Letter from the chair  Welcome to the third edition of the Chemistry and Physics newsletter. I warmly encourage you to read through this newsletter which documents the incredible success of the undergraduate students and faculty in the Department of Chemistry and Physics. From offering the first pre-engineering class and graduating the first pre-engineering student, to having chemistry and physics majors enrolling in graduate school, to pursuing ACS accreditation, our department has come a long way. Our student and faculty participation in local, regional, and national research conferences is particularly noteworthy. We have also been the proud recipient of a NSF grant which has allowed the purchase of a computer cluster for computational physics. Kudos to the students and faculty who have helped to achieve these proud goals. I am sure our department will continue this growth in the coming years.

Students who want to study engineering can now begin their pre-engineering degree program at Augusta State. ENGR 2020, ASU’s first engineering course, is part of the university’s new Pre-Engineering program. This program focuses on the study of statics, which is the ability to objectively evaluate and analyze non-moving structures. Dr. Brent Gutierrez, instructor in ASU’s Department of Chemistry and Physics, has been teaching this course, and he says “To be able to offer an engineering degree in the CSRA is a milestone for our university. This is a great way for students to stay close to home, and receive their initial engineering education at ASU.” Since the introduction of the Pre-Engineering program, Dr. J. Andrew Hauger, chair of ASU’s Department of Chemistry and Physics, says the institution has received positive feedback from potential students. “We already have a number of students in the program, and we are expecting more to enter each semester,” says Dr. Hauger.

All mathematics and science courses required for the pre-engineering degree program are offered at ASU. Engineering fields available through Georgia Tech-Savannah include civil and environmental engineering, electrical and computer engineering, and mechanical engineering.

The National Science Foundation (NSF) Division of Materials Research awarded assistant professors Trinanjan Datta and Christian Poppeliers funding ($126,000) for a 16-node parallel computer cluster. A parallel computer cluster is a piece of equipment that carries out various calculations simultaneously. This equipment will allow ASU to become the computation center in the CSRA when it comes to parallel computations. The grant from NSF provides cutting-edge computing resources for materials science research, geophysics research, and other interdisciplinary projects underway in the Department of Chemistry and Physics. At present the cluster is being used to perform large scale simulations of magnetic materials and seismic wave propagation using wavelet transformation. Undergraduate students at the Department of Chemistry and Physics will greatly benefit from the presence of such novel equipment.

Department Undergoes External Review: The Department of Chemistry and Physics completed an external program review through the Council on Undergraduate Research (CUR) in April 2010. The review included an extensive self-study and was highlighted by the review team site visit which included meetings with department faculty, staff and students. A final report detailing the current state of the department and some suggestions for improvement will be available this summer. CUR is a national organization representing over 900 colleges and universities. Their mission is to support and promote high-quality undergraduate student-faculty collaborative research and scholarship.

The department is also seeking American Chemical Society (ACS) accreditation for its chemistry program. This accreditation will require an extensive study of the chemistry program and a detailed application to ACS. Students graduating from ACS accredited programs are viewed favorably for admission to graduate and professional programs. Currently, over 600 chemistry programs in the US are accredited by the ACS.
Student Honors and Recognition

Craig Atkins (above left), Neil Jenkins (center), and Lindsay Hilkert (right) each received a “top presentation” award at the Phi Kappa Phi Student Research Conference which was held on campus in March. Craig’s presentation was on the “Synthesis of Analogues of Dapsone as Potential DNA Binding Agents,” Neil’s was on the “Synthesis and Fluorination of Various 1,3,5-Triarylpyrazoles” and Lindsay’s was on “The Synthesis of a Cyclopentyl Derivative of an Antiprotozoal Reverse Diamidine”. In addition to these three students, many others presented their research at this year’s PKP conference (see page 4).

At the Student Honors Convocation, also in March, Lindsay Hilkert won the Richard T. Mixon award, which goes to the top all-around chemistry major, while Craig Atkins won the John W. Pearce award for outstanding performance in Organic Chemistry.

