GUSTAVUS ADOLPHUS COLLEGE
PHYSICS DEPARTMENT

September 2001

On-Campus Edition

Gustavus Physics

What's New in Olin

Inside this issue:

New classes; new computers; different jobs. This newsletter will detail changes within the department for the 2001-2002 academic year. On the faculty side, there are no new faces this year, but a few changes in responsibilities.

Dennis Henry returns from a year-long sabbatical leave and takes over the responsibility for the department's program of speakers and seminars. Following his leave, he is looking forward to working with students on projects of mutual interest in electromagnetic interference, and developing a musical pitch matching and memory demonstration, probably using LabVIEW.

Tom Huber will continue several roles in the department: advisor for pre-engineering and dual degree programs, coordinator for summer internship opportunities, coordinator of the physics department web pages, and as departmental liaison to the library and the teacher education program. He will also serve as the natural science division's representative on the College's curriculum committee.

(Continued on page 2)

Fall Semester 2001

Dates to Remember

- Sep. 5 Classes begin
- Oct. 2-3 Nobel Conference
- Oct. 19-22 Fall Break
- Nov. 6-20 January Term and Spring Registration
- Nov. 22-25 Thanksgiving Break
- Dec. 14-18 Final Exams

Students Receive Departmental Awards

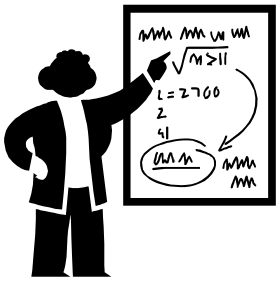
At the end of the 2000-2001 academic year, the physics department recognized several of our rising senior majors with awards.

Jonathan Jennings has been selected as the winner of the Milward T. Rodine Memorial Physics Award for the 2001-2002 academic year. This prize is named for the longtime Gustavus professor of physics (who taught here from 1933-1969) and is awarded annually to a junior physics major on the basis of interests and scholarly achievements.

Todd Johnson received the Gerald and Julia Swanson Scholarship in Physics for the 2001-2002 academic year. This scholarship was established to honor

(Continued on page 2)

Faculty Responsibilities



Faculty members have some new assignments this year.

(Continued from page 1)

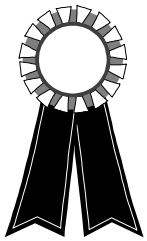
Steve Mellema continues as physics department chair for this, his third year. He will also share responsibilities for computer management in the department, and serves as the assistant radiation safety officer for the College.

Chuck Niederriter continues as the faculty advisor for the Gustavus chapter of the SPS (Society of Physics Students). Chuck is also physics computer network manager and manager of the Olin observatory for its evening observing sessions for the public and the campus community.

Paul Saulnier is on sabbatical leave for the 2001-2002 year, but will continue to pursue research projects on campus with students.

Julie Talbot returns to our department for a second year, this time as Paul's leave replacement. This fall she will teach the General Physics and Quantum Mechanics courses.

Annual Student Awards



Students majoring in physics are eligible for a number of awards.

(Continued from page 1)

the work of the physics department faculty who provided Gerald Swanson with a background that prepared him for graduate study in physics and for a career with the Bendix Corporation. The scholarship is to encourage physics students of promise who are enrolled full-time at the College.

Matt Miller was awarded the John Chindvall Scholarship in Physics for the 2001-2002 academic year. This endowed scholarship was established in memory of 1970 Gustavus graduate John Chindvall by his parents and friends. It is awarded annually to a student majoring in physics.

Mike Bland was selected to receive the Julian A. Crawford Memorial Prize in Physics for the 2001-2002 academic year. This prize consists of a one-year membership in the American Association of Physics Teachers (AAPT). The prize is named in memory of the former chair of the Gustavus physics department (1967-69) and awarded to the student with "the greatest potential for contributing to physics and society".

In consultation with the Physics Department, the Department of Mathematics/ Computer Science has chosen **Jonathan Miller** as the winner of the 2001-2001 John Borneman Prize Par Excellence in Mathematics. This award is named in memory of John Borneman, a 1955 Gustavus graduate, by his family. It is presented annually to an outstanding student in the fields of mathematics and physics.

In addition, **Matt Miller** and **Mike Bland** have also been named Physics Departmental Assistants for Fall Semester, 2001. This position has a nominal expectation of four hours per week in research, course development or other activities that will assist in the work of the department.

Junior Majors Win Major Scholarship Awards

Two physics majors, **Sarah Handahl** (‘03) and **Melissa Haugen** (’03), have been named Clare Booth Luce Scholars under the auspices of a grant given to Gustavus Adolphus College. These scholarships are awarded for two academic years, based solely on merit, and are calculated to include the cost of room and board as well as tuition and other fees and expenses.

