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Student Profile: Adam Jakus, MSE

I started my research the summer after my freshman year in 2006 as a participant in Georgia Tech's Materials Science and Engineering Summer Undergraduate Research Fellowship (SURF) program working for Dr. Seth Marder on "Characterization of Novel Organic Polymer Materials for Thermochemical Lithography." During that summer, I realized that research was something I wanted to pursue both as a student and eventually as a professional. I have always enjoyed learning the material in my classes, but being given the opportunity to use that knowledge to discover or create something new for the benefit of the scientific community and society in general was extremely satisfying.

Starting fall 2006, I began working with Dr. Naresh Thadhani in the Materials

Science and Engineering department's High Strain Rate Laboratory. Although I did not have a specific project that semester, I became knowledgeable of the research dynamics of that particular lab group and their individual research goals as well as the lab equipment. Beginning in the spring of 2007, I started work on "Modeling and Simulation of the Impact Response of Linear Cellular Alloys for Structural Energetic Material Applications," which is currently the topic of my undergraduate thesis, a requirement for participation in the Research Option. In addition to working on this particular project, I used my newfound knowledge of finite element computer simulations to do contract work through the Georgia Tech Research Institute (GTRI) in helping to determine an optimal per-



sonal body armor material configuration for protection against various calibers of ammunition.

As I continued this research, I began working once again in Dr. Seth Marder's group during the summer of 2007 through the SURF program on "High Resolution Solution Deposition of Gold Nanoparticles onto ITO and Si." Although I primarily worked in the High Strain Rate Laboratory through the 2007-2008 school year, I continued my research with Dr. Marder as well. I believe that working in both groups simul-

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Undergraduate Research News

Student Profile: Stacy Carolin, EAS

A 28-hour plane ride. Tree trunks the size of a small vehicle. Deadly spiders and poisonous snakes. Thousands of bats, rivers, mountains rainforests, and caves--and all the science you could fit in-between.

The opportunity to accompany my professor and two postgraduate students on a field trip was mostly the result of good timing. I had been studying global climate change in Dr. Kim Cobb's lab for almost a year, and the trip was scheduled to take place right at the end of my summer research grant. I immediately recognized the great opportunity I had been given and signed on to what turned into a very rewarding and memorable adventure.



Our destination was Mulu, a world heritage site in Malaysian Borneo located almost directly on the equator (near Indonesia). The tropical Pacific is an interesting site to investigate global climate change because of El Nino (ENSO) climate events. ENSO is characterized by changes in atmospheric pressure and sea surface temperatures on an irregular basis (usually 2-7 year cycles), which cause either heavy floods or severe drought depending on the type of event. There is currently little understanding of what forces the frequency and severity of ENSO events naturally and even less on a possible human influence. Luckily, stalagmites that grow from drip waters (i.e. precipitation events) in caves can act as the "ice cores" of the tropical Pacific. Mulu is heavily affected by ENSO events and receives plenty

of rain. It also has plenty of caves - some of the largest and most beautiful in the world - which made it a prime candidate for our stalagmite-based climate research.

The objective of the trip was mainly to collect samples to be analyzed back at Tech. During our three-week stay we collected rainwater, bedrock from topographical highs, calcite scrapings from cave ceilings, drip waters, pool waters, core drillings from growing stalagmites, and old fallen stalagmites. The project I have been focusing on involves the "mini" stalagmite cores (about 3 cm long) we collected. The cores are dated using radioactive decay techniques and then cut open and drilled along a transect at steps that correspond to 6-12 month intervals. The drilled powders are run on a mass spectrometer machine to



get oxygen isotopic ratios, which have been shown in previous studies to have an inverse relationship to precipitation amount. Using these techniques, we should be able to produce a very high-resolution precipitation record that can recognize ENSO events over the past 300-400 years, something that has never been done at this location.

Overall, the trip was extremely successful, not only because of the science we accomplished, but also because of the amazing change in culture that I was able to experience on the other side of the world. Thank you to all the groups who contributed funding and made this possible!



