, Switzerland.

SPEAKER BIOGRAPHIES continued

Ms. Renee Lopez-Smith
Ph.D. Candidate Department of Plant Biology
Southern Illinois University at Carbondale
Carbondale, Illinois

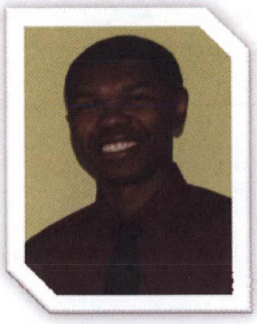
Renee Lopez-Smith is a Ph.D. candidate in the Department of Plant Biology at Southern Illinois University Carbondale. Her studies of gamete development and fertilization in *Ceratopteris richardii* have provided novel information on a range of features from shape plasticity of the motile male gametes to the involvement of cytoskeletal proteins and cell wall constituents in morphogenesis and fertilization. She has facilitated numerous workshops and panel discussions that specifically address the transition from undergraduate to graduate education. Ms. Lopez-Smith was awarded the McNair Scholarship as an undergraduate and has received both the Illinois LSAMP Bridge to the Doctorate and the HEART GK-12 fellowships since entering her graduate program.

SPEAKER BIOGRAPHIES continued

Ms. Amelia Merced
Ph.D. Candidate Department of Plant Biology
Southern Illinois University at Carbondale
Carbondale, Illinois

Amelia Merced received a B.Sc. and M.Sc. degree in biology from the University of Puerto Rico, Mayagüez. She is currently a PhD candidate in the Plant Biology Department at Southern Illinois University and recipient of the prestigious SIU Doctoral Graduate Fellowship. She was a GK12 Fellow both in Puerto Rico and in southern Illinois, in 2009 received the Sullivant Award for a distinguished research article publish in The Bryologist. She has worked for the University of Puerto Rico-Río Piedras Herbarium as database manager and at Duke University on a virtual flora of the mosses of North Carolina. Her research interests are in evolution, development and diversity of plant structures and questions related to homologies in mosses and bioinformatics. Her PhD project is on the evolution and ultrastructure of stomata in mosses.

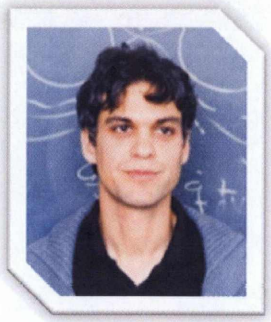
SPEAKER BIOGRAPHIES continued



Mr. Edward Nash, III
Computer Science Undergraduate Student
Chicago State University
Chicago, Illinois

Edward Nash, III is a junior at Chicago State University. His current field of study is computer science. Thus far, during his undergraduate experience, he's researched a strategy of making a processor (Blue Gene/P) much more efficient. During the school year, he works as the head lab assistant and head tutor for multiple courses within the Computer Science field of study. He also volunteers his free time, on campus and in between courses, helping the professors of the Math, Computer Science, & Economics department as well as the department itself with whatever he can. With the work he does and has done, the extensive knowledge he has of the computer science field, and the research he's conducted, he received the opportunity to present at the 5th International Undergraduate Research Symposium in Belgrade, Serbia in 2012. This experience, he says, "Changed his life for the betterment of his career and himself". Edward plans to continue college through to his masters. He plans to get his Ph.D. as well. He knows that no matter which degree he has, he wants to help change lives with it.

SPEAKER BIOGRAPHIES continued



Dr. Enrico J. Ramirez-Ruiz

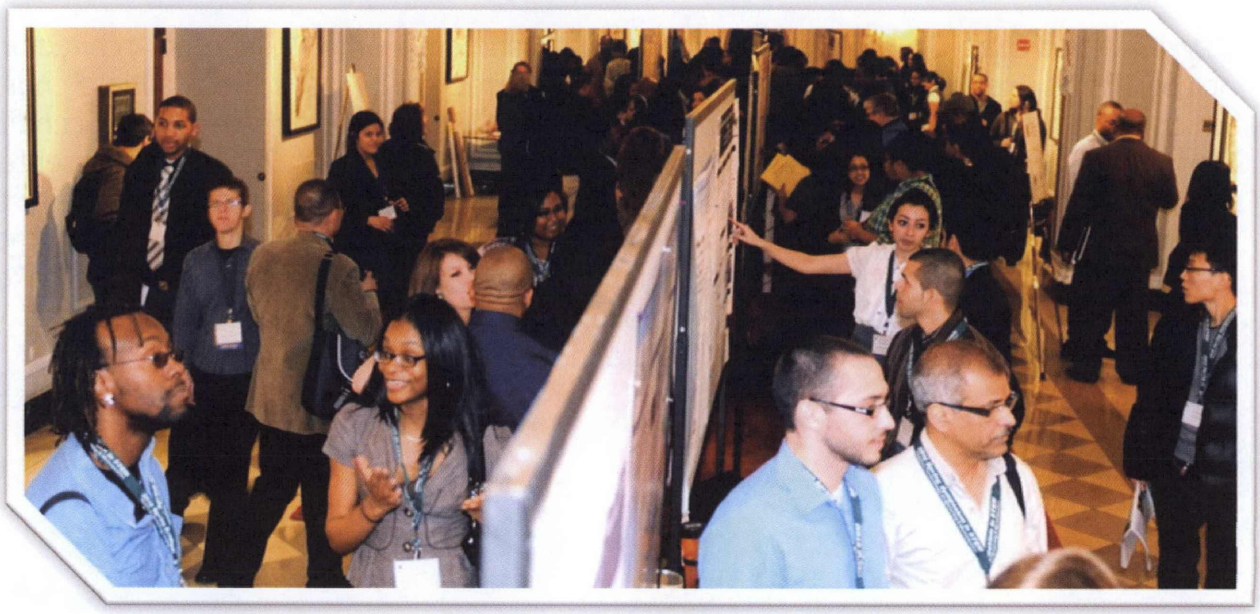
Sophie and Tycho Brahe Professor, Niels Bohr Institute
Associate Professor, Astronomy & Astrophysics Department
University of California at Santa Cruz

Erinco J. Ramirez-Ruiz, Ph.D. is a Professor of Astronomy at the University of California, Santa Cruz and the Sophie and Tycho Brahe Professor at the Niels Bohr Institute, Dr. Ramirez-Ruiz uses computer simulations to explore violent phenomena such as stellar explosions, gamma-ray bursts, and the accretion of material onto black holes and neutron stars. His research addresses fundamental questions in high-energy astrophysics and provides a framework for understanding the observational data coming from new telescopes and astronomical surveys. After studying at the University of Cambridge in 2004, he was a John Bahcall Fellow at the Institute for Advanced Study in Princeton. Since joining the UCSC faculty in 2008, Ramirez-Ruiz has won a prestigious Packard Fellowship for Science and Engineering and a National Science Foundation CAREER Award. In 2009, he established the Lamat program, an internship program that selects physics students from neighboring community colleges for a summer internship at UC Santa Cruz. In 2010, he was elected a member of the Mexican Academy of Sciences. Then 35, he was the youngest scientist ever elected to the academy.

SPEAKER BIOGRAPHIES continued

Ms. Carolina Verdial
Architecture Undergraduate Student
Illinois Institute of Technology
Chicago, Illinois

Carolina Verdial is a third year undergraduate student in the College of Architecture at the Illinois Institute of Technology. She transferred to IIT as a Presidential Scholar which gave her a chance to launch with an IIT faculty member to research in "Scenario Planning in architecture and urban design" during the summer of 2011. She presented her research at the International Undergraduate Research Symposium in University of Belgrade, Serbia through the Illinois LSAMP. Her most recent research started another faculty member in summer 2012 through Illinois LSAMP. Investigates what makes architecture/furniture/products local & global which involves three cities she visited in Mexico, Zacatecas, Mexico City, Guadalajara in relationship to Chicago.



POSTER SESSION LIST AND ABSTRACTS

Atrium

1. Imino sugars and Boron Neutron Capture Therapy

Hector Alvarado and Narayan S. Hosmane
Department of Chemistry & Biochemistry, Northern Illinois University, DeKalb, IL 60115
hosmane@niu.edu

My research is regarding the idea of Boron Neutron Capture therapy (BNCT) to help combat cancer in humans in a much more effective and healthier form then having to use chemotherapy. BNCT is a fairly new concept for curing cancer and the possibilities are infinite. This is why I have decided to focus on one specific section of BNCT research. One of the main benefits of using boron for cancer treatment is that the radiation that it emits is much less harmful then radiation that is emitted when a patient goes through chemotherapy. My research is regarding the idea of using amino sugar as a carrier for the therapy in the human body. We are trying to create water-soluble molecules so that boron isotopes can be properly incorporated into the cancer cells. My research plays a key role in helping future research regarding BNCT. The ultimate goal of my research is to find better treatment for cancer by synthesizing smaller and effective boron drugs, which can accumulate greater number of boron isotopes into cancer cells.

Unfortunately not many carriers have been proven highly effective in transporting the boron isotope into the cancerous cells. Rapidly dividing cells need a large quantity of energy. This energy is obtained from sugars. Sugar is a good candidate as a boron drug carrier.

2. Synthesis and Functionalization of Boron Nanorods

Eyrusalam Bedasso, Amartya Chakrabarti, Matt Rodriguez, Kennieth Boblack and Narayan S. Hosmane
Department of Chemistry & Biochemistry, Northern Illinois University, DeKalb, IL 60115
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Boron nanostructures maintain the unique properties of bulk boron, while carrying the advantages of their nanodimensions. Boron based nanomaterial's hold a good promise to be used for Boron Neutron Capture Therapy (BNCT). We have recently developed a method to synthesize boron nanorods (BNRs) in simple and environment-friendly way. Functionalization of boron nanostructures is the main key to reach that goal of applying BNRs in BNCT. Earlier research has shown BNNTs can be solubilized using such polymers having interaction between amine groups of the polymers and the electron deficient boron of BNNTs. We have attempted prepared water soluble boron nanorods by reacting the amine terminated polyethylene glycol with BNRs. The products were identified using transmission electron microscopy (TEM), energy dispersive X-ray diffraction spectroscopy (EDS) and NMR spectroscopy. TEM exhibits presence of nanorods in the water soluble product in the dimension of 50 to 100 nm in length and 5 to 10 nm in diameter. *Funding: National Science Foundation (CHE-0840504 and CHE-0906179) supported this research.*

3. Building a Construct to Knock-Out the Gene for Old Yellow Enzyme in *Dictyostelium*

Timothy Benson, Richard Townsend, Andrew Maselli, and Kevin Swier
Department of Biological Sciences, Chicago State University, Chicago, IL 60628
kswier@csu.edu

The organism *Dictyostelium discoideum*, a soil-living amoeba, makes its living by eating bacteria, a process termed phagocytosis. A screen of *Dictyostelium* mutants for inefficient degradation of bacteria after phagocytosis, suggested that a gene for the oxidoreductase, Old Yellow Enzyme (OYE), is necessary for this process. Our objective is to knock out the gene for OYE in *Dictyostelium* to verify this phenotype and to investigate the role of OYE in phagocytosis. We are following two parallel procedures to build a knockout construct. In one strategy, we have amplified left and right arms of the OYE gene by PCR and cloned them into the commercially available knockout vector, pKOSG, which contains a gene for blasticidin S resistance. In the other method, we have removed a central portion of the OYE gene and replaced it with the gene for blasticidin S resistance. When either of these constructs is transformed into *Dictyostelium*, it should recombine with the endogenous gene and disrupt its expression. Blasticidin S-resistant transformants will be screened by PCR to verify that the construct has inserted into the OYE gene.

4. The Effects of Insulin and Metformin on Insulin Receptor Production in Breast Cancer Cells

Casey Bishop, Keane Buenarte, Famous Ivabor, Greesha Kagan, and Jori Lambert
Department of Biological Sciences, Harry S Truman College, Chicago, IL 60640
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In recent years, the effects of hormones in breast cancer development have been increasingly investigated. It has been shown that there is an increased amount of insulin receptors on the surface of breast cancer cells when compared to normal breast cells. This increase in receptors leads to an increase in the amount of insulin and insulin-like growth factor (IGF) that can bind to the cell. This results in the activation the mitogen-activated protein kinase (MAPK) pathway that results in cell proliferation. Metformin has been identified as a possible cancer therapeutic, targeting the AMP-activated protein kinase pathway which results in cell checkpoint regulation and apoptosis. Our research aims to investigate the effects of insulin and metformin dosing on normal human epithelial breast cells versus human adenocarcinoma epithelial breast cells derived from a metastatic site. Growth curves will be carried out to determine what effects if any the treatments are having on cell proliferation. Cell morphology will be observed throughout the experiment. Fluorescent staining and subsequent microscopy will be used to identify the relative abundance of insulin receptors on the cell surfaces of each treatment group.

5. First Analysis of the Electroretinogram in the Madagascar Hissing Cockroach (Gromphadorhina portentosa)

Wil Bogue, Andrew Urdiales, Edgar Mantes, Fredrick Prete, and Aaron Schirmer
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The electroretinogram (ERG) is a sub-corneal extracellular recording revealing the summed electrical responses of compound eye (i.e., optic lobe) photoreceptors to discrete light pulses. Previous studies in other species of cockroaches have shown the ERG to be a robust technique to analyze changes in photoreceptor sensitivity and activity under various ambient conditions. However, no data has been published on the ERG of the unique, apterous cockroach, Gromphadorhina portentosa. Our current research reveals that this insect's ERG consists of four distinct components: transient and sustained ON (electrical) potentials elicited by light stimulus onset, and transient and sustained OFF potentials elicited by stimulus offset; the transient and sustained potentials are distinguished by their differences in repolarization times. Specifically, increasing light pulse (stimulus) duration from 100-6500 ms caused an exponential decrease in repolarization rate of the sustained ON and the latency to

the maximum amplitude of the sustained OFF potential. In addition, increased stimulus duration (up to 2500 ms) caused an exponential increase in the maximum amplitude of the sustained OFF at which point the response saturated. Changes in light intensity affected the amplitudes (but not shapes) of the four component waveforms. Additionally, ERGs recorded every 15 minutes over 72 hours under constant light conditions revealed rhythmic oscillatory changes with periods of approximately 24 hours in the latencies to the maximum amplitudes of both the transient ON and OFF potentials. This first analysis of ERGs in G. portentosa provides a novel source of data regarding the cellular and physiological changes in visual systems.