Clare Booth Luce’s remarkable career spanned seven decades and many professional interests: journalism, politics, diplomacy, and the theater. In each, she broke new paths for women to follow. By the time of her death in 1987, she had become a national symbol of women’s accomplishments and potential. Under the terms of her will, she chose to establish a legacy to benefit current and future generations of women with talent and ambition in the areas of science and engineering where, in our society, they continue to be underrepresented.

Pursuant to Mrs. Luce’s bequest, the Henry Luce Foundation established the Clare Booth Luce Program to encourage women to enter, study, graduate, and teach in fields where there have seemingly been obstacles to their advancement.

This is the second year in which Gustavus has awarded Luce scholarships, and the Physics Department is excited and pleased to have two of its outstanding junior majors selected as this year’s recipients. We wish Melissa and Sarah success in their study and research endeavors this year.

...to encourage women to enter, study, graduate, and teach in fields where there have seemingly been obstacles to their advancement.

New Computers in the Physics Department

This summer the physics department network of computers underwent a complete makeover in terms of both hardware and software as well as network connectivity. The goal was to bring the most speed, power and reliability possible to the department network.

On the hardware side, new Pentium III computers were installed in the Classical Physics I lab (Olin 224) complete with digital video-capture capabilities. Fast Pentium III machines were also moved into the Physics Library to provide needed access to physics students for research or course-related work outside of class hours. All other lab computers received processor and/or memory upgrades, and the network wiring infrastructure inside Olin Hall was upgraded to 100 megabit/second speeds.

On the software side, all of the lab and library computers will now run Windows 2000 and will be a part of the new “PHYSICS” domain run by our new Windows 2000 Advanced Server.

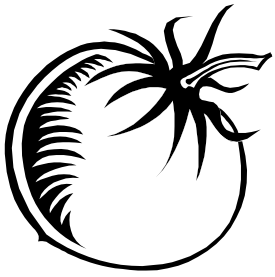
Every student enrolled in a course in the department will receive instructions on the use of the new network during the first week of classes.

The goal was to bring the most speed, power and reliability possible to the department network.

How I Spent My Summer (by the Physics Faculty)

The faculty members in the department had a busy summer.

A. Jenning Ellis writes:
"The start of this summer, as far as gardening was concerned, was not conducive to planting. It was either too wet, too cool, too dry, or too hot. The tomatoes that I got in, started as seedlings last spring, have yet to show a ripe tomato; they have produced lots of vines, however! Raspberries, asparagus, roses, lilies and hollyhocks have done well.



"The tomatoes that I got in, started as seedlings last spring, have yet to show a ripe tomato."

I ended the summer with a train trip, my preferred mode of travel, to Alexandria, VA, and Durham, NC. Before coming to Gustavus, I lived south of Old Town Alexandria for four years while I worked at the Islamic Saudi Academy. While staying in Alexandria I visited the Academy and St. Aiden's Episcopal Church, which I attended when I lived there. I got a chance to visit with some friends from that era, as well as from college days.

The reason for the trip to Durham was to visit Duke, my alma mater, for the first time in a quarter of a century. I arranged with the Alumni Affairs Director to meet with my counterparts in chemistry and physics to see what they are doing with the lab programs in those departments. The general physics lab program there is not as extensive as ours, but they have a neat lady who is spicing it up and adding labs to it. I had a chance in chemistry not only to see their lab program, but to visit with my first chemistry professor there. He is 81 and still comes to his office every day. We visited for an hour. He was interested in finding out about Gustavus, the departments that I am in and the Nobel Conference.

The reason for the timing of my trip to Durham was an NBA All-Star Charity Basketball Game. It brought many of the guys that have played for Coach K at Duke in the last 20 years back to raise money for three charities that Duke is supporting in the Durham community. Players like Grant Hill, Christian Laettner, Corey Magette, Elton Brand, Tommy Amaker, etc. Over 40 in all. Duke won 145-125.

All-in-all, it was a great way to end the summer: seeing these guys play, visiting the campus, taking the trip, visiting old friends. But I am still buying fresh tomatoes from the Co-op, waiting for my own plants to produce!"

Dennis Henry devoted his year-long sabbatical leave primarily to writing projects, research at 3M in St. Paul, and attending conferences and giving talks. Last fall he renewed his consulting relationship with his former group at 3M, working on measurements and modeling of magnetically coated particles. That research concluded unexpectedly in late December when 3M cut back on research consultants.