Save The Date
Undergraduate Research Spring Symposium
April 1, 2009

Faculty Interview: Dr. Ben Klein, ECE-GT Savannah

U/G Research: How did you become involved as a mentor to undergraduate researchers?

BK: I first became involved not long after joining GT. A student approached me with the request to do research for academic credit; being new, I was not familiar with the many undergraduate research options here at GT. That first experience was OK, but I felt it could be better. After a few years of having one or two undergraduate researchers every semester, I now have a much better idea of how to ensure success.

U/G Research: What types of projects have you mentored? How do you utilize undergraduate students in your research?

BK: When I first started having undergraduate researchers in my lab, I would give them independent projects. Over time, I found that the students preferred to work closely with a graduate student. Now, I always assign undergradu-

ate researchers to a single graduate student, and they carry out important tasks that the graduate student simply doesn't have time for. For example, one recent undergraduate did an excellent job exploring and testing various mesh generation computer programs for use with our electronic transport simulation tool. It's the kind of thing that seems simple on its face, but in fact it's very involved, and makes a huge difference to the future success of our research. He ended up being unsatisfied with the available software, and he wrote a few scripts of his own instead. Very useful! I think the student enjoyed it quite a bit, because he understood that his work would be applied to a real-world problem.

U/G Research: Describe the summer research programs at GT Savannah.

BK: Well, let me describe what I've been involved in. First, you can take undergraduate research or

independent study credits in summer. This has historically been the most attractive option for my students. In addition, we have a great relationship with the UROP office in Atlanta and Dr.

Harwell, who provide PURA awards to pay students to perform research, as well as small grants for materials, supplies, and/or travel for undergraduate researchers. At GT-Savannah, we've been very successful in obtaining PURA and M&S awards.

Besides these, Dr. Elliot Moore runs a fantastic REU program here in Savannah, called CREATE. The students, most of whom come from other campuses, stay in dorms here in Savannah and spend 8 weeks doing intensive research 40 hours a week. This is the 'real deal' – there's no better way to get involved in research.

The students are paid a stipend, as well.

U/G Research: What should a student do to become involved?

BK: Talk one-on-one with the professors whose



courses you find interesting, and ask them about their research. Most professors will be happy to talk your ear off about their own research! Don't think that you need to be a straight-A student – in my experience, the most important factors in determining the success of an undergraduate research project are interest level, motivation, and good interactions with a graduate student.

U/G Research: What are the benefits to faculty of mentoring undergraduates in research?

BK: In any large project, there are a large number of tasks involved, ranging from quick and easy to ponderous and hard. In addition, talented undergraduates can be great prospects for future graduate researchers,

Undergraduate Research News

Mentoring Corner

If you are a regular reader of our newsletter, you might have noticed a change in the title of this section. In the past, we referred to this section as “Faculty Corner”, but realized that “Mentoring Corner” would better reflect the diversity of those who mentor our undergraduates in research—faculty, post-docs, graduate students, and research scientists. The section will continue to offer advice and information geared toward mentoring undergraduates in research.

Mastering Mentoring Workshop Series Continues

Over 75 mentors have joined us for two workshops this Fall semester on mentoring basics and techniques. The workshops have been co-hosted by UROP and the Center for the Enhancement of Teaching

and Learning (CETL). The first workshop on September 16, emphasized the basics of mentoring undergraduates in research and hosted panels of students and experienced mentors in two discussion sessions on the topic. Following the “basics” workshop, we suggest that more experienced mentors begin attending the sessions in our new series on mentoring—Mastering Mentoring. Participants will gather to discuss more focused topics related to mentoring undergraduates in research using a variety of formats, including case studies, panel sessions, and role playing. Individual sessions in the series will be offered on various topics during fall and spring semesters. The first session in the series on October 28th covered “Motivating Undergraduate Researchers”

and included tips on how to recognize lack of motivation, techniques for how to encourage students, and discussion of several case studies. Materials from the sessions can be found on the UROP website. Additional sessions in the Mastering Mentoring series will be offered this Spring and next year. Watch the UROP and CETL websites for additional information.