6. Neurotoxic Effects of Acrylamide on Expression of Nr4a2 in the Nervous System of Juvenile Rats

Jaime Brown, Brandy Cooper, Abby Dunker, and Abir T. El-Alfy
Department of Pharmaceutical Sciences, Chicago State University, Chicago, IL 60628
ael-alfy@csu.edu

Acrylamide is an alkene monomer with established neurotoxic actions. Heightened public concern stems from finding that acrylamide is formed in starch-based foods cooked at high temperatures. Additionally, a report by the World Health Organization estimates acrylamide intake is 2-3 times higher in children, however, the extent of neurotoxicity in children is not understood. The objective of this study was to assess behavioral effects, gene expression and translational changes induced by acrylamide in juvenile rats. METHODS: Three week-old male Wistar rats were administered 30 mg/kg acrylamide daily (n=6) for 21 days and neurobehavioral effects assessed twice weekly. Gene expression changes were evaluated in tissues of acrylamide treated rats and specific genes were identified via microarray. RT-PCR was done, followed by western blot analyses to confirm transcriptional effects. RESULTS: Acrylamide induced neurotoxic symptoms: increased heel splay ($p<0.01$), decreased hind limb grip strength ($p<0.001$), and decreased locomotor activity ($p<0.01$). Gene expression changes were identified in areas involved in neuronal development, pain pathways, muscle contraction, and control of motor function. Microarray revealed a reduction in the expression of the nuclear receptor gene Nr4a2, required for development of dopaminergic neurons. CONCLUSION: Acrylamide-induced neurotoxicity in juvenile rats is associated with gene expression changes and down regulation of Nr4a2 at the transcriptional level. Further testing is needed to confirm down regulation at the protein level. *Funding: Chicago State University CTRE and the Department of Pharmaceutical Sciences at Chicago State University supported this research.*

7. Antioxidant Capacities in Tea with Various Steeping Conditions

Maher Budron, Nataliya Milikhiker and Sandra Chimon Peszek
Department of Chemistry, DePaul University, Chicago, IL 60614
speszek@depaul.edu

The focus of this research is to determine the effects of different types of teas and steeping conditions in the process of antioxidant extraction. Four types of tea were analyzed in this project (black, green, white, and chamomile). Data was collected using an ABTS assay. If antioxidants were present in the teas, they would react with the ABTS free radicals thereby causing the blue ABTS radical cation solution to become less blue. The data showed that the green tea contained the highest levels of antioxidants while chamomile had the lowest antioxidant levels. Also, warmer steeping temperatures resulted in greater extraction of antioxidants for all four teas.

8. Effects of De-icing Salts on Soil Chemistry in an Urban Detention Basin

Cesar Bustos, Jazmin Villegas, Ricardo Barron, Jean Hemzacek, Laura Sanders, and Kenneth Voglesonger
Department of Earth Science, Northeastern Illinois University, Chicago, IL 60625
K-Voglesonger@neiu.edu

This project analyzed the impact of de-icing on an urban storm water detention basin to inform the community the effects that human activities have on the basin. We tested the changes de-icing has on the level of salinity. Our hypothesis: the bottom of the basin contains more salinity than the sloping areas. Four parameters of the soil were tested: electric conductivity (EC), infiltration rate, salinity and texture. To characterize salinity patterns, samples of topsoil were extracted on a 20 x 20 ft grid and tested for EC, salinity, soil texture. To measure EC, 1:1 of deionized water and topsoil were mixed thoroughly, and EC was measured with a conductivity meter. A commercial laboratory conducted salinity analyses. USDA field classification techniques were used to distinguish soil texture. To measure infiltration, a seven-inch diameter metal ring was pressed three inches into the soil and filled with deionized water to a depth of one inch repeatedly. Results indicate faster infiltration rates on sloping sides of the basin than the basin's flat center. Results for EC were that the basin's base had higher than the sloping sides of the basin. In soil texture we had a wide variety of texture like sandy clay, and silt loam. EC is evident when clay is in the soil. Our initial purpose was to determine the amount of concentration of NaCl. The results obtained proved otherwise as high concentration of CaCl2 were found within the Detention Basin. The graphs made showed a plausible correlation between the four parameters.

9. Mechanisms Stimulating Antibiotics Enhanced Macrophage Microbicidal Activity

Shawn Curry, Mariah Hurt, Kevin Jones, Vance McCracken and Dennis J. Kitz
Department of Biological Sciences, Southern Illinois University at Edwardsville, Edwardsville, IL 62026
dkitz@siue.edu

Our laboratory is interested in defining some of the mechanisms contributing to antibiotic enhancement of macrophage microbicidal activity. Using thioglycolate-elicited peritineal macrophages from AKR/J mice we will coincubate macrophages with drugs such as Cubicin, macrophages without Cubicin and with positive controls such as bacterial LPS. Assay protocals are described in the methods section and preliminary results shown. This work has been supported in part by the Max Baer Heart Fund, FOE. SC and MH are LS-AMP Research Scholar's, NSF/HRD 094024.

10. Neurotoxic Effects of Acrylamide on Kappa Opioid Receptors in the Nervous System of Juvenile Rats

Michelle Dudek, Rainier O. Celi, and Abir T. El-Alfy
Department of Pharmaceutical Sciences, Chicago State University, Chicago, IL 60628
ael-alfy@csu.edu

Acrylamide is a water soluble compound with established human neurotoxic effects. Initially, the primary route of known exposure was occupational, through the production and use of acrylamide. More recent data now suggests humans may be exposed to acrylamide through starch-based foods cooked at high temperatures, which has raised public concern. The World Health Organization has also reported acrylamide intake is 2-3 times higher in children than adults. Few studies have examined the effects of acrylamide on developing nervous tissue and its mechanism of neurotoxicity is not understood. The primary objective of this project was to assess behavioral effects, gene expression, and translational changes caused by acrylamide neurotoxicity in juvenile rats. Twenty-five day old Wistar rats were randomly assigned to receive acrylamide (30mg/kg) for 21 days and neurobehavioral effects were assessed. Microarray analysis was utilized to identify

changes in gene expression of acrylamide treated rats and a significant alteration in the expression of the kappa opioid receptor (KOR) was observed in the sciatic nerve, which plays a role in the pain pathways. The down-regulation of KOR was measured further using Quantitative RT-PCR and western blot analysis to confirm the transcriptional effects. Western blot analyses revealed a significant decrease ($p<0.05$) in expression of KOR in the motor cortex and cerebellum, while the expression was significantly increased in the sciatic nerve ($p<0.01$). The gene expression changes and down regulation of KOR expression may help explain pain sensitization previously reported with acrylamide exposure. Funding: *CSU Center of Teaching and Research Excellence (Seed Grant 2011).*

11. The Physical and Chemical Properties of the Sediment at Prairie Wolf Slough

Myles Edwards, Katy Rico, Robin Zalinger, Amanda Henderson, and James Montgomery
Department of Environmental Sciences and Studies, DePaul University, Chicago, IL 60614
jmontgom@depaul.edu

Prairie Wolf Slough (PWS), a restored farmed wetland in northeastern Illinois, was created to improve the water quality of storm water runoff entering the North Branch of the Chicago River. Past research has shown that PWS acts as a point source of phosphorous to the Chicago River and shows that higher phosphorus concentrations in the water is leaving PWS than is entering the wetland. Our objective is to assess the physical and chemical properties of the sediment within the wetland to determine if the wetland's sediment is a contributing factor. Collected sediment samples were tested via SRP analysis, C: analysis, and particle size determination. Determination of a monthly sedimentation rate was also conducted. The results of this study theorize that phosphorous adhered with the soils and sediments are solubilized and released into the overlying water column, where it is then swept out of the wetland during storm events.

12. Design of Sustainable Greenhouses for Urban Infrastructure

Jaime J. Encarnacion, Eric Gibson, Greg Gosney, Jake Watt, Patrick Westerkamp
Craig Foster, PhD - UIC Department of Civil and Materials Engineering
David J. Kleinwachter - Christopher B. Burke, Engineering, Ltd.
Noranne Magee - UIC Greenhouse Supervisor
fosterc@uic.edu, dklein3@uic.edu, noranne@uic.edu

The green initiative is an important issue due to growing environmental problems, such as air pollution and waste water, currently occurring in cities across the United States. Cities like Chicago face another environmental issue known as heat-islanding, or the heat-island effect. The large number of black rooftops and pavements causes a rise in ambient temperature which contributes to the aforementioned environmental problems. Implementing greenhouse on urban rooftops will allow vegetation within to absorb sunlight, thus reducing the amount absorbed by the structure and effectively cooling the structure. Along with reducing energy costs through natural insulation, such a greenhouse will reduce storm water runoff through absorption by vegetation, and provide fresh fruits, vegetables, and herbs year-round. Such a greenhouse would have to be designed to structurally withstand wind and snow loads in the Chicago-land area, and be retrofitted to the top of any urban structure. An irrigation system designed in conjunction would use storm water runoff as well as reuse excess water drained from soil within. The final design is in compliance with local, state, and federal regulation supported by structural and finite element analysis, civil engineering construction manuals, building codes, and basic hand calculations. The goal is to design a greenhouse that can be accommodated by urban infrastructure in the City of Chicago with objectives in sustainability, stability, energy efficiency, and cost-effectiveness.

13. Design and Optimization of Oral Sustained-Release Capsules Containing Microparticles

Gerald G. Enriquez, Brandon A. Orawiec, Syed A. A. Rizvi, and Duc P. Do
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College of Pharmacy, Nova Southeastern University, Fort Lauderdale-Davie, FL 33314
ddo@csu.edu

Oral administration remains the most convenient route of drug delivery. Despite some progress, oral sustained-release drug products have not yet reached their full potential in the clinic. The aim of the present study was to design sustained-release capsule containing microparticles of Biopharmaceutics Classification System Class II and Class III drugs. Drug-loaded microparticles were prepared by a spray drying method using biodegradable polymers. Formulation parameters affecting the size, size distribution, surface properties, drug encapsulation efficiency, percent yield, drug stability, and drug release were optimized. Optimized formulation of microparticles containing drug was then filled into gelatin capsules. Chemical and thermal stability of the spray-dried drug was determined by FTIR and DSC, respectively. Accelerated stability studies were also conducted as per ICH guidelines. In vitro drug release studies were performed, and drug release kinetics was evaluated. The microparticle formulation containing 1% bovine serum albumin and 0.1% glutaraldehyde was found to be optimal. Spectroscopy and stability studies showed that the drug was stable after microencapsulation. Spray-dried microparticles sustained the release of the drug for more than 24 hours. The release kinetics followed Higuchi model. These results suggested that microencapsulation by spray drying is a suitable technology to formulate sustained-release capsules.

14. Enhancing the Lipophilicity of Silybin by Esterification

Wenceslas Fanouth-Nguessan, Dereje Gemeda, and Ehab A. Abourashed
Department of Pharmaceutical Sciences, Chicago State University, Chicago, IL 60628
eabouras@csu.edu

The flavononolignan silybin is the major biologically active component of milk thistle fruit (*Silybum marianum*, family Asteraceae). Many attempts have been made to enhance the bioavailability of silybin via chemical or pharmaceutical approaches. Some of the chemical approaches included the generation of lipophilic derivatives but the reported reactions were either incomplete or had relatively low yields. Thus, the goal of this project was to optimize esterification reaction conditions and to apply these conditions to synthesize different silybin esters. Under our optimized reactions silybin was reacted with four different acyl halides to generate their respective silybin esters. The optimized reaction conditions included the addition of 5 eq of acyl halide to silybin in 5 mL DMF at 0 ^{o}C then allowing the reaction to run at room temperature for 16 hrs. The above reaction was run at 50 and 100 mg scales of silybin with full reproducibility and complete conversion of the starting material to one major product in most cases. The products obtained were purified by centrifugal thin-layer and/or flash chromatography. Two of the products were identified as silybin-23-propionate and silybin-23-benzoate by 1- and 2-D NMR spectroscopy. The remaining ester analogs of silybin synthesized during this experiment will also be identified by NMR spectroscopy. The presented reaction conditions introduce a simple method for providing silybin in a lipohilic form that is more compatible with further biological evaluation. The produced esters can also be tested as potential prodrugs for enhancing the bioavailability of silybin.

15. Live Imaging of Drosophilia Mitosis

Chelsea Franklin and William Gilliland
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Mitosis is the process of cell division in animal cells, where a single cell makes an exact copy of its genome and divides to produce two identical daughter cells. This process has been divided into the characteristic phases of prophase, pro-metaphase, metaphase, anaphase, and telophase/ctyokinesis. During these phases, the chromosomes (DNA plus proteins such as Histones) are pulled apart by a structure called the mitotic spindle

(protein fibers made of tubulin). In recent years, one significant technological advance has been the discovery of fluorescent proteins, which cells produce and that fluoresce at different wavelengths of light, such as red (RFP) or green (GFP). These proteins allow us to image live cells using fluorescent microscopy and track the location of different proteins in the cells. The goal of this experiment was to visualize mitosis as it occurs in live embryos of Drosophila flies. In this experiment, we crossed flies carrying RFP-tagged histone to flies carrying GFP-tagged tubulin, and collected females whose eggs contained RFP-labeled chromosomes and GFP-labeled spindles. We then used these labels to image the phases of mitosis in the developing embryo. We were able to observe and record each phase of mitosis as it was occurring in the Drosophila cells.