In April he finished rewriting the AAPT brochure "Planning for Graduate Studies in Physics and Related Fields", which is in press for fall release. In January he was commissioned by The American Journal of Physics to

(Continued on page 5)

Faculty Activities

(Continued from page 4)

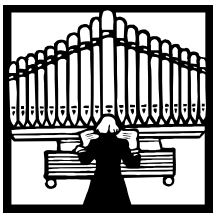
write a Resource Letter on Teaching Electronics. This lengthy article went to press in August. His article "Enhancing electromagnetism experiments with clamp-on ammeters", was published in the January 2001 issue of AJP, and was cited in the June issue as one of retiring editor Robert Romer's "editor's favorites".

Last September he attended the annual meeting of the Lexington Group in Transportation History in Indianapolis, and this summer the meetings of the Northern Pacific Railway Historical Association in Duluth, and the Great Northern Railway Historical Society in St. Paul. At the NPRHA meeting, he was appointed to the two-person Publications Committee, and at the GNRHS he co-presented a 50-minute illustrated talk on the history of St. Paul Union Depot.

In March he gave the luncheon talk "Some Magnetics Tales and Demonstrations" at the Twin Cities Section of the Electromagnetic Compatibility Society of IEEE in Bloomington. His biographical article "Were they really for amusement only?" is scheduled to appear in the next issue of The Pin Game Journal. Personal travel highlights were a one-week vacation in March in the U.S. and British Virgin Islands, and a June week at a familiar resort near Alexandria (MN).

Much of **Tom Huber's** time this summer centered on three trips he took:

The first trip was to DeKalb, IL to discuss sound production in organ pipes with one of the world's experts in acoustics. Last year, Tom, **Jon Skovholt** (’01), and **Charles Hendrickson** (’59, owner of Hendrickson Organ Company in St. Peter) developed a new method to measure the coupling between the oscillator and resonator in a reed organ pipe. (Advertisement - Tom is looking for students interested in this research project). In late June, Tom traveled to DeKalb to meet with Tom Rossing at Northern Illinois University to discuss their results and compare measurements with Rossing's much more sophisticated (and expensive) instrumentation. Rossing will be coming to Gustavus this fall to present a seminar and meet with Tom and Hendrickson on future research in organ pipe acoustics.



... a new method to measure the coupling between the oscillator and the resonator in a reed organ pipe.

Tom's second trip in late July was to Rochester, NY to attend the American Association of Physics Teachers (AAPT) meeting. He presented a paper, co-authored with **Steve Mellema** and **Matt Miller** (’02) demonstrating that there is a bug in the way that many least-squares fitting programs report uncertainties in parameters for weighted fits. Tom and Steve are developing a DLL subroutine library that will allow essentially any fitting program to correctly calculate the weighted fit for data sets with uncertainties in both *X* and *Y* directions. With luck, the first version of this will be available for use with Sigmaplot early this semester.

Tom's final trip in late August was to Fort Collins, CO to present a talk on Muon Catalyzed Fusion at Colorado State University. From 1992-1998,

(Continued on page 6)

Faculty Summer Activities

(Continued from page 5)

Tom and several Gustavus students traveled to Vancouver, British Columbia, Canada to participate in muon-catalyzed fusion experiments at the TRIUMF accelerator. Analysis of these experiments is still being completed, and Tom was invited to CSU to give a seminar on the results. He met with many faculty members and graduate students including **Jennifer Hightower** ('98). On the trip, Tom and the family enjoyed some time in Colorado and in the Black Hills of South Dakota.

When not away on trips, Tom has been busy preparing to teach Classical Physics I for the first time, as well making major revisions to the Experimental Modern Physics course. He is also working on an NSF proposal to purchase instrumentation and to allow Gustavus students to continue research in musical acoustics during the next three summers.

The Mellemas' travels took them to New York City.

Steve Mellema spent most of the summer in St. Peter, working on projects in the department. Along with **Amit Bohara** ('04) he began porting his ubiquitous MODELFIT computer program to the Windows OS, rewriting the code in Java. They hope to have a working version of the program completed by the spring semester.

Steve's article entitled "A Physics Lecture for the 21st Century" was published in the July issue of the international journal, *Physics Education.* It appeared in a special feature of the journal entitled "The Reflective Teacher". (The article can currently be accessed on that journal's website.)

Using the research faculties in Olin Hall, and collaborating with **Paul Saulnier,** he began a new experiment involving optical scattering in random media. The idea is to characterize the scattering in a stationary (*e.g.* powder) sample by using optical heterodyning and a short coherence-length laser to measure the distribution of scattering path lengths in the sample. They plan to continue the experiments this fall with the help of student research assistants.