National Science Foundation (NSF) Research Experiences for Undergraduates (REU) Participant Survey

Interested in learning more about the impacts of full-time summer research experiences for undergraduate students? Check out a recent report from SRI International discussing a recent survey research related to assessment of undergraduate research sponsored by the National

Science Foundation (NSF). According to the report, “Research experiences had a major impact on undergraduates’ awareness, confidence, skills, and understanding regarding research, graduate school, and related careers.” Students participating in the survey also reported an increased interest in scientific, engineering, or research careers after the experience. Over 53% of respondents reported that the experience raised their expectations regarding their terminal degree. “Before they had ever participated in research, only a fourth of the students expected that their highest degree would be a PhD; at the time of the survey, 49% expected a PhD to be their highest degree.” For additional information and study results, visit: <http://www.sri.com/policy/csted/reports/university/index.html>.

Have You Seen “The Tower” Lately?



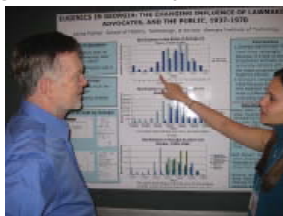
The Tower, an interdisciplinary research journal for undergraduates of all majors, has finally arrived to Geor-

gia Tech. This journal will enable students to gain the exposure and experience of submitting their research to

a professional publication. For more information, please visit <http://ejournals.library.gatech.edu/tower>.

Georgia Tech's Materials, Supplies, and Travel Grants for Undergraduate Research

What do RFID readers, human antibodies, and the UVA library have in common? All were supplies or travel funded from Georgia Tech's Quality Enhancement Plan (QEP) for over 106 undergraduate students through more than 71 projects. The funding program was established to help support the purchase of materials and supplies to enable undergraduate research projects and to support travel for research which must be conducted away from campus. Students from the main Atlanta campus and the Savannah campus have benefited each of the 3 fiscal years in which the program has been sponsored.



Leyna Palmer presenting her work at the Southern Sociological meeting.

Faculty participating in the program have appreciated the extra support (or only support) for a specific project. In many cases, it allows faculty to provide a better project than could be achieved without the funding. Hang Lu, Assistant Professor in Chemical and Biomolecular Engineering, remarked "usually because of the high cost associated with microfabrication and materials, I arrange to have the undergraduate student collaborate with an experienced graduate student, where the graduate student does the microfabrication. With the support from the UROP M&S supplement, Michael learned micro-molding techniques, as opposed to just testing these devices once they have been fabricated by the graduate students."

HTS faculty member, Doug Flamming, was able to

introduce undergraduate Sean Solomon to primary source research through a trip to the University of Virginia's Special Collections Library. The trip, according to Flamming, was "essential to this project" and the experience of working in "a specific, out-of-town archive for an extended period" is important for history students, something to which most undergraduate students are not exposed. Undergraduate students Leyna Palmer and John Akin worked with Amy D'Unger in HTS on a project involving Eugenics in the state of Georgia. Funding was provided to help fund the expense related to copying hundreds of redacted medical records of individuals sterilized in the state of Georgia between 1937-1970. As a result of this work, Leyna was able to complete a research thesis and



Mobile power supply designed for boom crane experiments in Dr. Bill Singhose's lab.

present her work at the annual meeting of the Southern Sociological Society last April.

One project funded by the program during 2008 included the design of a mobile power system to enable boom crane experiments in settings outside of the traditional laboratory by students under the direction of Bill Singhose in ME. Solid modeling programs were used by the student team of Taft Jones and Jon Danielson to design a trailer for the new power system. John Vaughns, a student working with BME assistant professor Melissa Kemp, completed a project determining the differences

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Ben Klein ...cont'd from page 3

and fresh eyes and enthusiasm can revitalize an entire group.

U/G Research: Why is Undergraduate Research

important?

BK: Particularly if a student is considering graduate school, undergraduate research is

important in order to give the student a flavor of what research is all about. I think most undergradu-

ate students don't understand how real research is done. After seeing a group at work on a problem, you can get a very

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Undergraduate Research News

Adam Jakus ...cont'd from page 1

taneously has given me an enhanced perspective on and broader understanding of science in general as each group has different dynamics as well as different areas of research.