16. Data Migration in Environmental Quality Information System

Sofia Galarza[1], Clare Tang[1], and Yuejun (Eugene) Yan[2]
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[2]Argonne National Laboratory, Argonne, IL 60439
xtang@govst.edu

Environmental Quality Information System (EQuIS) is used to store sample data from field and lab testing and results data. As the technology evolves, the software needs to be updated. The study is addressing migration of all data from the old system to the new system. The migration needs to maintain data integrity and storing. Once the data are transferred, it is important to cross-examine both databases to make sure everything was transported successfully and to allocate any gaps or breaks that need to be adjusted. *Funding: Governors State University and Argonne National Laboratory supported this research.*

17. Little Ant's in the Prairie: A Comparison of Midewin National Tallgrass Prairie's Remnant and Restored Areas

Soraida Garcia and Susan A. Kirt
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Ants (Hymenoptera: Formicidae) are one of the most important contributors to our native prairies, aerating soil, enhancing drainage, and promoting seed dispersal. There are over 20,000 species of ants throughout the world, with 129 present in Illinois. Ants are very sensitive to environmental changes, including natural area restoration, and can be a useful tool in determining potential indicator species. Our study is located at the 8,000 ha USDA Midewin National Tallgrass Prairie Preserve in Wilmington Illinois. The preserve contains grazed pasture, unplowed remnant and restored prairie and is the largest grassland restoration project in the United States. Our objective is to determine ant diversity between five remnant, restored, and non-restored grassland sites. Twenty-five pitfall and bait traps (50 total) were used to capture arthropods, including ants, at each study site for a total of 250 samples. The ants will be used to determine if, by sampling the ant communities, we can determine remnant prairie health and if native ants were attracted to the restored areas. Funding: Prairie Bionic Inc. and the DOE Visiting Faculty Program supported this research.

18. Stormwater Harvesting – Winnetka, IL

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The Village of Winnetka, Illinois utilizes a separate sewer system for the conveyance of wastewater and storm runoff. Homes with basements have a system in which infiltrated rainwater is collected from the foundation perimeter by sump pump and directed away from the house. The sump pump system is designed to prevent water from seeping into basements by discharging on to the backyard while others are directly connected to the Village

storm sewer system. Concerns arise when backyard discharge areas become degraded due to frequent inundation. Another issue is the limited capacity of the storm sewer system network. Due to the increase of storm events, the village has proposed improvements on a large scale and high cost. This study looks into Green infrastructure, such as rainwater harvesting and rain gardens, which can help alleviate overcapacity issues in the storm sewer network in a cost effective manner. The Rainwater Harvesting System utilizes tanks to store rainwater to be used for non-potable water along with rain gardens which are small depressional areas that can store and encourage rainwater infiltration and evapotranspiration through the use of permeable soils and native plantings. Referring to the ASCE Standard Guidelines for the Design of Urban Subsurface Drainage, a system is developed into two differently sized residential lots in the Village to compare and evaluate their effectiveness in reducing stormwater runoff.

19. Low Resolution Structures of Cold, Warm, and Chemically Denatured Cytochrome-c *via* Small Angle X-ray Scattering

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The results of a small-angle x-ray scattering (SAXS) study of equine cytochrome-c protein under different unfolding conditions are discussed. Although the measured radius of gyration of this protein over a wide range of temperatures and GuHCl concentrations conform to a two-state thermodynamic model, we find different levels of residual structure present depending on whether the protein is cold- or warm- denatured. We present DAMMIN reconstructions of these different unfolded states using 1532 dummy atoms with a 1.5 Angstrom radius, and suggest ways that these different unfolded states may be described by the same folding free energy.

20. Interpretation of Sand Layers within a Soil Profile in an Urban Nature Center

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This research project examines characteristics and lateral extent of sand layers within a soil profile in a Midwestern, urban nature center. This study investigates the origin of the sand, with a hypothesis that it represents material deposited on glacial till. Methods used included mapping the lateral and vertical extent of sand within the soil, USDA field textural classification, and microscopy to examine surface texture of the sand grains. An auto-level and stadia rod were used to survey the site and create a map to illustrate the location of the targeted sand layer. Soil probes were used to retrieve samples to examine soil profiles. Each profile was analyzed for depth and thickness of soil horizons, color variations, soil texture, and depth to parent material. Glacial till was identified by acid reaction of its calcium carbonate component. Sand within the soil was found in two layers, distinguished by color and depth. Microscopic evaluation showed that the sand particles in both layers were similar in terms of grain size distribution and angularity, however they differed in color. The shallower sand is brown, with organic coatings, while the deeper sand is yellowish-brown due to oxidized iron coatings. Possible origins for the sand include aeolian, fluvial, beach, or human processes. The grain size distribution of the sand in soils at this site indicates transportation and deposition through aeolian processes.

21. El Niño Southern Oscillation (ENSO) impacts in Central America-El Salvador

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Central America (C.A.) is home to many biodiversity hot spots and over 50 million people. This study will take an in depth look at El Salvador temperature and precipitation records during different phases of El Niño-Southern Oscillation (ENSO). The first goal is to review the available literature on drivers of climate variability in El Salvador, including topographic features and ocean/atmosphere interactions. The second goal is to investigate the potential role of climate change in El Salvador, and its implications for humans/biodiversity with repeated events such as floods, landslides and drought. The third goal of this study is to analyze available data and quantify the effects of ENSO on climate in El Salvador. The study includes a review and comparison of two climate model predictions for Central America. The results of this research confirm that ENSO has an effect on the regional climate of El Salvador. Some of the results were consistent with past studies, such as increased surface air temperatures during El Niño, while others were counter to past studies, such as precipitation during La Niña. El Salvador receives less rain during ENSO periods than during neutral years. Better climate observation and improved modeling will assist in mitigating disasters in the future. *Funding: NSF/DoED Grant P217A080243-10 supported this research.*

22. Development and Optimization of a Microfluidic-based Multi-Parametric Assay for Evaluating Human Islet Function Prior to Transplantation

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Purpose: Human islet transplantation is a promising therapy for Type 1 Diabetes Mellitus (T1DM). However, long-term transplant outcomes are variable, mainly because of the unknown function of isolated human islets. Current standard assays for islet function and viability do not have predictive value for graft function within transplanted patients. *In vivo* transplantation in animal models has a well-defined predictive correlation, but only has a retrospective value. Furthermore, these experiments are both time consuming and expensive. We developed a microfluidic-based multiparametric assay for measuring the kinetics of intracellular calcium, mitochondrial potentials, and dynamic insulin release in response to glucose stimulation.

Methods: A total of six human islet isolations have been tested. To further validate the device a combination of both high quality versus bad quality human islet preparations stressed by varying hypoxia pelleting have been analyzed. To clearly measure the quality control of each preparation, two different operators run the control group for the human islet preparations in order to ensure the same results are obtained with the microfluidic device. Standard *in vivo* experiments and glucose static incubation tests are completed simultaneously with the microfluidic device.

Results: With the completion of the six trials, the results conclude that by using the microfluidic device one clearly visualizes the difference between the hypoxic conditions and the control batch of human islets. The *in vivo* experiments correlate with the results obtained from the microfluidic device where the human islets induced to two hours of hypoxia were unable to reverse diabetes and with the microfluidic device demonstrate no response to glucose stimulation.

Conclusion: This test is a real-time assay without the requirement to fix and dissociate islets. The goal of this study is to evaluate this device in conjunction with islet hypoxia stress and *in vivo* animal transplantation. Initial results

are promising, which suggests a huge potential for the application of this technology within human islet transplantation.

23. Tree Seedling Regeneration in a Degraded Tropical Landscape: Barriers to Tropical Pasture Restoration in Los Tuxtlas, Mexico

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The current scale of deforestation and continuing decline of tropical forests underscores an important need to restore degraded tropical landscapes. Research here focuses on highly degraded habitats, such as pastures, where forest regeneration may be impeded or no longer possible. The study site, a former cattle-ranching pasture dominated by introduced African stargrass Cynodon plectostachyus, borders the tropical rainforest of Los Tuxtlas (Veracruz, Mexico). Approximately 16% of the Los Tuxtlas original rainforest cover remains today, with 5% remaining as continuous forest. To determine tree recruitment success within pasture habitat, seed-seedling experimental exclosures were built to mitigate herbaceous vegetation and abundant pasture fauna. Experimental exclosures tested 1) the degree that pasture herbaceous vegetation inhibits or facilitates recruitment of tree species, 2) the intensity of seed and seedling removal by pasture fauna, and 3) the prevalence of life-history traits that correlate with seedling establishment success. Preliminary analyses reveal that herbaceous vegetation and exposure to rodent fauna significantly limit tree seedling recruitment in degraded tropical pastures. After 12 months, seven out of sixteen tree species recruited of which six were categorized as being large seeded with weights ranging from 6.5 to 0.117 grams. Additionally, while the decline in seedlings within grass-only treatments suggests that grass inhibits recruitment; the compared magnitude difference between seedlings recruiting in the presence of rodents reveals that this rodent effect is larger overall. The substantial rates of seedling inhibition by pasture vegetation and fauna may be sufficient to strongly influence regenerating tree population dynamics within degraded tropical pastures. Further research and analyses will focus on species specific responses to pasture and fauna presence.

24. Cell Wall Structure and Callose in Stomata that Open and Close Compared to Stomata that Open but do not Close

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Stomata are essential for two of the most important functions of seed plants: gas exchange and evapotransporation. These processes are regulated by two guard cells that open and close the stoma on a diurnal cycle due to changes in turgor pressure. Wall thickenings in guard cells prevent certain parts of the wall from stretching and enable guard cells to separate, thereby forming a pore or aperture. However, stomata in the less-specialized bryophytes, namely mosses and hornworts, open once and do not close. I hypothesized that guard cell wall thickenings and distribution of the cell wall polysaccharide callose may attribute to the inability of moss stomata to open and close. To test this hypothesis, I conducted transmission electron microscopy (TEM) on guard cells in capsules of the moss *Polytrichum ohioense* and compared them to stomata on leaves of the garden pea, a flowering plant. *Polytrichum* has highly thickened walls all the way around guard cells, whereas pea has walls that are thicker at the inner and outer aperture wall of the stoma and thinner along the outside of the guard cell and where they meet. These features likely contribute to functional differences between the two. Immunogold-labeling of callose at the TEM level revealed abundant callose in pea stomatal walls than *Polytrichum* where callose is sparsely localized near the aperture. Because callose is linked with cell wall rigidity and with ABA regulation of stomatal closing, it follows that pea stomata that undergo cycles of closure have more callose in guard cell walls.
Funding: NSF/DGE Grant 0638722 supported this research.

25. Investigating the Over Sporulation Effect of A. fumigatus Induced by P. aeruginosa

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Spores are found mostly everywhere within the air, Aspergillus fumigatus produces spores that can harm immunocompromized patients. It is essential to understand the pathway that leads to spore production, since a potential inhibitor can be developed to aid those affected by this fungi specie. The purpose of this investigation between co-culture interaction focuses on the induction effects and identification of key components that trigger such mechanism. We approached the analysis by conducting a series of co-culture crude extracts as treatments for AF-WT, and additionally recording the amount of spores produced. Our data demonstrates the phenomena of induction and morphological changes. Further research will proceed to investigate the components responsible that favor over-sporulation for each phenotype.

26. Isotopic Variability of C and O in Carbonatites—Proterozoic to Recent

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Carbonatites are igneous rocks composed of ≥50% carbonate minerals. Sr-Nd isotopic compositions indicate they have a source(s) in the deep mantle, and thus carbonatites have the potential to track the geochemical evolution of carbonate components in the mantle. If mantle domains are not mixed, isotopic change with time might be expected as carbonate sediments are recycled into the mantle, particularly after the Archean. Calcite and dolomite separates of 43 carbonatite samples from 25 centers on five continents were analyzed for stable isotopes. The post-Archean carbonatites are from distinct periods (~130 Ma to Recent, ~370, 1100-1300 Ma, ~1900, and ~2270 Ma), and their published eNd values are greater than 0, indicating mantle sources, but only 40% of the carbonate separates fall into the δ18O vs. δ13C "mantle box." The carbonatites have δ13C and δ18O values that show no significant increase or decrease from Proterozoic to Recent time. However, the range of oxygen isotope values appears to have expanded from δ18O of +6.3 to +22.2 to δ18O of +5.8 to +28.2 per mil. The range of carbon isotopic ratios has expanded from δ13C of -5.0 to -0.5 to δ13C of -8.0 to +1.0 per mil. This increased variability may be a result of increased carbonatite magmatism with time, greater preservation of younger carbonatites, or increased variation of contributions to carbonatite sources, including crustal modification. The variation in oxygen in carbonates either represents an exotic component in the mantle or crustal exchange, or both, but analysis of silicates is necessary to test this.

27. The Sawtooth Sunflower: Excessive Watering and Calcium

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After visiting the Chicago State University Prairie Garden, we saw that the Sawtooth Sunflowers were wilting and also rooted in visibly dry soil. It appeared that the Sawtooth Sunflower plants were suffering from the drought and therefore needed water. To solve that problem it was decided to investigate water. Upon investigating the water, it was found that water contributed to life function of plants and particularly to the pH of the soil. Further investigating revealed that water combines with chemicals in the air to form acid rain, which lowers the pH of the soil. Based on research, studies showed that calcium would increase the pH in the soil. The purpose of this experiment was to investigate the effects of hydrated lime (various types of calcium and magnesium) on the growth of Sawtooth Sunflower plants under greenhouse conditions compared to the prairie garden. Due to an increase in the pH the micronutrients were not able to be absorbed. The experimental period ran for a total of four

weeks. Ten plants were marked as control in the prairie garden and forty plants were potted with their soils and placed in greenhouse. One set of ten plants in greenhouse were used as a control and thirty plants received the calcium solution. Measurements were taken once per week of the leaf count and leaf length. The results show that the plants in prairie continued to thrive in their natural habitat regardless of the drought. The plants in greenhouse all died at the end of the fourth week.