By far the most enjoyable part of the summer was a three-week trip to the Eastern US, including stops in: Princeton, NJ to visit an old Peace Corps friend; New York City, to show Dan and Jacob where their mother used to work (the United Nations) and live; Gettysburg, PA, to tour the battlefield; Rochester, NY to attend the summer meeting of the AAPT; camping in the Green Mountains of Vermont; and finally a visit to Chuck and Debbie Niederriter's families in Erie, PA.

At the AAPT meeting, Steve gave a paper entitled "The Physlet Virtual Pre-Laboratory", describing the use of Java applets on the web to allow students to do a "virtual" experiment before actually performing the real laboratory exercise.

The final month of the summer was consumed by the arduous task of building an all new computer network in the physics department. This work was done jointly with **Chuck Niederriter**, and is described in more detail in the

(Continued on page 7)

A Busy Summer for All

(Continued from page 6)
article on page 3 of this newsletter.

As always, it was a busy summer for **Chuck Niederriter**. The summer began with more work on the house, but the addition was finally finished with the completion of the deck. However, then it was time to move on to renovating the kitchen, a task that will be mostly done before school begins.

Chuck registered first-year students in June and taught the Astronomy Summer Camp before heading off on a three-week working vacation. He began the "vacation" refereeing National Science Foundation CCLI proposals in Washington. After a weekend of camping, it was off to the AAPT meeting in Rochester, NY. There he served as substitute section representative for Minnesota, presented on the physlet work, attended committee meetings, and served on focus groups. Finally, there was a chance for some real vacation in Vermont and Pennsylvania.

August has been spent working on the kitchen along with making the final push to get all of the physics computers upgraded and ready for use in the fall. The summer certainly went by quickly, with little time for sailing and canoeing. Maybe next year?

This summer **Paul Saulnier** spent time on collaboration projects with **Steve Mellema** (in physics) and Nancy Butler (in biology). Both projects are ongoing. Additionally, he managed to complete most finishing touches on his post tornado house construction projects. Paul will be on sabbatical this year (thanks for returning, Julie!!!)

Speaking of **Julie Talbot**, she writes:

"This summer I had more money, and more cash, than I've had for most of the preceding summers, so I was able to spent more time traveling and having fun than I've been able to do recently. I spent time in Pennsylvania, South Carolina, New Orleans, and Kentucky, and drove through a whole bunch of other states in the process.

In Pennsylvania, I visited my parents. My time in Clemson, South Carolina was spent visiting friends from my graduate school years, and complaining about the heat.

The trip to New Orleans was purely for fun, and I did all the touristy things people do in New Orleans, including going to cemeteries, riding a streetcar through the Garden District, touring the French Quarter, drinking a mint julep on the veranda of a sugar plantation, and drinking a hurricane at Pat O'Brien's.

In contrast, the trip to Kentucky was a mission trip with a group associated with Allegheny College, my alma mater. Each year, the group goes to the same region of Appalachia, and works with the same group of people. So, after a while, it becomes more like visiting friends than mission work. This year, most of my work days were spent roofing or housecleaning."

"...I did all the touristy things people do in New Orleans..."

Student Summer Internships

As is true every year, a large number of our students were involved in research internships this summer at sites ranging from Alaska to Texas. The programs in which they were involved included areas as diverse as astrophysics, biomedical engineering, civil engineering, electrical engineering, geophysics, and materials science.

Troy Anderson ('03) had a research internship with Dr. Azad Siahmakoun in the Department of Physics and Applied Optics at Rose-Hulman Institute of Technology in Terre Haute, Indiana. Their group worked on optical radar under the auspices of a grant from the Naval Research Laboratory.

Mike Bland ('02) writes:
"I have recently returned from my internship at the University of Alaska's Geophysical Institute in Fairbanks, Alaska. The institute is involved with research in many aspects of geophysics including solid earth geophysics, atmospheric physics and planetary physics. I worked in the Remote Sensing Volcanology department on a project attempting to create thermal interference patterns in images. Much like radar interferograms indicate changes in land surfaces, a thermal interferogram would indicate small scale temperature changes at a target site such as a volcano. While I wasn't quite successful in creating the desired images some important first steps were made and are being pursued by a post-doc working there. I also did some real time monitoring of active volcanoes for the Alaskan Volcano Observatory which monitors over 40 potential active volcanoes. I was also able to explore a bit of the Alaskan wilderness. From the North Slope where the sun never sets to the southern tip of the Kenai Peninsula, it is magnificent country. All in all the summer was a blast."

"I also did some real time monitoring of active volcanoes for the Alaskan Volcano Observatory."

Karen Bogenschutz ('02) had a research internship in the NSF Research Experience for Undergraduates (REU) program at the University of North Dakota in Grand Forks.