In order to obtain perspective on research outside of Georgia Tech, I participated in the National Nanotechnology Infrastructure Network (NNIN) REU program during summer 2008 at the University of New Mexico. The specific topic of my research was "Synthesis and Characterization of Multifunctional Magnetic Nanoparticles for Treatment of Cystic Fibrosis," and culminated with a four day convocation at Cornell University including a pre-

sentation given to the ~80 NNIN REU interns. Upon my return to Georgia Tech, I continued my research with Dr. Naresh Thadhani and Dr. Seth Marder.

I consider myself to have significant research experience for an undergraduate and not just on a single project or in a single lab group. From these experiences, both at Georgia Tech and elsewhere, I have come to the conclusion that participating in research as an undergraduate student is an eye opening experience; however, even more eye opening is having an understanding of many fields of research as well as their many interconnections. What is often left out of discussions

of undergraduate research, as well as research in general, is the group dynamic which can vary dramatically and is just as important to advancing knowledge and technology as the experiments themselves. In addition to these insights gained through my experiences and interactions with undergraduate researchers from various other universities, I have gained appreciation of the interdisciplinary nature of and resources available for research at Georgia Tech. For those individuals who enjoy learning and applying their knowledge to make a difference, undergraduate research is an excellent start, and there is no better place for it than Georgia Tech.

Editor's Note:

As a result of Adam's work, he has been awarded an American Society for Metals (ASM) Outstanding Scholars Award which includes a monetary prize and a trip to the Materials Science and Technology (MS&T) Conference in Pittsburgh this October where the award was presented. Adam recently won best undergraduate poster in Computational Physics at the April American Physical Society (APS) meeting in St. Louis, has been invited to a week-long leadership conference sponsored by the Leadership Institute, and will present his research at the 2008 Undergraduate Symposium at Argonne National Laboratories.

Upcoming Workshops

**Presenting w/Pizazz:
Advance Powerpoint 2007
Thurs., Nov. 13, 2008
4:00pm- 5:00pm
Library, Homer Rice Ctr.**

The session will cover: Using media clips such as sound and video; Using PowerPoint's built-in animation

features & creating custom animation; Creating buttons in PowerPoint and assigning actions to them; Creating hyperlinks that launch another computer document from a PowerPoint slide; and Formatting/printing posters from PowerPoint.

Register by emailing urop@gatech.edu.

**Summer Research in
Aachen, Germany
Info Session**

Tues., Nov. 18, 2008

6pm, Student Success Ctr.

Interested in research in Germany? If so, then join us as we

host Dr. Heide Nederer, from RWTH Aachen University, as she discusses their Undergraduate Research Opportunities Program. For additional information, visit: <http://www.exzellenz.rwth-aachen.de/go/id/sav/lang/en>.

Materials, Supplies, and Travel Grants...cont'd from page 5



Undergraduate John Vaughns working in the Kemp Lab.

between two patient-derived cell lines from patients suffering from acute lymphoblastic leukemia. QEP funding was used to purchase human antibodies necessary for the experiments. During a meeting with co-researchers at Emory, John presented slides on his initial data and participated in discussions of future research by the team.

Georgia Tech Savannah



Alberto Gomez's shows off the new RFID technology used in construction zone safe research in the Teizer group.

faculty members Paul Work and David Scott teamed with undergraduate student David Fiser on a project developed to produce preliminary data for a proposal to Georgia's Department of Natural Resources. Funding was used to purchase the materials necessary to develop an artificial shell used in a field investigation of the mechanisms by which sea turtles are injured. A third GTS faculty member, Kevin Haas, used funding from the program to pull together the instrumentation and supplies necessary to evaluate the impacts of ship wake on Tybee Island. The students presented posters and reports to the Tybee Island Beach Task Force as part of their project.