28. Microbicidal Activity Can be Stimulated by Antibiotics, What's Next

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Our laboratory is interested in drug effects on mouse macrophage immune response. Antibiotics including Cubicin, , Tigecycline, Dalbavancin, Zithromax, Clindamycin and others have mostly been found to stimulate macrophage killing of candidal yeast targets. T cell function also was enhanced as determined by an ear-thickness assay used to measure (DTH) delayed-type hypersensitivity. We are planning (see our other poster today) to study some of the mechanisms that may be responsible for microbicidal enhancement in macrophages such as changes in cytokine production, nitrous oxide, digestive enzymes and toxic oxygen. *Funded: This work has been funded in part by the Max Baer Heart Fund, FOE. MH and SC are LS-AMP Research Scholars, NSF/HRD094024.*

29. Lunasin Internalization is Mediated by Clathrin-Dependent Endocytosis and Macropinocytosis but Inhibited by Brefeldin in Human Macrophages

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Lunasin is a bioactive peptide derived from plant foods that contains a unique Arg-Gly-Asp cell adhesion motif. Cardiovascular disease (CVD) is the leading cause of death in the United States. Diet influences the diverse risk factors associated with CVD, and atherosclerosis, a major vascular disease initiated by inflammation, is the most significant. Prior studies have shown that lunasin possesses the potential to inhibit pathways involved in the inflammatory cascade in macrophages. The objective was to determine potential endocytic pathways involved in mediating the internalization of lunasin in human THP-1 macrophages using fluorescence confocal microscopy. Brefeldin A (BFA) disrupts intracellular protein transport and trafficking of endocytic vesicles. BFA pretreatment (20 µg/mL) at 30 min, 3 h and 6 h inhibited lunasin internalization into macrophages by 97.5, 99.6 and 99.8%, respectively. Pretreatment of macrophages for 30 min with amantadine (1 mM) and amiloride (1 mM), specific inhibitors of clathrin-mediated endocytosis and macropinocytosis, abolished lunasin cell entry. Nystatin (54 µM), an inhibitor of caveolae-dependent endocytosis, blunted but did not inhibit lunasin internalization. In conclusion, these data suggest that lunasin internalization is primarily mediated by endocytic mechanisms that involve both clathrin-coated vesicles and ion channels associated with macropinosomes.

30. Developing a Neural Network to Predict Open Circuit Voltages for Dye Sensitized Solar Cells

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Dye sensitized solar cells (DSSC) are an attractive alternative to silicon-based solar cells due to the prospect of high energy conversion efficiency and low production cost. However, their efficiencies remain low with the best all dyes exhibiting efficiencies of around 11%. One of the parameters controlling the efficiency of the solar cell is the open

circuit voltage (Voc). Voc is a function of the band gap and thus should depend on to depend on the chemical structure of the dye molecule used in the cell. Descriptors such as hydrophobicity, rotatable bond count, branching indices and absorption maximum have been proposed, however, no obvious linear relationship exists between these parameters and experimental values of Voc. In this work, a quantitative structure-property relationship (QSPR) analysis of Voc and 209 thiophene derivatives (149 training, 60 validation) was carried out using the Neural Network algorithm in Mathematica 8 using radial basis functions. To determine the optimal network we investigated three descriptor sets, changing the number of included neurons, and employing regularization. A working model capable of predicting the Voc of 77% of the validation set to within 10% was developed. Results also indicate additional descriptors are necessary to deal with extreme Voc values. However, the created database is the most complete set of solar cell dye molecules compiled and will be of great benefit for future studies.

31. Inhibitory Effects of Natural Antimicrobials Agents against *E. coli, S. aureus,* and *K. pneuomoniae*

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The U.S. relies on bacterial and fungal sources to create new antibiotics. On average, two or three antibiotics are derived from microorganisms each year. In recent decades, there has been a decline in this rate due to the limited lifespan of antibiotics and a limited amount of sources to synthesize new antibiotics. Bacterial resistance to commonly prescribed antibiotics is the main factor in reducing the lifespan of antibiotics. Pathogenic bacteria have become problematic in the community health standpoint due to antibiotic resistance. Often over-prescribed antibiotics are becoming ineffective in treating common bacterial infections. *E. coli*, *S. aureus*, and *K. pneumoniae* are commonly seen in causing severe infections with growing resistance. Unconventional therapy is becoming more popular amongst the public and natural sources of antimicrobials are being tested for their efficacy. This study determined the effectiveness of natural antimicrobials such as clove oil, tea tree oil, grapefruit seed extract, colloidal silver, and garlic extract and their ability to inhibit the growth of *E. coli*, *S. aureus*, and *K. pneumoniae*. The Kirby-Bauer disk diffusion method and turbidity testing were used to determine their ability to inhibit bacterial growth with both positive and negative controls. Clove oil, tea tree oil, and grapefruit seed extract showed inhibitory effects against bacteria compared to the controls. Zones of inhibition for several products approached that of standard effective doses for common antibiotics used in a clinical setting. *Funding: Governors State University supported this research.*

32. *Sizing It Up: CSU NANO Technology Week*

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In middle school, students are introduced to chemistry and the idea of chemical sciences, but not as the topic relates to scale. "Nano", a familiar term that has evolved due to mainstream electronic devices, is primarily introduced when students begin learning the metric system. Real world applications of the nanoscale are not usually introduced until college. A gap exists between what students learn in early grades (the metric prefixes) and what they experience (nanotechnology). The inclusion of nanotechnology into a science curriculum has the potential for positive results; expanded and contemporary topics combined with hands on activities may peak student's interest in careers advancing the field of nanoscience. To train educational professionals, a five day workshop will be offered to teachers in grades K-12 to introduce them to nanotechnology and to train them on classroom lessons that have been specifically designed and developed to demonstrate scale and nanoscale measuring instruments. The Nanosurf AFM (Atomic Force Microscope) is a portable instrument which we used in the classroom to demonstrate nanoscale concepts. When combined with with engaging hands-on activities, the

AFM can be operated in middle school and high school classrooms to allow students to merge chemical and mathematical concepts with real-world actions. We will discuss the outcomes of our experiences. *Funding: This research is supported by the Chicago State University Center for STEM Education & Research.*

33. A Growth Comparison of Prairie Wild Bergamot using macro-minerals Nitrogen, Phosphorus and Potassium (NPK) Under Greenhouse Conditions

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A comparison of the arthropod communities was done at the 1 ha, Chicago State University (CSU) prairie garden; a surrounding turfgrass landscape, and the 24 ha Gensburg-Markham (GM) prairie.The GM prairie is a remnant that has been actively managed since 1971, while the CSU prairie was installed over turfgrass in 2003. Both the CSU and GM prairies were sampled in June and October, 2012. using 25 pitfall traps per site.. The turfgrass landscape was sampled only in October using 10 pitfall traps. All traps were set up and left in the field for three days, after which arthropods were collected, sorted, and stored in vials containing 70% ethanol. Individual specimens were examined microscopically and identified to genus and species when possible. A total of 1186 arthropods were collected, encompassing 17 genera and 69 species. The greatest species richness was found at the CSU prairie during summer (31) , a value twice as high as the G-M site. Species richness was least in the turfgrass site, sampled in fall (8 taxa). The Shannon-Weiner Diversity Index (SWI) revealed the a similar high level of diversity in both prairies during the summer vs. fall (2.79 and 0.67 vs. 2.43 and 1.52) for the CSU and G-M prairies, respectively. The turfgrass SWI was 1.35, twice as high as the fall CSU prairie index, but still lower than the GM value. Additional analyses are planned to determine the extent of taxa similarity among sites as well as native arthropod diversity. *Funding: Prairie Biotic Inc. and the DOE Visiting Faculty Program.*

34. Detection of Common Motifs in Core Promoters of Key Starch Degradation Genes in *Arabidopsis* and *Medicago sativa*

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Starch is stored in the taproot system of *Medicago sativa*, the major forage species grown in the US. The degradation of starch involves many enzymes, one of which is β-amylase. There is a high level of expression of β-amylase in the root tissues of *Medicago sativa* but how this gene is regulated at the transcription level is not clear. Our objective was to detect motifs that are common among core promoters of important starch degradation genes (*AtGWD, AtBAM 1&3, and AtISA3)* in *Arabidopsis* and *M. sativa* β-amylase. We subjected 330 base pairs core promoters of the *Arabidopsis* starch genes, *M. sativa* β-amylase core promoter and two *Arabidopsis* non-starch genes as controls to the transcription factor binding site database (PLACE). We compared the retrieved motifs for their common occurrence and frequencies in these promoters. We used a goodness-of-fit chi square analysis to determine the significance of the frequency of common motifs. Three important motifs were found that showed differential frequencies among starch and non-starch genes. First, ROOTMOTIFTAPOX1,ATATT, motif was found only in *M. sativa* β-amylase (*MsBAM1*) core promoter and in *Arabidopsis* main starch degradation genes *AtGWD, AtBAM 1&3, and AtISA3,* but none were identified in non-starch degradation genes. Second, the GATABOX motif, GATA, was found in higher frequency in *MsBAM1* and the *Arabidopsis* starch genes and in low frequency in the non-starch gene *AtCAD*, but was not found in *AtADH* both non-starch genes. Third, the DOFCOREZM, AAAG, motif was found in starch as well as non starch degradation genes. These motifs may work together in co-transcriptional regulation of starch degradation genes to regulate re-growth of *Medicago sativa* after harvest for forage production or free range cattle grazing which depends to a large extend on carbon reserves in the roots of this species.

35. Arthropod Biodiversity of Urban Prairies and Turf Landscapes

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A comparison of the arthropod communities was done at the 1 ha, Chicago State University (CSU) prairie garden; a surrounding turfgrass landscape, and the 24 ha Gensburg-Markham (GM) prairie. The GM prairie is a remnant that has been actively managed since 1971, while the CSU prairie was installed over turfgrass in 2003. Both the CSU and GM prairies were sampled in June and October, 2012, using 25 pitfall traps per site. The turfgrass landscape was sampled only in October using 10 pitfall traps. All traps were set up and left in the field for three days, after which arthropods were collected, sorted, and stored in vials containing 70% ethanol. Individual specimens were examined microscopically and identified to genus and species when possible. A total of 1186 arthropods were collected, encompassing 17 genera and 69 species. The greatest species richness was found at the CSU prairie during summer (31), a value twice as high as the GM site. Species richness was least in the turfgrass site, sampled in fall (8 taxa). The Shannon-Weiner Diversity Index (SWI) revealed that a similar high level of diversity in both prairies during the summer vs. fall (2.79 and 0.67 vs. 2.43 and 1.52) for the CSU and G-M prairies, respectively. The turfgrass SWI was 1.35, twice as high as the fall CSU prairie index, but still lower than the GM value. Additional analyses are planned to determine the extent of taxa similarity among sites as well as native arthropod diversity. *Funding: Prairie Biotic Inc. and the DOE Visiting Faculty Program.*

36. Polypharmacological Strategies for Short-Circuiting Multifactorial Diseases: Peroxynitrite Scavenger-Sphingolipid Hybrids

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The goal of this work is to provide a conjugate of our peroxynitrite decomposition catalyst (PNDC) and a sphingosine-1-phosphate(SIP) agonist (related to FTY-720) which has improved biological activity over that of the individual compounds. Since the catalytic decomposition of peroxynitrite (using catalysts such as PNDC) and SIP agonists are both effective in treating inflammatory and neuropathic pain, conjugates such as compound PNDC-FTY-720 may have a highly synergistic mode of action. Cross-coupling of the aryl bromide analogue of our prototype PNDC with different acetylenes under Sonogashira reaction conditions was studied. Synthetic routes including the preparation of complex PNDC, various acetylene containing analogues of the lipid tail and head group of FTY-720 and conjugation chemistry for the construction of analogues related to compound 3 will be discussed.

37. Antibacterial Properties of Extracts of Subtropical Algae Against Potential Bacterial Pathogens

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Previous antimicrobial studies of the crude extracts from marine algae collected in Guam, Caribbean islands, and Fiji indicate that potent activity exists against a diverse group of potentially harmful marine microorganisms. The panels included: the pathogenic fungus *Lindra thalassiae*, saprophytic fungus *Dendryphiella salina*, saprophytic stramenopiles, *Halophytophthora spinosa* and *Schizochytrium aggregatum*, and pathogenic bacterium *Pseudoaltermonas bacteriolytica*. While these microorganisms are ecologically relevant, it is unclear what role they play in specific algal habitats. In the present study, we explore the hypothesis that algal antimicrobial chemical defenses are adapted to the microbial flora in their immediate microhabitat. We are evaluating the inhibitory activities of the algal extracts from Florida against both local and remote bacterial populations. The panel of bacteria includes strains isolated from the surfaces of algae collected in the Florida Keys and marine habitats from other remote destinations (North Atlantic Ocean, Red Sea, and South Pacific Ocean). To date, we

have screened algal crude extracts against 22 strains of bacteria including 17 species from Florida. As would be expected, the results show variable growth inhibition among species. Some bacterial strains appear to be much more susceptible to the algal extracts than others. The IC50s of the crude extracts are typically higher than those observed for the streptomycin and tetracycline controls. The trends in activity will be further explored by sequencing the 16s rDNA of the strains used in the assays

38. The Effects of Insulin and Metformin on levels of AMPK and IGF-1 in Breast Cancer Cell Cultures

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Investigations into the effects of hormones in breast cancer development have been steadily increasingly in the last 15 years. Insulin and insulin-like growth factors (IGF) have been shown to play an important roll in the development of several cancers. IGF is a potent mitogen, inducing the proliferation of cells and is an important regulator of cell growth. An extensive amount of cross-reactivity occurs between the ligands and receptors involved in the insulin and insulin-like growth factor pathways. Our research aims to investigate the effects of insulin and metformin dosing on normal human epithelial breast cells versus human adenocarcinoma epithelial breast cells derived from a metastatic site. Metformin has been identified as a possible cancer therapeutic, targeting the AMP-activated protein kinase pathway, therefore decreasing cell proliferation. Metformin is currently on the market as a treatment for diabetes type-2, working to decrease the amount of blood glucose. Western blots and ELISAs using primary antibodies will be used to detect and quantify the amount of IGF-1 and AMPK.