Brian Collins ('03), who was at the Quantum Institute at Rice University in Houston, Texas, writes:
"I was able to attend Rice University to participate in their REU this summer. There, I worked on research regarding Single Walled Carbon Nanotubes under Dr. Enrique Barrera in the Materials Science Department. We studied the effects of different environments at high temperatures on the nanotubes. They hope that this material will be used in applications like nano-electronics, hydrogen storage for car fuel cells, high strength, light weight materials, etc. I learned about vacuum systems, the Thermogravametric Analyzer, Raman Spectroscopy, the Scanning Electron Microscope, the Transmition Electron Microscope, etc. Anyway, it's been a really busy summer (one that's gone way too fast) and I'm just arrived back at home from the hot depths of Houston to prepare for school at GAC."

Sarah Handahl ('03) had an internship in the Electrical Engineering department at the University of Minnesota. She writes:

(Continued on page 9)

How I Spent My Summer (by the Physics Students)

(Continued from page 8)

"Basically, my whole project is based around medical imaging with ultrasound. Yes, ultrasound has been around for a very long time, but we are using it in new, amazing ways, that will eventually change the way we perform surgery. To begin with, we are working with *contrast agents*. These are actually tiny microbubbles, on the order of 10^{-6} m in diameter. These bubbles are injected into the blood stream of a patient before ultrasound is performed. What happens with these is that when the ultrasonic waves hit them, they begin to oscillate. But the key is that they do so non-linearly. Because of this, they produce enhanced images on the projection screen, allowing the white regions to become brighter and therefore, giving the operator a more highly resolved image. The problem with them is that they only last about 15 minutes and are very expensive. We are working on characterizing the different types of bubbles and documenting their differing attributes. In doing this, we hope to find out which agent works best for which part of the body, such as the liver, heart, blood vessels, etc.

In finding which contrast agent works best, we can then use it in the rest of our experiments, such as *non-invasive surgery*. This is the main basis of everything we are working on, and it is an amazing breakthrough. Basically, we are using the transducer (which sends the ultrasonic waves) to first image a part of the body. Then (assuming that in a real life situation we'd be doing this in order to find a site in the body which needs medical attention) we can use the ultrasound to perform surgery. This is done by targeting the unhealthy body part, such as a blood vessel, with the ultrasound image, focusing the waves at a certain point (to accuracy within a millimeter) and then upping the voltage to the point that the waves will destroy whatever object they are focused on. This procedure is absolutely amazing. You can perform surgery without cutting the skin. Absolutely no scarring. So far, we have been experimenting with this on a compound we have developed which simulates human tissue. These experiments are spectacular-- we have the tissue sample submerged in water and we place a few tubes in the sample to simulate blood vessels. Then, using the imaging component of the ultrasound, we find which tube we want to target, focus on it and fire. You can physically see the tube being destroyed by an invisible force. This week, we will be working with real tissue samples. The reason this is so important is that tissue back-scatters a lot more than our simulated models do, making the procedure harder to perform. But hopefully, we'll continue to perfect it, allowing us to introduce a new form of surgery.

The final part of our research consists of obtaining evidence of our non-invasive surgery. See, if we don't break the skin in our surgery, it is hard to tell if we did what we needed to do, such as cut a ligament or blood vessel, etc. To solve this problem, we send two ultrasonic pulses of opposite polarity to the region targeted. In doing this, the linear components will cancel out, leaving us with non-linear feedback. Tissue is non-linear, so there

(Continued on page 10)

"This procedure is absolutely amazing. You can perform surgery without cutting the skin."

Student Experience a Variety of Internships

(Continued from page 9)

will always be some feedback, but where destruction occurred in the body, there will be much more. The reason for this is that in hitting a certain target, tiny bubbles are formed and, like the contrast agent, will oscillate non-linearly, proving that the target was, indeed, hit.

"...there's no textbook for this stuff. We're the ones developing it"

It's so interesting and I feel very lucky to be a part of this program. I feel like I'm being paid to go to school. I don't feel like this is work, because it really isn't. I learn so much everyday it's as if I'm taking a class. But it's all hands on and it's not a class, because we're the first group to be working on it-- there's no text book for this stuff. We're the ones developing it."

Jeremiah Jazdzewski ('03) writes:
"I had an engineering internship with the City of Duluth Engineering Department. I worked with the traffic engineer and several surveying and drafting engineers. I helped do a lot of traffic studies and roadway design with the traffic engineer and I did some surveying and storm/sanitary sewer design with the drafting engineers. It was a really good learning experience in the area of civil engineering. The biggest bonus from the summer was that I got an introduction to using AutoCad, one of the top engineering and design programs. As an added bonus I also got some hands on experience working with the engineers that run and maintain the Areial Lift Bridge in Duluth. Overall it was an excellent experience and they told my that they would rehire me in a second."