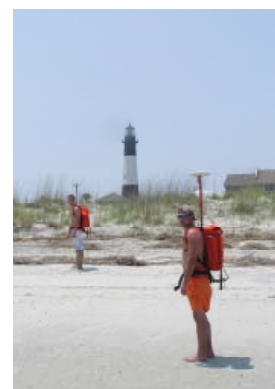
Keith Edwards, an associate professor in Interactive Computing, took advantage of the funding to purchase several digital

voice recorders and small wireless handheld computers in order to develop user interfaces for potential use in home-based networking. The materials were used by students Tom Morgan and Darryl Prince to perform user studies and develop a remote control application allowing easier user control on networked devices. The results were used in a series of demonstrations to lab visitors. CEE faculty member Jochen Teizer purchased materials necessary to move a theoretically-based undergraduate research project in radio frequency technology (RFID) to a hands-on test bed for their concepts. Over five individual students and two senior-level classes benefited from the RFID equipment used to test ideas related to construction site safety.

Sound interesting?

Ready to mentor an under-

graduate in your work, but lacking the necessary materials and supplies to enable the work? If so, faculty who are interested in working further with undergraduate students but are hesitant to do so due to the lack of specific materials and supplies which are required for a project should consider applying for the awards. Applications for Spring 2009 are due December 1st. Additional information on the award and its requirements can be found at: <http://undergradresearch.gatech.edu/faculty.php>.



Students evaluating the effects of ship wake at Tybee Island, GA.

 Ben Klein ...cont'd from page 5

clear idea of what's involved. Basically, it's a chance to

"try before you buy". Since the financial incentives for

obtaining an engineering Ph.D. are not great, you

should only pursue it if you love research.



Undergraduate Research Opportunities
Program (UIROP)
Georgia Institute of Technology
MC 0740
Atlanta, GA 30332-0740
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Fax: 404-385-6940
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www.undergradresearch.gatech.edu

Undergraduate Research Opportunities Program (UIROP)

News from the Director

It's hard to believe that we have only 5 weeks left in the Fall semester! How time has flown. I wish all students and faculty best of luck on exams and final projects! I invite you to enjoy the articles on several students and mentors in this November issue, including a profile on a student who participated in research in Borneo, an interview with a faculty mentor at Georgia Tech Savannah, a personal perspective from Adam Jakus, an MSE student pursuing the Research Option, and a report on our popular Mentoring workshop series.

I also invite you to check out the inaugural issue of Georgia Tech's Undergraduate Research Journal, *The Tower*. Visit gttower.org to check out the first issue which will be out on November 7th. Congratulations to the student Editorial Board leading the work: Chu Yi, Editor-in-Chief; Martha Lesniewski, Associate Editor for Submission and Review; and Henry Li, Associate Editor for Production. Many thanks also go out to the Tower staff including copy editor, layout specialist, the webmaster, and our many reviewers. Special thanks also go out to past Editors-in-Chief Dianne Palladino and Mark Youngblood, Student Publications Manager Mac Pitts, Student Publications Board Chair Dr. Carole Moore, and the working group of faculty and previous students for their vision and support in creating the publication. Congratulations to *The Tower*!

Lastly, save the date of April 1, 2009, for our annual Undergraduate Research Spring Symposium and Awards. Plan now to present your work!

Best,
Karen Harwell

Let Your Voice Be Heard!!



Student Advisory Board for Undergraduate Research (SABUR)

The Student Advisory Board for Undergraduate Research (SABUR) works toward implementing new ideas for programs and resources for students interested in research. If you're interested in serving on this board, please email the Chair, Savannah Gowdy at gt.sabur@gmail.com. *Freshman, sophomores, and juniors are particularly encouraged to become involved!*

WE WANT TO HEAR FROM YOU!!!!

UIROP Facebook Page

Interested in hearing more about upcoming Undergraduate Research events, news, funding, etc? Then join the GT Undergraduate Research Opportunities Program (UIROP) Group on Facebook.

Listserv

To receive information and announcements from Georgia Tech's Undergraduate Research Opportunities Program (UIROP), join the uirop-news listserv. To join: Send an e-mail to sympa@lists.gatech.edu with a subject of "subscribe uirop-news".