39. The Role PKG and Syk kinases in the Receptor-Dependent Pathway of Superoxide Generation in Neutrophils

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Within the human immune response to bacterial infection is the neutrophils NADPH oxidase enzyme which mediates the production of reactive oxygen intermediates (ROI). The enzyme is made up of the membrane-associated proteins gp91 and p22, and the cytosolic proteins p47, p67, p40 and Rac. Upon stimulation of an appropriate receptor by a chemokine or chemoattractant, the cytosolic components translocate to combine with the membrane bound components. This forms an active oxidase which can transfer electrons from NADPH across the cell membrane to molecular oxygen generating ROI, thus killing the bacteria. It has been shown that one of the key signaling molecules in this pathway is protein kinase C, PKCδ, involved in the phosphorylation of the cytosolic component, p47. However, whether or not other kinases are involved in this signaling event still remains unclear. In this study, we propose to investigate the role of other kinases such as protein kinase G (PKG) and tyrosine kinase (Syk) in this pathway. Preliminary data obtained from superoxide generation assays using mouse isolated neutrophils show that, specific inhibition of PKG and syk kinase completely abolishes superoxide production in the formyl peptide receptor (FPR)-mediated pathway for superoxide generation. This opens a door to help put together the pieces of the puzzle as to where these kinases fit in this pathway. Further study would involve the use of neutrophils isolated from wild-type and knock-out mice as well as cell reconstruction assays to study the roles of PKG and syk kinases.

40. Histological Characterization of Hollow- and Solid-Stemmed Genotypes of Wheat (*Triticum aestivum*)

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Wheat serves as a major cash/food crop in the United States and other parts of the world. Wheat farmers suffer major yield losses due to sawfly, *Cephus cinctus*, a pest that causes lodging by burrowing into the stem. Some wheat cultivars have stems with solid piths, making them resistant to sawfly. Characterizing the solid-stemmed phenotypes would offer the basis for engineering the trait into desirable wheat cultivars. The aim of this project was to evaluate the histological differences between hollow- and solid-stemmed wheat genotypes. Wheat near isogenic lines (NILS), having 97% similarity in their genetic makeup (except for the solid stem locus) were grown in the greenhouse and destructively sampled at 5-, 6-, and 7-weeks. Stems were snap-frozen, cross-sectioned and evaluated under a scanning electron microscope (SEM). Structural differences between solid and hollow-stemmed wheat were observed at the 7-week growth stage. The epidermis, vascular bundles, and parenchyma cells were observed in both classes of genotypes at 100x magnification. The solid-stemmed genotypes showed thicker epidermis and larger vascular bundles than the hollow-stemmed genotypes. However, there were no obvious differences in the parenchyma cells for both classes of the genotypes. Further analysis with ImageJ showed that the distance from the pith to the epidermis of the wheat stem was greater in the solid-stemmed phenotype than the hollow-stemmed phenotype. The ImageJ data confirmed an earlier report that solid-stemmed wheat had narrower stems than the hollow-stemmed wheat genotypes. We are currently seeking answers to the molecular basis of the observed differences. Funding: Funding: This work was supported T-CAP/USDA.

41. Purification of Anticancer Drug Precursors from Transgenic Moss

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The moss Physcomitrella patens was genetically engineered to express the first two enzymes involved in the biosynthesis of Taxol, an anticancer drug. Transgenic moss produced at least three toxoids, one of which is a novel taxane called OCT, while the others are unknown compounds. To determine the identities of the unknown compounds, they will need to be extracted from the moss and purified. Hence, the transgenic moss was subjected to methanol extraction followed by silica gel chromatography, in order to separate the unknown compounds from OCT and the naturally occurring diterpenes (kaurene and kauranol). Two-elution solvent systems were tested, the first one using hexane/ether (95:5), and the second one using hexane/dichloromethane (1:1). Both elution methods separated kaurene from the unknown toxoids. However, only hexane/dichloromethane afforded fraction of one unknown compound that contained no OCT, as determined by GC-MS analysis, while hexane/ether generated fractions containing OCT without the unknown toxoids. This result will guide large scale purification of the unknown compounds to obtain sufficient amounts for chemical characterization and anticancer tests.

42. Intestinal Mucosal Tissue Injury Following Burn and Acute Alcohol Intoxication is a Result of Hyperactive Neutrophils

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Alcohol use imposes a greater risk of trauma-associated mortality due to the development of multiple organ dysfunction syndromes than trauma alone. Nearly half of all burn patients admitted to trauma units has ethanol in their blood. We investigated the degree to which acute alcohol administration contributes to compromised mucosal immunity, specifically neutrophil-mediated intestinal complications associated with burn injury.

43. Build e-SWAT User Interface

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The work described here is part of an ongoing project to design, develop and implement the latest computing technologies, such as cloud computing and database management, for environmental research. Two computing tools were the focus of the current study. The Soil and Water Assessment Tool (SWAT) is a river basin scale model developed to quantify the impact of land management practices on large, complex watersheds. One application is the evaluation of biofuel production in the Upper Mississippi River Basin. The study investigated and developed user interfaces, intersystem communications, file management and computer security to enable cloud computing for SWAT. The cloud computing approach provides hydrologists better GUIs for setting up model parameters and reviewing results and more computing power to run simulations. *Funding: Governors State University and Argonne National Laboratory supported this research.*

44. Variations of Soil Chemistry and Biological Activity with Tree Coverage in an Urban Nature Center

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This research examines variations in soil respiration associated with a woodland, versus solitary trees within a savanna, including both an oak and a pine tree, all in an urban nature center. In addition to soil respiration, soils were analyzed for bulk density and macronutrient content (phosphorus, nitrogen, and potassium). Soil respiration, the exchange of gases by living organisms in soil, is measured by carbon dioxide emissions over time. It is expected that the respiration rate in the woodland will be lower than in the vicinity of solitary trees within the savanna. Single trees may have lower nutrient uptake, leaving more soil nutrients to support other soil organisms. It is also expected that lower soil respiration rates will correlate with lower concentrations of macronutrients within the soil. Standard methods of the U.S. Department of Agriculture were used for all the tests. In the savanna, soil respiration rate, bulk density, and nitrogen, phosphorus, and potassium content were measured at increasing distances from tree bases in order to assess the impact of tree coverage. The results indicate that the woodland has a lower soil respiration rates compared to areas near solitary trees. The research allowed for the exploration of the variability in tree coverage and tree species and relationships of these variables to respiration rate and macronutrient concentration. This research demonstrates variations in soils within two distinct ecosystems, and possibly variations due to different species of trees.

45. Comparative Study of Microbial Levels as a Function of Distance from Bat Guano in the Sediment from Two Southern Illinois Caves

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The growth of organisms in cave environments, in general, is limited by organic input. These cave ecosystems are mostly constant in overall physical composition. Increased nitrate levels as a result of bat guano presence in Griffith and Layoff caves in Hardin County, IL, and the pathogenic coliform bacteria present in fecal matter are harmful to humans and animals alike. These conditions may increase in amount as a result of bat activity and water flow to places other than the designated cave environment. This study attempts to: 1). Determine the impact of bat guano at various distances on the overall number or bacteria and specifically the potentially harmful fecal pathogens in the cave environments, and 2). To observe if bat guano presence has differing effects on pathogen levels based on differing sediment composition and water flow levels in disparate cave environments. These questions were tested by taking sediment samples from Griffith and Layoff caves and performing counts on total coliform bacteria as well as overall aerobic bacterial levels using standard plate count and selective media. Results showed little to no influence on overall microbial levels as a function of distance from the cave guano sources in Griffith cave, but coliform numbers were variable, but followed no specific pattern correlated to distance. Layoff cave showed increases in both total bacteria and coliforms only directly on the guano piles. Further study is needed to effectively determine diversity of bacterial types and overall importance of guano to microbial organisms within these cave environments. *Funding: Governors State University supported this research.*

46. Comparison of E. coli Presence and Overall Coliform Counts between Sites on the Kankakee River, Near the Momence Municipality Sewage Treatment Facility

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The Environmental Protection Agency of the United States has set up parameters for safe drinking water for public access. Small rural communities are often overlooked for analysis of drinking water due to the low population density compared to that of cities with large population densities. Momence Community drinks water from a separate underground spring with sources of possible contamination of fecal coliforms. Within a Five mile radius of the ground water there is a local sewage recycling plant, the Kankakee River, and many industrial businesses that contaminate the water supplies. Using EPA methods, four locations were tested for E. coli and other fecal coliforms using selective media and carbon usage patterns from BiOLOG Eco-Plates. These sites included an upstream control site, the Sewage treatment facility, recycled water site and downstream site. Although there is a low p-value for the aerobic counts, suggesting there is sufficient evidence to suggest contamination from the recycled water, it is not important for this experiment as they are not fecal coliforms, and are other bacteria, which the EPA considers not harmful for the environment. No fecal coliforms, including *E. coli* and *Enterobacter,* are being released into the environment from the sewage recycling plant. With a high p-value, we fail to provide sufficient evidence to suggest any contamination from the sewage recycling plant to the adjacent Kankakee River. Interestingly, the data suggest that the upstream control site had significant amounts of fecal contamination compared to the test site which had little to no coliforms present. *Funding: Governors State University supported this research.*

47. Apoptosis Induction in Human Cancer Cells

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Hygromycin (Invitrogen) is an aminoglycoside antibiotic that inhibits translation in sensitive mammalian cells has been reported to being an effective inducing agent of apoptosis in cancer cells expressing a functional p53 protein. We treated HeLa INT 407 cells (p53+) and HL60(p53-) with a concentration of hygromycin B, commonly used in our lab, at 500 ug/ml for varying amounts of time. Apoptosis was detected on single cells by DAPI staining, trypan blue exclusion test, and phase contrast microscopy. As early as 8 hours post-treatment morphological changes were detected by both phase contrast and fluorescence microscopy. Chromatin condensation, shown as a significant reduction in nuclear volume, was revealed in treated cells by DAPI staining. Preliminary data suggests the intrinsic pathway of apoptosis is prominent. *Funding: We gratefully acknowledge supportfrom the Fraternal Order of Eagles.*

48. X-ray fluorescence Microscopy to Image Bennington and Colo Series Soil

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Soil is a vital component to life on earth; nearly all of our food is derived from it. Therefore, a greater understanding of soil phenomena is needed to effectively maintain one of Earth's important resources. Soil colloids make up the smallest particle size of the soil fraction. They are unique in regards to their high surface to volume ratio, heterogeneity, and their ability to attract cations and water molecules. Through colloid mediated processes plants are able to uptake these nutrients into their tissue, but these processes are not yet understood. For this study, two well-classified soil samples were obtained, a Bennington and Colo series (Ap layer), from the National Resource Conservation Service. To identify morphology, samples were imaged using visible light microscopy. To determine trace element distributions, X-ray fluorescence microscopy was used to obtain elemental maps of the samples. As matter transport is dependent on water in the soil matrix, samples were imaged in an aqueous environment. Findings of soil specific trace element distributions will be presented and put in context with their agricultural impact. Future studies will focus on colloidal tomography and effects of in situ manipulation. These studies seek to increase understanding of individual colloid interaction rather than interactions in a bulk system e.g., for efficient plant nutrition and soil remediation. *Use of the Advanced Photon Source, an Office of Science User Facility operated for the U.S. Department of Energy (DOE) Office of Science by Argonne National Laboratory, was supported by the U.S. DOE under Contract No. DE-AC02-06CH11357.*

49. Antifungal Activities of Algal Extracts From Florida Against Enviromental Strains of Fusarium SPP and Dendryphiella

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With warming ocean temperatures and changes in pH and salinity, there have been major disease outbreaks caused by opportunistic marine pathogens that thrive in these new conditions and in some cases, become more virulent. While some marine organisms appear to be susceptible to infection, outbreaks in algal populations have not been observed. Previous studies demonstrated that extracts from algae exhibit antimicrobial activities against a broad range of microorganisms that have been identified as pathogens in the marine environment. The purpose of this study is to screen algal crude extracts from common tropical algae from the Florida Keys for antifungal

activity against strains of *Fusarium* spp. and *Dendryphiella salina*. Samples of the marine algae *Udotea looensis*, *Caulerpa sertulariodes*, *Dictyospearia cavernosa*, *Avainvillea elliotti*, *Neomeris annulata*, *Ulva lactuca* and the sponge *Chalinuba moliba* were extracted in 1:1 EtOAc:MeOH and partitioned in EtOAc and H2O. Extracts were assayed in a sterile 24-well microtiter plate format and considered active if growth was inhibited by 50%. Overall, all of the extracts inhibited the growth of at least three strains of fungi at 100 mg/ml, well below natural volumetric concentration in the algae and sponge. The crude extract from the lipophilic and hydrophilic extracts of the green alga Ulva lactuca inhibited growth of some strains at 1 mg/ml. This data supports the hypothesis that common marine algae produce antifungal metabolites that may protect them from infection.

50. Three Dimensional Analysis of Hirano Body Structure in the *Dictyostelium discoideum* Using Electron Microscopy

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In neurodegenerative diseases the cytoskeleton of neurons are altered. One of the least studied of these alterations is the aggregation of actin and actin-binding proteins known as Hirano bodies. The role Hirano bodies play in neurodegenerative diseases' pathology is unclear *Dictyostelium discoideum* is an amoeba that is used as a model system to study the formation of the highly ordered structure of Hirano bodies also found in human brains. The thin sections of the cells used in transmission electron microscopy make it difficult to observe the relationship between the actin filaments in the Hirano bodies and the actin of the surrounding cytoskeleton. Preserving the three dimensional relationships between components will reveal the spatial relationship between Hirano bodies and other ultrastructure components. We have tested a technique that preserves the three dimensional structure of single cells. Cells are grown on glass cover slips, fixed and critical point dried. Adhesive tape is then used to remove the top layer of the cell membrane. The removal of the top of the cell membrane allows us to image the inside of the cell by a scanning electron microscopy and investigate how the Hirano body interacts with the rest of the ultrastructure. The challenge is assuring that the structures we have identified by morphology are Hirano bodies. To confront this challenge a correlative study needs to be performed to confirm that we have correctly identified a Hirano body and not other cellular components.