Todd Johnson ('02) writes:
"I have been working at the University of Minnesota's Saint Anthony Falls Laboratory, through the Geology Department. Most of my work consists of running experiments in a flume. We are studying the landform development at continental margins. There is a very delicate balance between processes in the fluvial system, the shelf, and on the delta slope. There is strong coupling between these regions, so that small changes in the experimental parameters of one region can affect all of the regions and create large changes in shelf length and shoreline position. The main motivation behind these studies is for re-interpreting the stratigraphic record. Traditionally, a shoreline advancing onto land has been interpreted as a sea level rise, but experiments like this show that the advance may be due to other changes in wave strength, sediment flow, etc."

Jonathan Miller ('02) had an internship at Indiana University Cyclotron Facility. He writes:
"I worked with Dr. David Murdock on a theoretical study of the way the stucture of two dimensional quantum wires effects their transmission properties. These structures were based upon a finite number of a repeated elements. I studied these finite periodic structures and finite periodic structures with a defect, usually in the middle. My work, which went beyond that which was done before, was studying the transmission band of periodic structures (which had been done before) but with higher accuracy (in the past these calculations were done with Single Mode

(Continued on page 11)

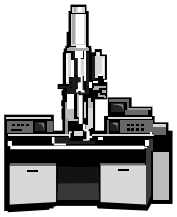
Summer Internships

(Continued from page 10)

Approximation). I included the higher modes in my calculation, which allows greater accuracy at low energies and enables the transmission at higher energies to be calculated and also the putting of a defect in a periodic structure. (I did not do this though; I ran out of time.) I really enjoyed it."

As a member of an NSF sponsored REU program, **Matt Miller** ('02) worked with Professor Peter Garnavich at the University of Notre Dame on a project in astrophysics and cosmology.

Eric Nordberg ('03) writes:
"I had a really fun time at the University of Minnesota's Electrical Engineering Department. I did preliminary research on what I was told were 'perpendicular recording media' What I did wasn't that cool. I just did work on nailing down the parameters for even Co electrodeposition, but I did get to play in the clean room RF Sputtering and Profiling. I also got trained on the scanning electron microscope and the environmental scanning electron microscope. So, even though my research was pretty menial, I got to play with fun toys. I found a picture someone took of at the SEM this summer. Well, I thought it was cool."



"I also got trained on the scanning electron microscope and the environmental scanning electron microscope."

Would You Like to Do a Summer Internship?

The majority of our graduating majors will complete at least one research internship before they graduate from Gustavus. Typically these are done in the summers between the sophomore and junior or the junior and senior years, but there are programs that will accept students between their freshman and sophomore years.

A research experience is valuable in many ways. It gives students a taste of what the "real world" of research is like and helps them to plan for future graduate studies and jobs. And, in both those cases, having such an internship on your resume can open a lot of doors.

So, if the kinds of experience described by the students in the previous article sound interesting, talk to your advisor or to Tom Huber, who is the department's internship coordinator.

Graduating Class of 2001

At the Commencement Exercises on May 27, 2001, sixteen physics majors graduated from Gustavus. This gave us the largest graduating-major class of any college or university in Minnesota. What follows is an update on their plans, which encompass areas from aeronautical engineering, biomechanics, civil engineering, electrical engineering, medicine, and high-energy physics to philosophy, religion and science.

"I'll be starting research and doing some TAing this fall."

Tim Andeen writes:
"Summer has been great and now that it is winding down it seems a little strange not to be getting ready to go back to Gustavus. As for what I am doing, right now I am waiting for classes to begin at Northwestern University. I'm in the physics department and will be starting work on a PhD, probably with an emphasis on high energy physics. I start classes the 24th of September (Quantum Mechanics, more Math Methods and Statistical Mechanics) but before then I get my first shot at the PhD qualifying exams. This first one is just a practice run, but if I pass sections now, I don't have to take them later. They emphasize that the Classical Mechanics portion is particularly workable so I have been reading some from Marion and Thornton. Also I'll be starting research and doing a little TAing this fall. I am very excited and really looking forward to beginning. One a side note, I am living with Arno in an apartment and having a great time. If anyone finds themselves in the Chicago area they should be sure to look us up!"

David Anderson received a fellowship to attend graduate school in physics at the College of William and Mary in Williamsburg, Virginia. He writes:
"I'm in Virginia now, and life here is great. The apartment is a lot like a College View apartment, except there are four bedrooms. It's also a bit older, but that's not a problem. My only complaints are that there isn't a garbage disposer in the sink, and the shower is set up so that you have to go through the cold water to get to the hot. So every morning you either get really woken up or suffer cardiac arrest. So far I've woken up.