Also, Phillip Wilkerson (right) won the Best Undergraduate Research in Chemistry award. Phillip has presented at the PKP Student Research Conference each of the past two years, and gave two different presentations (one oral and one poster) at the SERMACS meeting in Puerto Rico this past fall.

Two departmental scholarships were also awarded for next year. The Mixon Scholarship went to James Wilson and the Dinwiddie Scholarship went to Karis Smith. Congratulations to all of these students!

Students Present Research in Puerto Rico

Chemistry majors Van Beaty, Neil Jenkins and Phillip Wilkerson, along with Dr. Stephens, attended the 61st annual Southeast Regional Meeting of the American Chemical Society (SERMACS) in San Juan, Puerto Rico in October to give presentations about their research. One of the many highlights of the trip was when the group met Professor Roald Hoffmann, a recipient of the Nobel Prize for Chemistry in 1981 (photo to right). Lunch on the beach was also a nice treat! Thanks to the Pamplin College of Arts and Sciences, the ASU Foundation, and the local section of the American Chemical Society (ACS) for partial funding of this trip!

Chemistry Club Activities

The Chemistry Club had a busy year with several cookouts and events. The annual year-kickoff cookout was a lot of fun for the many folks who came and enjoyed burgers and brats at Dr. Colbert’s house. For the annual community service project, club members judged science fairs at Tutt Middle School and Horsby EAMS. Also, club members went the extra mile and responded to South Columbia Middle School’s request for a “magic show,” Harry Potter style. With short notice and fun demos, the show was a hit.

The club’s biggest event, however was the second annual Tour de Chem in December. The Tour helps get middle-school aged kids get excited about chemistry before they hit the rigors of full-fledged high school chemistry. A group of kids from St. Mary’s Catholic School toured the chemistry wing of the science building. Amongst other fun demos, they got hands-on fun making their own bouncy balls, watched as burning metals emitted brilliant colors, and screamed as an improvised explosive reached its activation energy with a simple tap of a yardstick. Thanks to all who helped make the Tour a huge success!

Freshman Seminar Course

This past fall marked the first time the Chemistry Freshman Seminar course (CHEM 1000) has been offered. The course, taught by Dr. Zuckerman, was created to introduce freshmen to the many facets of being a chemistry major. The “class photo” is shown here.

‘Advanced Organic’ Poster Presentations

During the last week of spring semester, students in Dr. Crute’s Advanced Organic (CHEM 3810) class once again gave poster presentations about topics of interest from the current literature. This annual event is a great chance for students to practice their presentation skills, and for us to learn about new developments in organic chemistry. Below, Sean Singletary (left) and Lauren Lynam (right) discuss their posters.
Graduate school bound!

Rebecca Sawyer presenting her poster at Phi-Kappa-Phi

My experience at ASU has been educational, exciting, and a lot of work. I have been a student of the Chemistry and Physics department for the past four years, and throughout those years I have gained experience in lab assisting, tutoring, and research. My professors that I had within those four years have taught me not just Physics, but professionalism, and have shown me possibilities for my future. Through the Physics department I found my love of research, which has opened the door to graduate school for me. I will attend graduate school at University of Memphis in the fall, where I will work as a Research Assistant for CERI (Center for Earthquake Research and Information) and receive a masters in Geophysics. I would not be where I am today without the wonderful mentors I had throughout the past four years at ASU. If I could give advice to upcoming students it would be to get involved with your department. However, for future Physics students I would say, physics is not easy and one would need to stick with physics and put your all into your classes, and also to get involved with research. Research is very important and a great experience if one plans to continue on their education in Physics after undergraduate education. Physics is a lot of work but there are teachers and students that are willing to help upcoming students, you just need to ask for help. One last piece of advice, work lots of practice problems, because practice makes perfect!