51. The Genome of Mouse Strain RF/J Promotes Both FemaleTransmission Ratio Distortion of t Haplotypes and Sex Ratio Distortion

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Chromosome 17 (Chr 17) of the house mouse, *Mus musculus*, is characterized by naturally occurring structural variants known as t haplotypes. One of the hallmarks of t haplotypes is male-specific transmission ratio distortion (TRD) in which t/+ males transmit the t haplotype to as many as 95% of progeny. We have examined progeny of crosses in which the female parent carries a t haplotype opposite a Chr 17 homolog from any one of three defined inbred strains (BALBc, CAST/Ei, or RF). For two of the homologs (BALBc and CAST/Ei), there was neither TRD nor sex ratio distortion (excess of one gender among offspring). However, t/RF females transmitted the t haplotype to 60% of progeny, which is significantly different from 50% ($p = 0.029$). Furthermore, male offspring accounted for 72% of the total, a significant deviation from the expected 50% ($p = 0.0001$). These data provide strong evidence that the RF/J genome houses genetic variants that influence either oocyte development, fertilization, or embryonic development in a manner which favors individuals with the t haplotype or the Y chromosome. Although sex ratio distortion has been documented in mice, female TRD of t haplotypes is a novel observation. We are currently pursuing studies to map the location of genes influencing female TRD and sex ratio distortion in the RF/J genome.
Funding: NSF grant (MCB-0919742) supported this research.

52. Enzyme-Degradable Hydrogel System Modeled by Microparticles

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It is projected that by 2030 67 million Americans will be afflicted by Osteoarthritis (OA), a degenerative disease of articular cartilage in synovial joints. Due to its avascular nature, cartilage has a limited ability to self-repair. We investigated the use of poly(lactic-co-glycolic acid) (PLGA) lipase encapsulated microparticles to model enzyme-degradable poly(ethylene glycol) hydrogels as a scaffold for cartilage cells (chondrocytes) in cartilage tissue engineering. This project is divided into two primary objectives, first, the development, characterization and employment of enzyme sensitive scaffolds for cartilage tissue engineering; we achieved this by determining the appropriate culture conditions for chondrocytes in enzyme-degradable gels by creating and comparing chemically-defined culture medium versus bovine serum medium for culturing chondrocytes. The second objective involved designing a microparticle system to model enzymatic-degradation to further characterize degradation and inform scaffold design. To achieve this we created PLGA lipase-encapsulated microparticles by a solvent evaporation method using a double emulsion, and assessed lipase release from particles. We synthesized lipase-degradable PEG-caprolactone hydrogels of different macromer molecular weights to create systems with different crosslinking densities and mesh size. Degradation was characterized by measuring swelling ratio and compressive modulus over time with exogenous lipase, and future experiments will encapsulate lipase microparticles in PEG-caprolactone gels and similarly assess degradation.

53. Identification of Dominant Bacteria and Determination of Physiological Diversity from Soils Contaminated with Various Motor and Mineral Oils

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Oil spills are becoming more frequently as the demand for oil is rising. Remediating contaminated soils can be labor intensive, expensive and damaging to the environment. Using bioremediation is a cheaper and cost efficient alternative to chemical and mechanical remediation. However, in order to effectively use bioremediation as an alternative method, a more defined oil degrading bacterial communities is needed from the sites affected. The objectives of the study were to identify the dominant bacteria in contaminated soils with motor oils, hydraulic fluids and transmission fluid, also to define the physiological status of the bacterial communities in hydraulic fluid and transmission fluid contaminated soils. A series of soil samples were taken from a known location with hydrocarbon contamination. The samples were enriched with motor and mineral oils for 30 days. After the 30 days the samples were diluted and grown on R2A agar. The bacteria from the agar were also inoculated into BiOLOG Eco-plates. The ecoplates were used to determine a diversity index based on carbons used by the bacterial consortium. The dominate bacteria growing on the media were inoculated on BiOLOG Gen III plates to identify the dominate species for each oil. Hydraulic and transmission fluid showed evidence of bacterial growth and a variety of dominant species were detected and described here. Transmission fluid had the highest diversity index out of all the samples. Transmission fluid and hydraulic fluid have the ability to be biodegraded by bacteria and future work will focus on DNA based analysis of these enrichments. *Funding: Governors State University supported this research.*

54. Effects of Soil Management Practices in Relation to Bacterial Abundance and Diversity

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Agricultural soils can be very diverse in the nutrients they carry along with the bacterial communities they contain. Some studies have suggested soils that have more biodiversity may be able to resist change or arable soil better than those with lower diversity. Management of soil has a profound effect on the bacterial communities within them. In many cases the supplemented elements into these managed soils are nitrogenous compounds. In this study the bacterial communities of three differently managed soils will be tested with BiOLOG Eco-Plates along with total bacterial counts and diversity among them. The three different soil practices include organic, conventional and biosolid all which are located at Governors State University. Samples were taken and then plated on R2A agar to obtain total bacterial counts and bacterial diversity. BiOLOG Eco-plates are also used which helps to determine community level changes in bacteria by using 31 common carbon sources. A Kruskal–Wallis test was performed on the sites and significance was found for both total bacteria and diversity.($p<.05$). A post Dunn test was performed and it revealed the organic plot was significantly high diversity but also significantly lower total bacteria compared to that of the biosolid plot. A PCA test was run to determine similarity between sample sites and dates. Total bacteria was found to be significantly more in biosolid soil compared to organic soil and diversity was significantly more in organic than biosolid. *Funding: Governors State University supported this research.*

55. Acute Serum Amyloid (A-SAA) can be Considered a Chemokine

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Acute serum amyloid A (A-SAA) is a major acute-phase protein with cytokine-like properties that is expressed at sites of inflammation. A-SAA induces migration of immune cells to sites of inflammation. A-SAA plasma levels are 1000 times higher in patients with autoimmune diseases such rheumatoid arthritis (RA). The purpose of this study is to determine if A-SAA could be classified as a chemokine. Cytokines are messenger molecules, while chemokines are a distinct kind of cytokine that direct the migration of white blood cells to diseased or injured tissue. Chemokines induce chemotaxis, the movement of a cell or group of cells that follow a chemical messenger to a new location. A new mathematical approach called the natural vector method was used for analyzing genetic information of all major chemokines and A-SAA. A-SAA was found clustered with two chemokines: CXCL9 and CCL23. The human receptors for these chemokines, hCXCR3 and hCCR1, were subcloned into a mammalian expression vector and were transfected into rat basophil cells (RBL). FACS analysis showed that these cells express these receptors, respectively. To test whether A-SAA uses these receptors, the transfected cells were stimulated with their respective ligands and A-SAA. We found A-SAA can induce phosphorylation of MAPKinase Erk via western blot assay. This data indicated that A-SAA may indeed use hCCR1 or hCXCR3 as its receptor. Next, we want to test whether A-SAA can trigger cell function theory using these receptors. *Funding: This study is supported by NSF grant DMS-1119612 awarded to Rong L He.*

56. Assessment of the Inhibiting Efficacy of Fluoride Based Dental Mouth Rinse on *Staphylococci*

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Dental ailments affect a vast majority of adults. *Streptococcus mutans* was considered the most significant bacteria in cavity production, however recent research indicates an ecological community of bacteria is the cause. Saliva fills many beneficial roles inside the mouth, such as pH neutralizing and transport of protective materials

against plaque biofilms. The Ecological plaque hypothesis implies that since saliva is in close proximity to the dental microflora it will impact the bacterial profile of the teeth. Current research has found *S. aureus*, a common bacteria associated with disease, in the oral microflora of adults and children. The use of the dental mouth rinse has shown the potential to inhibit the presence negative bacteria inside the mouth through various methods, such as varnish adherence or metabolic disruptors. The goal of this study was to test the hypothesis that usage of a Fluoride based Dental mouthwash (particularly Listerine) will effectively inhibit Staphylococci species, specifically *S. aureus*, at various concentrations and time intervals. A saliva sample with *S. aureus* was obtained and verified using BIOLOG GEN III analysis. The inhibiting efficacy of Listerine was accomplished using a disk-diffusion method, as well as a comparison of Listerine effectiveness at various time intervals in a broth medium. Bacterial inhibition generally was observed using the disk-diffusion and Listerine inoculation method with significance based on the Tukey-Kramer Method. As the concentration of Listerine was increased, it's potential for bacterial inhibition increased. Additionally, increased exposure to Listerine increased the potential for bacterial growth inhibition in Tryptic Soy Broth. *Funding: Governors State University supported this research.*

57. The CSU Science Teaching and Learning Laboratory

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Chicago State University has recently renovated two classrooms to promote innovative science pedagogies and provide opportunities for improvements in collecting data for education research. Key components of the room include eight Hitachi Starboards, four observation cameras in the ceiling, tables that foster collaboration and team building, an opportunity to project video feeds to any Starboard, and a floor to ceiling whiteboard space. In this poster we describe these components in detail and describe how faculty in our department are using the room to promote effective teaching and inquiry-based learning. We also present successes and challenges in implementing new instructional materials and discuss what we might do differently in future renovations. These rooms are used both to aid students in understanding the material and also in recruiting new students into the sciences.

58. The Great Phosphorus Mystery of Prairie Wolf Slough Wetland: Water Retention and Phosphorus Concentration

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In this study we measured the hyrdrologic retention time in Prairie Wolf Slough wetland using lithium chloride (LiCl) tracer. LiCl was selected because Li is a conservative element that it is not readily absorbed by plants. Retention time is a measure of the amount of time that water flowing into the wetland before exiting the wetland. The longer the retention time, the more likely that sediment in the water settles out and that plants remove nutrients such as nitrogen and phosphorous. In this study the results were inconclusive due to the lack of rain that was experienced during June and July 2012. Retention time is an important property to consider when developing wetland restoration plans.

59. Enterprise Centralized Management: Adding OSX into a Windows Environment

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Fermi is primarily a physics research facility, where the current focus is the proton accelerator and the discovery of new particles. Currently the Mac ecosystem at Fermi National laboratory consist of approximately 400 machines which are managed individually by there respective owners, though these are lab machines the IT department has little to no control over these machine. To rectify this situation, the engineers at Fermi will be standing up an OSX management server to have these system managed remotely. Once the server is in place and the client is installed, the IT department will be able to view reports on these various systems. Being able to review these reports will decrease user down time and possible prevention with close monitoring. Along with enforcing D.O.E (Department of Energy) policy, software will also be able to be pushed to each individual system when needed, which will reduce the need for a tech to physically visit the machine allowing more time for the techs and engineers to focus on larger scale projects and problems.

- Install and configure management server
- Deploy client software
- Add systems to active directory for multiple user system use
- Observer system reporting data

Funding: Governors State University and Fermi National Accelerator Laboratory supported this research.

60. Exploring Marine Natural Products as Sources of Antifungal Compounds Against Known Fungal Pathogens in the Genus Fusarium

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F Fungi in the genus *Fusarium* are fungal pathogens with representatives that cause infections in immuno-compromised patients, livestock, agricultural crops, marine fish, reptiles and invertebrates. Nosocomial infections in patients after undergoing surgery for cancer, chemotherapy, or bone marrow transplants can be treated with amphotericin B and voriconazole, however the survival rate is low in patients who display adverse reactions to these drugs. Economic losses in agricultural crops are as large as $3 billion. The economic loss in livestock is also estimated be in the millions. The limited availability of antifungal agents highlights a need for alternative antifungal agents. A promising approach to the discovery of new antifungal compounds is to investigate the active components of tropical marine extracts. Crude extracts from marine organisms were screened against a panel of known human and agricultural pathogens including *F. keratoplasticum, 'F. oxysporum', F. solani f.sp. pisi, F. oxysprorum f.sp. lycopersici, F. verticilloides*, and *F. graminearum* (a.k.a. *Gibberella zeae* strain Ph-1). Samples of the marine algae *Udotea looensis, Caulerpa sertulariodes, Dictyospearia cavernosa, Avainvillea elliotti , Neomeris annulata, Ulva lactuca* and the sponge *Chalinuba moliba* were extracted in 1:1 EtOAc:MeOH and partitioned in EtOAc and H2O. Extracts were assayed in a sterile 24-well microtiter plate format and considered active if growth was inhibited by 50%. All of the extracts inhibited the growth of at least four strains of *Fusarium*. In addition, the human pathogens *F. keratoplasticum* and *'F. oxysporum'* were inhibited by all extracts at 100 mg/ml and *U. looensis* at 1 mg/ml.

61. Lead Phytoextraction by Means of Native Prairie Plants

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Heavy metals such as lead (Pb) have been found in dangerously high quantities in the urban areas of the United States. Various methods have been used to remove Pb from the soil, but these methods have proven to be costly and marginally effective, however; the use of plants to remove heavy metals, including Pb, is relatively inexpensive. This study explores the dangers of heavy metal intakein humans. More specifically, this study recommends certain prairie plants as effective remediators of lead, and further explores the potential of using plants which grow naturally in a particular geographic region as Pb remediators. It describes the processes of phytoremediation, and ultimately seeks to contribute data that may be used to create a database of plants which may be used to remove Pb from the urban landscape.

62. Preliminary Phytochemical Investigation of *Cochlospermum angolense* Bark

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The bark of *Chochlospermum angolense* (Family Cochlospermaceae), commonly known as Borututu, is an emerging herbal dietary supplement for improving various liver conditions. The chemistry of borututu bark has not been thoroughly investigated. A phytochemical approach was utilized to prepare a total methanolic extract, fractions of the bark, and to develop an isolation method for three major compounds (CA.44.1,CA.44.2, and CA.52.1) from the ethyl acetate fraction of the total extract. Purity of the isolated compounds was confirmed by TLC and HPLC. Preliminary NMR data for CA.44.1 suggest a carotenoid structure resembling that of cochloxanthin. The yields of the isolated compounds were not enough for further structure elucidation. In the next phase of this project, the developed isolation procedure will be scaled up in order to provide sufficient amounts of isolated compounds for their chemical structures to be unambiguously identified and for further biological investigation.