(Continued on page 13)

Where Are Our Graduates?

(Continued from page 12)

My roommates are interesting. Andrey is a Russian going for a Ph.D. in computer science, who is either really shy or would hardly notice if the rest of the human species disappeared. Zhou Ming is from China, going for a Master's in accounting. Very talkative. David McCarthy (yup, two Davids in one apartment for the poor international students) is from New York (upstate, thank goodness) and is going for a Master's in American History.

Finally, the town is great, and both the campus and public libraries around here are wonderful."

Simon Audette died, tragically, this summer. He was a member of the construction crew helping to build the new St. Peter Community Center. He fell from the roof of the building site. Our hearts go out to Simon's family and friends. Words cannot adequately express the depth of loss that we all feel when one of our department's "family members" is taken from us like this.

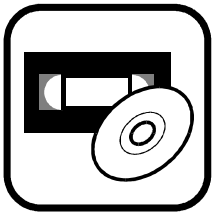
Matt Cunningham, who completed the dual-degree program in physics and engineering with Gustavus and the University of Minnesota, is now pursuing a Master's degree in the Electrical and Computer Engineering department at the University.

Chip Edstrom is seeking employment in the Twin Cities area.

Sarah Fredericks is in the graduate program in Philosophy, Religion and Science at Boston University.

Jason Haaheim got married this summer. He and his bride, Kirstin, are both attending graduate school at the University of California at Santa Barbara, Kirstin in music and Jason in electrical engineering. He writes:
"I started research in the Electrical Engineering department here at UCSB about a week ago. So far, I've just been reading up on our group's research area. I have something called the Dean's Fellowship (which, apparently, is the nicest fellowship the University offers -- how'd that happen!) and an additional research assistantship appointment. I am working for Dr. Umesh Mishra. The area of research is Gallium Nitride semiconductors, specifically LEDs and Laser Diodes. The motivation for research with GaN is that it works fairly well emitting coherently in the 400 nm range. This is good because that blue part of the spectrum is something researchers have been trying to develop for a long time for many different applications. Blue lasers in CD and DVD drives would multiply storage capacity by about 4x (smaller wavelength). Additionally, blue LEDs would complete the spectrum (they already have Red and Yellow) so that very efficient, long lasting white light sources could be produced using combinations of primary color LEDs. UCSB has done some pioneering work in this field, and several of the groups were cited in a CNN article a year or two ago. (http://www.cnn.com/TECH/9711/17/blue.laser/) Now, I don't know specifically what I will be doing yet, but at least I know it's in this general area of EE / Solid-State/Materials. I'm on the Ph.D. track, and my courses start on the 24th

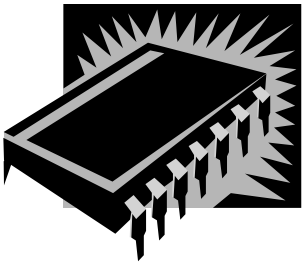
(Continued on page 14)



"Blue lasers in CD and DVD drives would multiply storage capacity by about 4x"

The Class of 2001

(Continued from page 13)
of September.



"...it is possible to get into a great graduate program in EE with a physics major..."

As for words of wisdom, hmmm.... Gustie physicists should know that it is possible to get into a great graduate program in EE with a physics major, that you can get really excellent funding if you put some time into your application, and that they'll even accept you in a program to study solid-state optolectronics and quantum devices despite the fact that you never took quantum, optics, or solid-state [ahem, due to conflicts with the music department. However, I'm definitely not advocating this course of action if it can be avoided]. I just have some catch-up work to do. But, I'm getting paid to do it, so what the heck!"

Raegan Johnson is employed in a technical internship at Honeywell Corporation in Minneapolis. She recently visited St. Peter, and is looking to apply to graduate programs in engineering for next year.

Arno Merkle has an assistantship in the graduate program in Electrical Engineering at Northwestern University in Evanston, Illinois.

David Oachs is completing the dual degree program in engineering at the University of Minnesota.

Patrick Rider is on the waiting list for admission to the Medical School at Creighton University in Omaha, Nebraska. While he waits, Pat has a job in his hometown of Anchorage, Alaska.

Zach Robinson worked this summer at the capon plant, and is seeking technical employment.

Jonathan Skovholt has a teaching assistantship in physics at the University of Delaware in Newark, Delaware. He is in the PhD physics program, and wants to work specifically in either optics or material science. Jon writes:
"I am beginning to understand why Paul is the way he is after meeting his old profs and friends."

Susan Sultvedt is at Arizona State University, in Tempe, Arizona. She has a graduate assistantship in the Exercise Science department, and is pursuing a degree in Biomechanics.