Graduating senior William D. Baez, a senior physics major received the department’s 2010 “Best Undergraduate Research in Physics” and “American Nuclear Society’s Outstanding Physics Major” award.

Chris Parham won an award at the 2010 Georgia Academy of Science: Best student talk of the Earth and Environmental Sciences section. His research using a magnetometer, found there is no evidence to support a large-scale intrusive event beneath Dagger Mountain. This means Dagger Mountain (the field area) was likely formed by the regional tectonic forces of the Laramide Orogeny. Therefore, Dagger mountain was likely formed approximately 35 million years ago.

Chris Wright (BS Sp 09) attended the IMACS World Congress on Computational and Applied Mathematics & Applications in Science and Engineering Conference in Athens, GA where his research "On the Benefits of Non Uniform Gradient Prescription in DTI" was presented. DTI is a technique which provides information on the orientation of nerve fibers in magnetic resonance images. Chris was able to demonstrate through simulation that higher quality imaging is obtained when a non-uniform set of magnetic field gradients was used.

Physics Club

This past academic year the Physics Club has been responsible for organizing a variety of activities ranging from Easter and Thanksgiving food drives to chalk talks. The food drives raised 361 lbs of food. Chalk talks were presented by Philip Javernick, Jeramy Barry, and Dr. Eric Zuckerman. Philip discussed his research on chaos and phase synchronization and Jeramy on the transfer matrix method. Dr. Zuckerman decided to give a glimpse into his PhD thesis on the multi-channel quantum defect theory. The physics club also came out with a new T-shirt, designed by their newly elected president Billy Baez.

FACULTY RESEARCH PUBLICATIONS/PRESENTATIONS

Dr. Christian Poppeliers published his research titled "Seismic wave gradiometry using the wavelet transform: application to the analysis of complex surface waves recorded at the Glendora array, Sullivan, IN, USA" in the Bulletin of the Seismological Society of America. Dr. Poppeliers was also invited for a colloquium talk at the University of Memphis Center for Earthquake Research and Information. The title of the talk was 'Seismic Wave Gradiometry using the multiwavelet transform: Applications and issues". In addition he also gave a couple of talks on seismology at the 2010 Seismological society of America.

Dr. Trinanjan Datta published his research work on frustrated magnets titled "Non-linear spin wave theory in BCC magnets" in the Journal of Physics Condensed Matter. He presented his research work on frustrated magnets at the 2010 American Physical Society March Meeting in Portland, OR. Dr. Datta was also one of seven theoretical physicists in the U.S. to be named a Kavli Institute for Theoretical Physics (KITP) Scholar at the University of California, Santa Barbara. He also presented his research on the kinetic Ising model, done in collaboration with his undergraduate research student William Baez, at the 23rd Recent Developments in Computer Simulational Studies in Condensed Matter Physics at the University of Georgia, Athens, GA.
The Southern Atlantic Coast Section of the American Association of Physics Teachers (SACS AAPT) is an organization comprised of individuals in Georgia and South Carolina who teach physics at the college or high school level. It provides a forum for these educators to exchange ideas and learn effective methods for physics instruction. Meetings are held in the Spring and Fall. The 2009 SACS AAPT meeting was held at Augusta State University, Augusta, GA. The meeting kicked off on October 16, 2009 with Prof. David Griffiths lecturing on the fundamentals of electricity and magnetism (see picture on right) followed by poster presentations, banquet dinner, and keynote address from our guest speaker Prof. Griffiths. The next day offered a series of talks ranging from physics education, physics history, laser physics, and medical physics. The details of the program are available at the following web link:

http://sacs-aapt.org/Meetings/Meeting_F09/SACS-AAPTFall09MeetingProgram.pdf

World renowned physics teacher David Griffiths lectures as students and faculty eagerly listen

2010 Phi Kappa Phi Student Research Conference

This year the Department had a large number of students present their research at the Phi Kappa Phi Student Research Conference here on campus. These students, and their advisors, are listed here:

**Faculty Advisors: Dr. Tad Whiteside and Dr. Andy Hauger**

**Wesley Allen Black**
“Extraction of Energy from Microwind Powered Devices”

**Faculty Advisor: Dr. Shaobin Miao**

**Jacob Magoulas**
“Synthesis of 1,2-Benzquinone Derivatives”

**Faculty Advisor: Dr. Barbara Mysona**

**Megan Clendenning**
“Differentiation of the Muller-Glial Cell Line, rMC-1”

**Faculty Advisor: Dr. Donna Hobbs**

**Jeremy Robinson & Maitri Desai**

**“The Effects of Curcumin on Beta-Amyloid Aggregates”**

**Faculty Advisor: Dr. Trinanjan Datta**

**Jamie Campbell**
“Electrical Circuits and Random Walk”

**Maitri Desai**
“Helicon Waves in Metallic Media”

**Philip Javernick**
“Phase Synchronization Effects in a Lattice of Chaotic Oscillators”

**Jeramy Barry**
“Transfer Matrix Method for 1D and 2D Ising Model”

**Faculty Advisor: Dr. Christian Poppeiers**

**Chris Parham**
“High Resolution Ground Based Magnetic Data at Dagger Mountain, Big Bend National Park, TX”

**Rebecca Sawyer**
“P-Wave Slowness Anomalies Across USAArray Determined by Beam Forming”

**Faculty Advisor: Dr. Chad Stephens**

**Craig Atkins**
“Synthesis of Analogues of Dapsone as Potential DNA Binding Compounds”

**Lindsay Hilkert**
“Synthesis of a Cyclopentyl Derivative of an Antiprotozoal Reverse Dia-midine”

**Zoe Renew**
“Synthesis of C-Substituted Bicyclic Sulfones as Potential HHV-6 Inhibitors”

**Phillip Wilkerson**
“Chemoselective Reduction of 1-Cyanomethylsulfonoyl-2-nitrobenzene, an Intermediate to Potential HHV-6 Inhibitors”

**Holley Burke**
“3-Arylfuran “Reversed” Amidines as Potential Inhibitors of Leishmania and Trypanosoma cruzi”

**Ryan Hawkins**
“Attempted Oxidation of Pyrrolo[2,1-b]quinazolines with Formation of a Stable Epoxide”

**Joy Harris**
“Synthesis of 2-Aminofluorene Derivatives as an Organic Chemistry Laboratory Project”

**Neil Jenkins**
“Synthesis and Fluorination of Various 1,3,5-Triarylpyrazoles”
ASU Student Research Presentations at Georgia Academy of Sciences

The 2010 Georgia Academy of Sciences annual meeting was held at Columbus State University in Columbus, GA. The meeting included six presentations by students from ASU’s Chemistry and Physics Department. Two presenters (Christopher Parham and William Baez) won the “Best Student Talk” along with a $100 cash prize in their respective sections. This is the third year in a row that students from ASU’s Chemistry and Physics Department has won the award. Way to go!

“MAKING A HOME-OWNER DEVICE FOR PRODUCING BIO-CHAR FROM PLANT WASTE AND CALCULATING IF THIS METHOD IS VIABLE FOR CARBON SEQUESTRATION”, Alexander Bauer


Joe Newton (B.S. ‘02, ASU) presenting his doctoral work at Augusta State University

Physics Alumni Joe Newton graduated High School in 1997 from Alleluia Community School and then double majored in Math and Physics at ASU and graduated in 2002. He went straight away to UNC where he studied experimental nuclear astrophysics and defended his dissertation entitled "Hydrogen Burning of 17-O" in December 2009. Currently he is working in the Department of Radiation Oncology at Duke University Medical Center as a postdoctoral associate. His present research is in the area of three dimensional radiation dosimetry using Optical CT.