Acknowledgements

ORAL PRESENTATION LIST AND ABSTRACTS

GROUP A - Dr. Brey WASHINGTON ROOM

63. Defining Exercise Motions Using A Segment-Joint Kinematic Model

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Extensive research in exercise, a subcategory of physical activity, has been conducted with the aim of instructing the individual in the proper techniques when performing specific aerobic and anaerobic forms of exercise. This past research, however, does not answer the basic question of how to specify an exercise motion mathematically. This paper presents a new approach to defining specific exercise motions by using a segment-joint model of the human body. This model makes the use of forward and inverse kinematic equations used in robotics and visually represents various exercise motions rendered using a 3-D virtual reality human manikin. A validation of this model is provided by presenting an example of a typical exercise motion utilizing the proposed segment-joint model approach. This segment-joint model will be able to differentiate between specific exercise motions and can form the basis of systematic approaches to the design of exercise equipment. *Grant H133E070029 from the National Institute on Disability and Rehabilitation Research (NIDRR).*

64. Elucidation of Fast Axonal Transport in Neurons by Using a Novel Compartmentalized Cell Culture Chamber

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Of all of the cell types in an organism, neurons exhibit the greatest dependence on intracellular transport of proteins and membrane-bounded organelles (MBO). Axons, unlike dendrites and cell bodies, lack machinery for protein synthesis, and consequently essential molecules and organelles must be transported from the cell body into axons throughout life for proper neuronal function and survival; a process known as fast axonal trasport (FAT). A growing body of scientific evidence has shown that dysregulation of FAT is sufficient to trigger an adult-onset distal axonopathy and synaptic disconnection leading to neurological disorders including Alzheimer's disease (AD), Kennedy's disease, Huntington's disease, and Parkinson's disease. Neurotransmitter-packed synaptic vesicle are vital nanometer-sized (~40 nm) MBOs involved in intracellular communication. In neurons, these vesicles are trafficked from the cell body to pre-synaptic axon terminals where they release neurotransmitters enabling cell-to-cell communication. Unfortunately, the lack of culture systems optimized for manipulation and observation of synaptic vesicle mobility in isolated axons has limited relevant investigations. On the other hand, traditionally, investigators have used slow speed imaging to report a variety of exogenous fluorescently-labeled organelles as synaptic vesicle, regardless of their size, mobility fashion and transport rate. [This study has been supported, in part, by a Chancellor's Graduate Research Fellowship to Hector Hugo Caicedo, Ph.D student and by a grant from the CBC (Chicago Biomedical Consortium) to Dr. Scott Brady, Ph.D, Professor and Head, Department of Anatomy and Cell Biology, University of Illinois at Chicago, Chicago, IL].

65. Water Filtration for Global Usage at an Individual Level

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A variety of crises' annually threatens the environment and result in compromise of water supplies worldwide. The immediate response by most countries is to ship bottles of water, which provides a quick but inefficient fix to a very serious problem. Plastic bottles take a lot of fossil fuels that pollute the environment. The resources that are necessary to create a water bottle consumes 50 million barrels of oil annually. In fact, Americans buy more bottled water than any other nation in the world, contributing 29 billion water bottles a year to the problem. Although products which help filter virtually any liquid into clean water have been developed, the associated costs are often prohibitive for sustained periods or large scale crises. This may eventually result in outbreaks of disease such as the cholera epidemic now devastating Haiti do to contaminated water supply. Project Purity is the task of creating a water bottle which would be able to purify a large amount of water over an extended time frame, while remaining affordable for crisis victims and the relief associations that seek to help them. Our product has the potential to bring a new avenue of affordable water filtration to the general public. More importantly, we hope to broaden development of this project to influence the lives of residents of distraught areas and impoverished countries. We believe that this can be accomplished by researching and testing the processes necessary to fully implement a Water Filtration Access project. As shortages of basic necessities are often more appropriately recognized as symptoms of deeper social disintegration, we believe that our interest in this aspect of service will ultimately lead to involvement in addressing other social problems.

66. Enzyme-Degradable Hydrogel System Modeled by Microparticles

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It is projected that by 2030 67 million Americans will be afflicted by Osteoarthritis (OA), a degenerative disease of articular cartilage in synovial joints. Due to its avascular nature, cartilage has a limited ability to self-repair. We investigated the use of poly(lactic-co-glycolic acid) (PLGA) lipase encapsulated microparticles to model enzyme-degradable poly(ethylene glycol) hydrogels as a scaffold for cartilage cells (chondrocytes) in cartilage tissue engineering. This project is divided into two primary objectives, first, the development, characterization and employment of enzyme sensitive scaffolds for cartilage tissue engineering; we achieved this by determining the appropriate culture conditions for chondrocytes in enzyme-degradable gels by creating and comparing chemically-defined culture medium versus bovine serum medium for culturing chondrocytes. The second objective involved designing a microparticle system to model enzymatic-degradation to further characterize degradation and inform scaffold design. To achieve this we created PLGA lipase-encapsulated microparticles by a solvent evaporation method using a double emulsion, and assessed lipase release from particles. We synthesized lipase-degradable PEG-caprolactone hydrogels of different macromer molecular weights to create systems with different crosslinking densities and mesh size. Degradation was characterized by measuring swelling ratio and compressive modulus over time with exogenous lipase, and future experiments will encapsulate lipase microparticles in PEG-caprolactone gels and similarly assess degradation.

GROUP B - Dr. Park KRUPA ROOM

67. Lead Phytoextraction by Means of Native Prairie Plants

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Heavy metals such as lead (Pb) have been found in dangerously high quantities in the urban areas of the United States. Various methods have been used to remove Pb from the soil, but these methods have proven to be costly and marginally effective, however; The use of plants to remove heavy metals, including Pb, is relatively inexpensive. This study explores the dangers of heavy metal intake in humans. More specifically, this study recommends certain prairie plants as effective remediators of lead, and further explores the potential of using plants which grow naturally in a particular geographic region as Pb remediators. It describes the processes of phytoremediation, and ultimately seeks to contribute data that may be used to create a database of plants which may be used to remove Pb from the urban landscape.

68. The Effect of Gibberellic Acid on Plant Growth

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Gibberellic acid (GA-3), a derivative of gibberellins, has often been used in botany to observe its effects in plant growth and seed germination. Gibberellic acid is known to enhance stem elongation, promote and induce flowering in angiosperms, and stimulate germination in dormant seeds. In the experimentation of our study, five specific types of plant seeds were used: Tagetes patula, Echinacea moench, Lupinus, Ocimum basilicum, and Asclepias tuberosa. The experimental and control groups each consisted of twenty-five plant pots. A total of fifty plant pots were filled with extracted soil from Chicago State University's Prairie Garden; twenty-five pots of soil were manipulated with gibberellic acid. The remaining twenty-five pots of soil represented the control group. The control and experimental groups were each divided into five studies: Tagetes patula (Rusty-red Marigold), Echinacea moench (Purple Coneflower), Lupinus (Assorted Lupine), Ocimum basilicum (Sweet Basil), and Asclepias tuberosa (Butterfly Weed). The plants were measured for height and hydrated daily over a two-week period for both experimental and control groups. The data collection proves that gibberellic acid promotes growth in the prairie plant seeds by a height difference from the control group. The prairie plants exposed to the hormone gibberellic acid (GA-3) exhibited positive linear growth. These results indicate that the application of gibberellic acid can be beneficial in restoring and revitalizing all prairie gardens.

69. The DnaJ Co-Chaperone Protein and its Influence on Symbiotic Biofilm Formation in Vibrio fischeri

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The Gram-negative bacterium, Vibrio fischeri, specifically colonizes its host, the Hawaiian bobtail squid, Euprymna scolopes. The symbiotic relationship that develops between the animal and microbe involves selective and complex interactions that must occur with each new generation. The Vibrio-squid association is used as a natural model system to demonstrate the initiation and persistence of beneficial and pathogenic animal-microbe interactions. One of the initiation steps required for the bacterium to colonize its host is regulated by the RscS-

SypG system. These regulators turn on the syp gene locus, and have been shown to be required for biofilm formation. A biofilm is an organized cluster of substrate-attached bacterial cells that have encased themselves in a protective polysaccharide matrix. When rscS is not present, the formation of an exopolysaccharide is abolished and colonization success rates decrease. A mediator protein, DnaJ, is known to act as part of a chaperone system and influence biofilm formation, colonization and heat shock resistance/repair phenotypes. In vitro and in vivo assays provided evidence toward the importance of both the DnaJ protein and RscS response regulator in this model system in order for biofilm production and a successful association between V. fischeri and E. scolopes to occur. By uncovering the mechanisms of biofilm formation in an intact, live animal system, we will better understand beneficial host-microbe interactions.

GROUP C - Dr. Mahesh GOODMAN ROOM

70. A Growth Comparison of Prairie Wild Bergamot using macro-minerals Nitrogen, Phosphorus and Potassium (NPK) Under Greenhouse Conditions

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The purpose of this study is to determine the effects of fertilizer enriched with Nitrogen (N), Potassium (K), and Phosphors (P) on the wild bergamot prairie plant and soil. This study will examine the effect of commercial fertilizer on modern day farming. This study will examine the effect of wild bergamot in a natural environment vs. a greenhouse environment with the addition of Nitrogen (N), Potassium (K) and Phosphorus (P). Twenty wild bergamot prairie plants were removed from the field; ten were taken from the high end hill part of the area and ten were taken from the low end of the prairie field. The twenty that were taken from the field were planted with the soil and potted into 5 inch plant pots. These plants were then treated with four types of fertilizer. Two plants each received only one of the fertilizers according to the color tag by which it was coded. The first set of plants was treated with Bayer Advanced, the second set was treated with Hi-yield fertilizer, the third set was treated with Miracle Gro and the fourth set was treated with Blooming and Rooting. Four plants served as an indoor control group and were only given water and no fertilizer.

71. Nature and Nurture: How Heredity and Environment Affect Transcriptomic Brain Differences in Apis mellifera Sub-species

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Apis mellifera is the most regarded social insect. The western honey bee is studied primarily because of its impact on global agriculture however its impact as a social insect might implicate its neuronal plastic transitions during behavioral roles. In this study, we analyze how environmental conditions might alter gene expression, or transcriptomes, in order to understand the biological, cellular, and molecular events of the honey bee guard behavior and physiology. Our method applies gene ontology to understand the functions and processes of each gene product that is expressed. We particularly analyze the transcriptomes of brain tissue in guard bees to compare how different environmental conditions, or colony hives, drive neuronal plasticity and physiology for the honey bee. We investigate particular experimental comparisons subsidiary to the scope of our research that explores how heredity and environment affect gene expression. Since one behavioral phenotype has already been

demonstrated to be regulated by the environment (aggression), we expect to see other significant gene expression differences under different environmental conditions. We conclude three significant gene expression differences that demonstrate both genotype and environmental dependency in *Apis mellifera* subspecies.

72. Variation of Intra-Population and Inter-Population Cattail Plant Species from a Broad Geographic Range using Microsatellite Markers

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Cattail plants (Typha spp.) are commonly found in wetlands throughout North America. T. latifolia is considered native and T. angustifolia is considered exotic. Their hybrid, T. x glauca, is the most invasive of the cattail species. Both T. angustifolia and T. x glauca alter wetlands' ecosystem function and biodiversity. Due to their hybridization, identification based on morphological traits is no longer reliable since there is a high overlap of these physical traits among the three species. Molecular techniques are a more promising way of identifying the different species. We have successfully identified four diagnostic microsatellite primer pairs and tested their variability within populations of each species in the Chicago region. We assess inter-population variability of microsatellite markers by collecting samples from a variety of geographic locations (Illinois, Iowa, Minnesota, South Dakota, and Wisconsin). At each field site, we used morphological characters to identify the Typha species and collected leaf tissue from at least five individuals. DNA was extracted with a Qiagen DNeasy® Plant Mini Kit and the four diagnostic microsatellite primer pairs were amplified with Polymerase Chain Reaction (PCR). Results obtained were visualized in a Beckman Coulter gene sequencer and analyzed in order to determine inter-population variability. The microsatellite markers were able to discriminate among the three cattail species and successfully detected advanced-generation hybrids. The observed level of discrepancy with our morphological identification suggests that the molecular markers are a more robust identification method. These genetic markers are essential for prevention and control of invasive species of cattail.

GROUP D - Dr. Renzaglia — ARMSTRONG ROOM

73. Lifespan and Survival of Mutant Mouse Strain BxR23 and a Bioinformatics Investigation of BxR23 Modifying Genes

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To date, there are many inherited human neurological disorders for which the cause is unknown. Hereditary forms of neurological disorders are often characterized by neurodegeneration of the brainstem and cerebellum; accompanied by ataxia as a symptom. Individuals afflicted with ataxia experience a progressive loss of muscle control, balance and coordination, and disturbance of gait. A spontaneous, autosomal dominant mouse mutation has been discovered in our lab. The mutant strain is called BxR23 and has been further characterized as a spinocerebellar ataxia (SCA). The phenotype is similar to human cases of ataxia with variations in penetrance. Additionally, homozygous BxR23 mice seem to exhibit an increased mortality rate. The purpose of this study is to statistically examine the lifespan (in days) and survival of homozygous BxR23 mice in comparison to strains C57BL10/J and RF/J, from which BxR23 was derived. Analyses include error bar graphs, the Levene's test of equal variance, a One-Way ANOVA, Tamhane's T2 post hoc test, a survival analysis, and a power analysis. Additionally, a bioinformatics approach is being pursued in an effort to identify genes that modify the ataxia phenotype in BxR23 via interactions with candidate genes beta 1 Galactosidase, (Glb1), the light intermediate chain Dynein subunit (Dync1li) and Transforming growth factor, beta receptor II (Tgfbr2). Funding: NIH/NIGMS SO6 GM008043 and a CSU CTRE SEED grant supported this work.