Jacob Thorius writes:
"I am at Iowa State University in Ames, IA. I am pursuing my Masters in Civil Engineering, specializing in Construction Engineering. I have a graduate assistantship appointment, however, I do not know yet as to what I will be doing. Classes start in a about one week.

The only words of wisdom I have for the next generation of Gustie physics students is to make the most of their time at Gustavus, because the time there goes by much faster than you think it ever will."

Darren Zanon has a research assistantship in Aeronautical Engineering at Cornell University in Ithaca, New York.

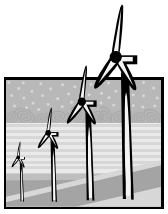
Gusties Investigate Wind Power Possibilities

This summer, a group of interested faculty, administrators, and students began to study the feasibility of bringing wind-power electrical generation to our campus. With concern over rising costs for electrical power, uncertainty over future power shortfalls, and an emphasis on moving toward sustainable, renewable sources of energy, the group has begun to investigate the wind patterns and velocities in and around the campus. (Anyone who has been a part of our community knows how we got our nickname, "Gusties".)

The group was chaired by Jim Gilbert, Director of the Linnaeus Arboretum, and included **Tom Huber**, **Steve Mellema** and **Chuck Niederriter** from the physics department, Bob Douglas and Mark Bjelland from Geography, and other faculty members from around campus. We met with both College and St. Peter city administrators, and will continue discussions this fall.

A group of summer students, led by **Andrew Ohrt** ('02) and including **Scott Stephens** ('03), organized and carried out measurements of wind speed and direction five times every day at nine different sites on or near campus using a hand-held anemometer. Additionally, using funds given by the Environmental Studies program, the College purchased a computerized weather station. This station includes an anemometer that is mounted on a high mast in order to gather continuous data on wind speed and direction.

Anyone interested in participating in these discussions or in helping with the measurements should contact one of the persons mentioned in this article.



...an emphasis on moving toward sustainable, renewable sources of energy...

Study Abroad Possibilities

Gustavus has one of the highest percentages in the country of students who choose to study abroad during their college career. For physics majors, careful planning for a study abroad experience is essential, given the highly sequential nature of the courses required for the major and for adequate graduate-school or career preparation. There are several study-abroad programs available that can integrate more easily with our major.

The semester– or year-long program with the physics department at the University of Wollongong in Australia allows students to take a full range of physics courses.

There are also programs at the University of Lancaster, England, and the Gustavus exchange program with the Science University of Malaysia. None of these programs requires any knowledge of a foreign language, and courses may be taken to fulfill both physics-major and general-education requirements.

Be sure to talk with your advisor if you are interested in studying abroad.

For more information contact the Office of International Education located in the International Center next door to Olin Hall. The study-abroad coordinator is Carol Moline (x7546).

There are several study-abroad programs available that can integrate more easily with our major.

GUSTAVUS ADOLPHUS COLLEGE
PHYSICS DEPARTMENT

Olin Hall
800 West College Avenue
St. Peter, MN
56082

Phone: 507-933-7308
Fax: 507-933-6104

Editor: Steve Mellema
email: mellema@gustavus.edu

We're on the web!
http://physics.gac.edu

Editor's Note: This Newsletter is issued at the beginning of the fall semester for the benefit of current and prospective students, alumni, faculty and others interested in the physics program. Students enrolled in the major course sequence will also be receiving copies of the current physics curriculum and advising guide, the fall activity calendar, and a users' guide to the physics software on the department's computer network. Juniors and seniors will be offered copies of the AAPT brochure "Planning for Graduate Studies in Physics and Related Fields", written by Dennis Henry.

All students are reminded to make an appointment to visit with their faculty advisor early in the fall semester, to discuss study abroad, January and Spring registration, or any other item mentioned in this newsletter.

January Term 2002

This is the only scientifically oriented computer programming class taught on campus...

It may be hard to believe, but January Term registration is not that far away, and it is time to start thinking about enrollment options. The Physics Department will offer three courses this coming year.

Dennis Henry will be teaching PHY310, Electronics and Instrumentation II. The pre-requisite for this course is PHY270, Electronics and Instrumentation I.

Tom Huber and **Julie Talbot** will be team teaching PHY210, Fortran for the Physical Sciences. This is the only scientifically oriented computer programming class taught on campus, and is offered every other year during January Term. The course is suitable for all physics students, including freshmen, as the only pre-requisite is PHY200, Classical Physics I.

Chuck Niederriter and Larry Potts (from the Department of Chemistry) will be team teaching PHY202, An Introduction to Materials Science. This introduction to an important, active, interdisciplinary area of science is also suitable for anyone interested (including freshmen) with the sole pre-requisite being PHY200, Classical Physics I.