“HIGH RESOLUTION, GROUND BASED MAGNETIC DATA AT DAGGER MOUNTAIN, BIG BEND NATIONAL PARK, TX”, Christopher Parham and C. Poppeliers.

“P WAVES SLOWNESS ANOMALIES ACROSS US ARRAY AS MEASURED BY LIMITED APERTURE BEAM FORMING”, Rebecca Sawyer and C. Poppeliers

This past January, Maitri Desai, Rebecca Sawyer and Tammy Dencker attended The Southeast Conference for Undergraduate Women in Physics (SCUWP) (http://www.physics.ncsu.edu/scuwp) hosted at Duke University. The conference is aimed at fostering a supportive network for female undergraduate physics students in Southwestern US. Besides providing a forum where students can interact with successful women in physics, the conference also offered advice on graduate school, laboratory tours, and career options.

All smiles after conquering the presentations at Georgia Academy of Sciences!

“DEPARTMENT MEET & GREET”

The Department kicked off each semester this year with a gathering of students and faculty in the JSAC. The events typically started with a speech from Dr. Hauger followed by social interaction among faculty and students. This social activity has become popular with students and faculty and is an important time for us to introduce new faculty and to learn about our new students. A special thanks this year to Pearson Education and Five Guys Burgers and Fries for donating gift certificates that were awarded as door prizes.

Rebecca Sawyer, Maitri Desai, and Tammy Dencker at the SCUWP meeting

ASU Chemistry & Physics undergraduate student research presenters at Columbus State University in Columbus, GA.

“PHASE SYNCHRONIZATION EFFECTS IN A LATTICE OF CHAOTIC OSCILLATORS”, Philip Javernick and Trinanjan Datta


“PHASE SYNCHRONIZATION EFFECTS IN A LATTICE OF CHAOTIC OSCILLATORS”, Philip Javernick and Trinanjan Datta

“DYNAMIC PHASE TRANSITION IN THE NEXT-NEAREST NEIGHBOR KINETIC ISING MODEL”, William D. Baez and Trinanjan Datta

Department Meet & Greet

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Ken, Jeremy, and Colbert

Chemistry majors pose for a snap

Crute, Miao and student followers getting ready to clean up the pizza box!
Biological Chemistry Research: Barbara Mysona

My area of research is focused on using chemistry to better understand biological processes. Over the past year, with the help of two Augusta State students, Will Brantley and Megan Clendenning, we studied the effects of staurosporine, a general kinase inhibitor, on the differentiation of the Müller glial cell line, rMC-1. The Müller cell is the main glial cell in the retina, the photosensitive layer of the eye that converts light images into neural impulses that are sent to the brain for further analysis and processing. Because primary Müller cells, which are taken directly from the retina, are difficult to harvest and grow, scientists often use cell lines. Cell lines are derived from primary cells but have been immortalized. Immortalized cells are cells that have been altered, sometimes by the introduction of a cancer causing virus, so that they will grow quickly and divide for many generations, similar to cancer cells. Unfortunately, when cells are immortalized, they often lose some of the characteristics of primary cells. The discovery of a chemical that causes a cell line to act more like the primary cells would be a very valuable tool for scientists. In the case of the Müller cells, we would like to grow the cells easily but then be able to change them or differentiate them so that they stop dividing, which is how Müller cells behave in the healthy retina. In the first part of our work, we discovered that although staurosporine halts cell division and changes the shape of rMC-1 cells so that they look more like primary Müller cells that staurosporine also causes many of the cells to die. For future work, we would like to alter our treatment conditions in an effort to improve cell viability as well as to continue investigating gene and protein expression changes in the treated cells. Many of the cell culture experiments for this project were performed last summer at the Medical College of Georgia in the lab of Dr. Sylvia Smith who kindly shared her equipment and supplies with us.