74. Isolation and Analysis of RmtATP6 Promoter

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Plants deal with different biotic (such as fungi and virus) and abiotic (such as drought and salinity) stresses by regulation of multiple genes in each stress. Salinity is one of the most important abiotic stresses in agricultural fields. One of the critical factors in soil salinity is irrigation and inappropriate drain piping systems. *RmtATP6* gene, produces a protein which exist in F_0 subunit of F_1-F_0 mitochondrial ATP synthase in rice (*Oryza sativa*) which involves in stress tolerance. Environmental signals can control different transcription factors (TFs) and gene functions via different signal transduction pathways. In this regard, along with the increase of ABA in ionic stress, the use of ATP in the cell increases too, therefore, gene such as *ATP6* that has ABA responsive elements would be induced. Despite the key function of non-coding regions in gene regulation and existence of Transcription Factor Binding Sites (TFBS), that are responsive to environmental stresses, on the promoter of this gene, in this study we tried to identify and isolate the promoter of *RMtATP6*. Also we illustrated that promoter is a variable region in the genome that varies in different cultivars of one specie. Also our bioinformatics and laboratory researches shows that this region is an inducible promoter and contains regulatory elements like ABRE, MYC, and MYB, this promoter can be used to control gene expression in further researches.

75. Ultrastucture and Immunolocalization of Pectin in Stomata of the Moss *Oedipodium*

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Stomata are plants structures that consist of a pore surrounded by two guard cells. Mosses are the first plants to evolve stomata, yet little is understood about the biology of stomata in mosses. Unlike in derived plants where stomata occur on leaves, stomata in mosses are restricted to the capsule of the sporophyte. Among mosses, *Oedipodium* has the most extensive capsular region on which stomata occur. I examined the ultrastructure of stomata and associated sporophyte anatomy of *Oedipodium* to gain insight into the function and evolution of these structures. Plant tissues were examined with light and transmission electron microscopy (TEM), including localization of an unesterified homogalacturonan pectin epitope using the monoclonal antibody LM19. Where stomata are located, the capsule consists of spongy tissue with substomatal cavities, supporting a gas exchange function. Wall thickenings of guard cells resemble those in vascular plants with the exception of the midsection of the cells, supporting a passive closing mechanism where drying guard cells touch in the middle of the pore. LM19 epitopes localize in fibrillar layers of all cell walls, in the junction between cells, and in outer walls intruding through the cuticle. Pectin composition of guard cell walls influences the ability of stomata to open and close in vascular plants. My study demonstrates that pectin localization in moss stomata walls differs from flowering plants. Unraveling the composition and structure of guard cell walls in mosses is a key element in understanding the evolution of stomata in plants. *Funding: NSF/DGE Grant 0638722 supported this research.*

76. Immunolocalizations of Arabinogalactan Proteins During Spermatogenesis in *Ceratopteris richardii*

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The spatial and temporal distribution of arabinogalactan proteins (AGPs) during spermatogenesis was investigated in the model fern, *Ceratopteris richardii*. In order to determine the presence of AGPs in sperm cells, male gametophytes were treated with Yariv phenylglycosides (ßGlcY), colormetric histochemical probes that specifically bind to AGPs. Sperm cells stained intensely with Yariv (ßGlcY) and clearly demonstrated the presence of AGPs during spermatogenesis. To characterize AGP epitopes present in sperm cells during their development, immunogold localizations were conducted with monoclonal antibodies *JIM13* and *JIM8*, epitopes considered to be reproductive AGPs in seed plants. Initially, *JIM13* epitopes localize at the sperm cell plasma membrane. As the locomotory apparatus is forming and the nucleus becomes a cylindrical coil, elimination of excess cytoplasm occurs and an extracellular matrix (ECM) forms between the sperm cell plasmalemma and cell wall. From this stage of development and onwards, both *JIM13* and *JIM8* epitopes are strongly expressed in the ECM of sperm cells. AGPs could play a critical role in sexual reproduction in ferns due to their specific presence in spermatogenesis cells. The results of these studies are compatible with those obtained from similar immunolocalization studies conducted on seed plants and point to a likely role for AGPs during sexual reproduction in seed-free plants. *Funding: NSF/DGE Grant 0638722 supported this research.*

GROUP E - Dr. Hunter — ELLINGTON ROOM

77. Comparison of Parthenolide Levels in Aquaponically vs. Conventionally Grown Tanacetum Parthenium (FEVERFEW)

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Aquaponics is a bio-integrated system linking recirculating aquaculture with hydroponic vegetable, flower, or herb production, eliminating the need for soil. With the increasing problem of limited access to quality nutrition in low income areas in inner city neighborhoods, the development of residential herbal dietary supplement agriculture may be of great benefit. Home production of herbal plants can be challenging due to limited agricultural land, cost, and inadequate space in small living accommodations. An in-home aquaponics system can be a su itable means of producing herbal products that may prove beneficial for patients suffering from nutritional deficiencies to help enhance their general health and/or quality of life. The aim of this project was (1) to design an aquaponics system that allows for minimization of space and (2) to determine if planted *Tanacetum parthenium* (feverfew) grown in an aquaponic system produces similar or increased parthenolide concentrations compared to traditionally grown soil controls. The self-sustaining system uses the waste products of the common goldfish (Carassius auratus auratus). Water is pumped from the 30 gallon tank to the plants using a drip irrigation system and then filtered through pea gravel before being returned to the tank. *T. parthenium* grown in the aquaponics system had significantly higher concentration of parthenolide at days 14 and 30 ($p = 0.01$, $p = 0.04$, respectively) and almost equal concentration at day 69 compared to the plants grown in soil. The results of this study demonstrate that feverfew can be grown in a small aquaponics system suitable for in-home use.

78. Alteration of the Antigen Binding Site of IgG Antibodies for Conformational FRET Studies

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The antigen binding regions (Fab fragments) of immunoglobulin G (IgG) antibodies are of interest due to their interactions with the epitopes of antigens and subsequent effector functions. Analysis of the flexibility of the Fab fragments provides information on the conformations of the antibody. This analysis can determine the possibility of certain conformations enhancing the ability to bind to antigen and other immune system molecules. The flexibility of the antigen binding regions of IgG antibodies can be studied via single molecule Förster resonance energy transfer (FRET). To do so, ligation reactions between IgG light chain and heavy chain plasmids with variable light and variable heavy chain regions from a single-chain variable fragment (scFv) plasmid were attempted. This will produce an antibody with an antigen binding site which contains a reactive lysine residue that allows for the attachment of a fluorescent dye molecule. This antibody can also be labeled with a dye molecule in the crystallizable fragment (Fc) region, allowing FRET analysis between the antigen binding site and Fc region of the IgG antibody to be conducted. Successful ligation and transformation reactions have been completed for the heavy chain plasmid only. Upon completing the light chain plasmid, the resulting light and heavy chain plasmids will be sent for protein production to create an antibody that can be labeled with fluorescent dye molecules for FRET studies.

79. GLI2 Modulates CD40L Expression in Stromal Cells

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Recent studies have established a role for the tumor microenvironment (TME) in tumor growth. Our lab has shown that the cytokine CCL5 can increase secretion of IL-6 via GLI2 transcription factor in the TME, highlighting a novel role for GLI2 in modulating cytokines. We hypothesized that GLI2 could regulate cytokines in the TME. Using stromal cells, we screened for cytokines that are differentially expressed in response to GLI2 by quantitative PCR and identified several cytokines that are increased including CCL2, CCL7 and CD40L. Using end-point PCR, we confirmed that overexpression of GLI2 increased CD40L expression in HS-5 and Saka stromal cells. GLI2 knockdown, using RNAi, resulted in a reduction of CD40L expression, suggesting GLI2 is required for CD40L expression. GLI2 protein contains an inhibitory domain near the N-terminus. Transfection of stromal cells with a GLI2 construct that lacks this inhibitory domain (GLI2 ΔN) resulted in increased CD40L expression beyond that of full-length GLI2. CD40L is expressed in a membrane bound and soluble forms. Enzyme-linked immunosorbent assay (ELISA) analysis showed that overexpression of GLI2 ΔN resulted in increased secretion of sCD40L. Bioinformatics analysis of the CD40L promoter identified 3 putative GLI binding sites. Future studies will investigate a direct interaction between GLI2 and CD40L promoter and determine the role of GLI2 in the expression of CD40L protein. CD40L has been shown to increase proliferation of malignant B-cells. Therefore, understanding the mechanism of regulation of CD40L in the TME may provide a novel therapeutic strategy for cancer patients. *Funding: Start-up funding provided to Dr. Sherine Elsawa (from the department of biological sciences and the college of liberal arts and sciences) and a Research and Artistry grant to Dr. Elsawa from the NIU foundation.*

80. A Cosmic Ray Muon Tracker with Applications in Astronomy and Archeology

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This project is dedicated to the development and construction of detector hardware, associated electronics, and data analysis tools to support an ongoing effort to measure cosmic ray events as part of a network of detectors based on the QuarkNet program. A large array of this type enables the study of high-energy cosmic rays through the detection of "showers," several kilometers in radius. These are the highest-energy particles ever observed in nature and thus of current interest in the astrophysics and particle-physics community. We propose to use a network of trackers (that will measure the direction of the muon showers) to increase the probability to detect high energy cosmic ray events. In addition, cosmic ray trackers can also be used for other interesting applications: In 1970 a technique is based on measuring the absorption of cosmic-rays using a tracker detector was used to search for chambers inside an Egyptian pyramid. Los Alamos National Lab is studying the same technique to detect nuclear contraband. In this talk we delineate the general characteristics of the proposed tracker detectors and its applications. We will present the studies leading to the design parameters of the tracker such as the geometry (size of scintillators) and performance of the electronics. We have investigated the dependence of the quality of the signal as a function of the place where the muon hits the detector, and we have studied this effect when we carry out the signal from the scintillator with an embedded optical fiber.

81. Theoretical and Experimental Studies of the Interaction between Nano-Silver and Model HepG2

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Silver nanoparticles are emerging and one of the fastest growing nanomaterials with wide range of applications. The growth in the usage of silver nanoparticles is often attributed to its anti-microbial properties. Despite the growing applications of this material, information about its toxicity is still lacking. The lack of rigorous toxicity studies of nano-silver makes them prone to catastrophic failure in their potentially important applications. As such, we performed DFT and TDDFT calculations to determine interactions between silver nanoparticles and human hepatocellular carcinoma (HepG2) by studying the binding properties between nano-silver models and model HepG2. In addition, HepG2 cells (HB-8065) purchased from ATCC is being cultured and soon be tested for exposure to nano-silver of different sizes to determine the effect in vivo.

82. Drosophila Jet Lag

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Shifts in the circadian rhythm of mammals and insects have been observed to occur during spatial dislocations involving significant time zone changes. Following such dislocations, the system of proteins that comprise the circadian clock move the body toward a new stable waking/sleeping equilibrium consistent with the altered environment.

Using a recently developed model developed by Fathallah-Shaykh, Bona and Kadner that we believe captures the full Drosophila's (fruit fly's) circadian clock, we report predictions of how the Drosophila adjusts its waking/sleeping rhythm to both instantaneous and more gradual time-zone shifts.

ILLINOIS LSAMP OVERVIEW

The Illinois Louis Stokes Alliance for Minority Participation (Illinois LSAMP) program was established in 1993 and is funded by the National Science Foundation (NSF). Illinois LSAMP is one of a number of consortia of colleges and universities in the United States and Puerto Rico with the goal of significantly increasing the number of undergraduate and graduate degrees awarded to underrepresented populations in Science, Technology, Engineering and Mathematics (STEM).

Illinois LSAMP consists of nine (9) universities, five (5) regional community colleges, and one (1) government laboratory. Together this group participates in a collaborative effort to provide programs that improve the quality of STEM education for students. Each of these organizations has made a commitment of faculty, staff, research facilities and technical assistance to ensure successful opportunities for students participating in Illinois LSAMP programs. NSF has established five Illinois LSAMP "Bridge to the Doctorate" programs. Two of these programs are located at Southern Illinois University at Carbondale and the other three are located at the University of Illinois at Chicago.

Illinois LSAMP activities are comprehensive and multidisciplinary, focused specifically on STEM education. Great effort is expended to address transition points in a student's academic career and to provide intervention at junctures crucial to preventing withdrawal from the STEM pipeline. Consequently, critical transition points along the STEM education pipeline; high school-to-college, 2-year to 4-year college, undergraduate study, and graduate study-to-careers, are addressed in various and innovative ways.

The efforts include: Hands-on Research Opportunities, Scholarship Programs, Science Conferences, Facilitated Study Group Sessions, Professional Development, Peer Mentoring Activities, Summer Bridge Programs, Tutoring Programs, Internships and Graduate Activities.

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CENTER FOR STEM EDUCATION & RESEARCH OVERVIEW

The Center for STEM Education & Research (CSER) was established in 2011 and is funded by the U.S. Department of Education (DoED). The purpose of the CSER is to connect existing Science, Technology, Engineering & Mathematics (STEM) programs, align them with the various STEM disciplines at Chicago State University (CSU), and provide support to student-faculty research collaborations as well as grant-funded research projects and programs, and to help research faculty to better prepare students for STEM challenges of the future.

The goals of this Center are to:

- Increase America's Talent Pool by Improving STEM Education for Students in Grades 6-12,
- Enhance Student Awareness of and Motivation for STEM Education and Careers through Improved Information, Mentoring and Outreach, and
- Provide Resources and Professional Development to Boost Faculty Research and Proposal Writing Productivity.

Establishing links between the STEM grade 6-12 activities, training and research grants, Centers, faculty and students at CSU is a central component of the CSER. To accomplish these goals, the CSER concentrates its efforts on four specific areas to promote STEM advancement at CSU:

- **Environment:** Provide positive surrounding influences that encourage and promote STEM learning.
- **Experiences:** Foster the acquisition of knowledge and skills by engaging CSU students in STEM K-12 and undergraduate research activities.
- **Evaluation:** Promote continual assessment and evaluation using rigorous formative and summative research methods and design.
- **Exposure:** Disseminate information and introduce students to new STEM events and activities such international fields trips, conferences & speakers.

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