Organic/Organometallic Chemistry: Shaobin Miao

Higher acenes and heteroacenes are important materials for electronic applications that include thin film transistors and potentially photovoltaic cells. One key advantage to the use of organic materials in electronics is the “tunability” of synthetic organic semiconductors. Functionalization of organic molecules used in electronic devices can lead to dramatic changes in solubility, stability, film-forming ability, and oxidation/reduction potentials. My research is focused on the synthesis of higher acenes, heteroacenes and their derivatives. Different synthetic strategies such as condensation and coupling are used to prepare those organic semiconductors. Compounds are fully characterized and will be tested as organic semiconductors.

Experimental Nuclear Physics: Andy Hauger

My area of research is concerned with the break-up of colliding nuclei into several intermediate mass fragments. This process is known as nuclear multifragmentation and is of wide interest because many characteristics of multifragmentation resemble the critical behavior observed in ordinary liquid-gas systems. In fact our research team was able to determine for the first time, the critical exponents for nuclear matter by analyzing the fragment distributions measured during relativistic collisions of gold and carbon nuclei. More recently I have worked in the area of medical physics first at the Vanderbilt University Cancer Center and then in collaboration with Dr. Nathan Yanasak at the Medical College of Georgia (MCG). Our work at MCG has involved several physics students including Chris Wright (BS, Spring 2009) and Ken Stephenson (BS, Spring 2011) working on simulation in the area of Diffusion Tensor Imaging (DTI) which is a technique using to track nerve fibers in magnetic resonance images. I have also explored various experimental and computational problems including the leaky pendulum (with Tanya Mikulas, BS, Spring 2007), the vacuum cannon (with Rebecca Sawyer, BS, Spring 2010) and the lengthening pendulum (with Seth Clark, BS, Spring 2009).
ASU’s first pre-engineering graduate: Charley Corley
Graduating from Georgia Tech with a degree in Mechanical Engineering has been a goal that I have had for the last two years. In order to achieve this, I needed to go to a university for some length of time and gain a GPA that would be sufficient to meet the standards at Georgia Tech. Since I have a wife and child, I did not want to move from Augusta unless it was necessary. Consequently, this situation nearly led me to settle for a two-year degree at a local technical school before I became aware of Augusta State’s pre-engineering program. Furthermore, after an eight year hiatus, going back to school has been a major challenge, but Augusta State’s pre-engineering program has not only given me a strong foundation in mathematics and science, but confidence and also created a bridge to Georgia Tech in Savannah. The Savannah campus would be a better option, for me, than the Atlanta campus because there will not be a large ratio of students per professor in Savannah, which gives more opportunities for the students.

My experience at Augusta State has been incredible. The most challenging classes, in my opinion, were in mathematics, physics, and chemistry, which are essential for any degree in engineering. I am far from the smartest individual in the class, but I have been able to maintain a high GPA. When I came across concepts or problems that I did not understand, the tutor centers became not only an aid but also a necessity. This was especially true in the Science department where professors are constantly stopping by the tutor center to help students. Additionally, most of my professors would take time to help me whenever I stopped by their office, not just during “office hours.” The best advice I could give to other students interested in this program is to put forth effort and ask questions. Nobody gets everything the first time around and professors are always available after class, so stop by if you are confused about an idea, concept, or problem.

HOW TO ENROLL IN AUGUSTA STATE UNIVERSITY PRE-ENGINEERING PROGRAM
The Augusta State University (ASU) Pre-engineering program gives students the opportunity to complete their entire core curriculum at Augusta State and then complete their engineering studies at the Georgia Tech - Savannah campus. After completing the full program, students will have earned a Bachelor's Degree in Engineering from Georgia Tech as well as the Associate of Science Degree from Augusta State. Georgia Tech - Savannah offers courses leading to degrees in these engineering areas: (1) Civil Engineering (2) Computer Engineering (3) Electrical Engineering, and (4) Mechanical Engineering. During the freshman and sophomore years students are enrolled at Augusta State University. ASU offers all of the humanities, social science, mathematics and science courses required in the Georgia Tech engineering curriculum.

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