

Gustavus Physics

Radiations from Olin Hall

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Fall Semester 2004

Dates to Remember

- Sep. 8 Classes begin
- Oct. 5-6 Nobel Conference
- Oct. 23-26 Reading Days
- Nov. 9-23 January Term and Spring Registration
- Nov. 25-28 Thanksgiving Break
- Dec. 17-21 Final Exams

This annual newsletter offers highlights of the 2003-2004 academic year and summer, news from current students, recent graduates and faculty, and information about the physics program for the year ahead. An online version with color photos will be available at <http://physics.gac.edu> early in the fall semester.

Another large group of Gustavus physics students participated in funded research with faculty in Olin Hall this summer, as well as at universities and national laboratories. In May, we bid farewell to the fifteen physics majors from the Class of 2004. Graduates from this and recent classes continue to pursue a variety of graduate and professional degree programs and careers.



Three faculty attended the summer meeting of the American Association of Physics Teachers in Sacramento, California, as well as meetings of the American Physical Society and other professional organizations during the year. Faculty continue to assume leadership roles on campus and nationally. (See following columns and photos for these and other stories.)

Chapter of Sigma Pi Sigma Established in 2004

There has been an active chapter of Society of Physics Students (SPS) at Gustavus for almost 20 years. Through the initiative of current students, and particularly from some in the Class of 2004, and with the guidance of Professor Chuck Niederriter, we now have a chapter of Sigma Pi Sigma (ÓÐÓ), the national physics honor society. ÓÐÓ was founded in 1921 and is a member

honor society of the Association of College Honor Societies. Sigma Pi Sigma is a lifetime membership. Nomination and election are by the faculty, based on a combination of student achievement in course work, research, and participation in department and SPS activities.

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Sigma Pi Sigma and Annual Student Awards

(Continued from page 1)

Sigma Pi Sigma is a member of the American Institute of Physics and “exists to honor outstanding scholarship in physics; to encourage interest in physics among students at all levels; to promote an attitude of service of its members towards their fellow students, colleagues, and the public; to provide a fellowship of persons who have excelled in physics.”

The following members of the Class of 2004 were elected to Sigma Pi Sigma: **Amit Bohara, Jason Crnkovic, Scott Ernst, Nathan Johnson, David Kupka, and Andrew Konicek.**

Student Achievement Awards

Each year the physics department recognizes physics students for their achievements with a variety of awards, scholarships, and nominations.

Cory Christenson ('05) and **Kelly Younge ('05)** will share the Milward T. Rodine Memorial Physics Award for 2004. This cash prize is named for the longtime Gustavus professor of physics (who taught here from 1933-1969) and is awarded annually to rising senior physics majors on the basis of interests and scholarly achievements.

Jolene Johnson ('05) has received the Gerald and Julia Swanson Scholarship in Physics. This scholarship was established to honor the work of the physics department faculty who provided graduate Gerald Swanson with a background that prepared him for graduate study in physics and for a career with the Bendix Corporation.

Alan Evans ('05) was awarded the John Chind-

vall Scholarship in Physics. This endowed scholarship was established in memory of 1970 Gustavus graduate John Chindvall by his parents and friends.

Carl Ferkinhoff ('05) was selected to receive the Julian A. Crawford Memorial Prize in Physics. This prize consists of a check, of the right amount for membership in AAPT or a professional society of the student's choice. The prize is named in memory of the former chair of the Gustavus physics department (1967-69).

In consultation with the Physics Department, the Department of Mathematics/Computer Science has chosen **John Purdham ('05)** as the winner of the 2004-05 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.

Collin Meierbachtol ('07) received the Harold Q Fuller Memorial Award in Physics, which is given to the first-year student who has the highest overall record in Classical Physics I and II.





Faculty Activities

Steve Mellema spent a large portion of the summer moving, reconfiguring and installing computers in the department's labs. A total of 27 new Pentium-4 class machines have been installed in preparation for this coming fall's classes. He was aided by departmental summer assistants **David Fowler ('05)** and **John Purdham ('05)**, who helped out with assembly, hardware and software testing. His one summer break from St. Peter came on a 10-day trip with the family to North Carolina, with the Mellemas helping to move the family of Prof. David Koppenhaver (Education) to their new home. This fall, in addition to serving on the College's Faculty Senate Subcommittees on Budget and Compensation, Steve will take over as the physics department seminar coordinator for outside speakers. He will also continue his duties as department computer coordinator throughout the coming year. This fall he will teach PHY305 Experimental Modern Physics and PHY390 Introduction to Quantum Mechanics.

Chuck Niederriter had a relaxing summer. The pace was somewhat slower, but the summer included the usual mix of research, recreation, and service. Chuck continues to push the College and the city of St. Peter to consider wind power, organizing meetings with SMMPA and a tour of the Fairmont turbines. The acoustic research efforts continued, trying to make sense of data taken last summer and during the school year. Chuck began work on an alumni newsletter, soliciting information from physics alumni for the last 25 years and

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Additional Student Awards

Brendan Johnston ('05) received the Positive Derivative Award for a rising senior, and **Michael Phillips ('06)** for a rising junior. These awards are given to students in recognition of their improvement in physics, and promise of future achievements. The award consists of a check adequate to pay for a yearly student membership in AAPT, SPS, IEEE, ASME, or a similar organization.

Seth Hayek and **Carl Ferkinhoff** have been named Physics Departmental Assistants for Fall Semester, 2004. Each 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. Two other seniors will be appointed for the spring term.

SPS Officers for 2004-05

Society of Physics Students Chapter Officers for this year are:

Senior Co-President: **Carl Ferkinhoff ('05)**

Junior Co-President: **Erika Galazen ('06)**

Treasurer: **Cory Christenson ('05)**

Activities Coordinator: **Mike Phillips ('06)**

Sophomore Rep: **Nate Souther ('07)**

The first meeting will occur early in the fall semester, at which time the new officers will outline their plans for fall activities. The faculty will also make brief presentations about opportunities for student collaborations in research and course development projects.





Faculty Activities (continued from p. 3)

(Continued from page 3)

editing it for a late summer publication date. Several days were spent helping with the construction of a house for Habitat for Humanity. In early August Chuck attended the AAPT meeting in Sacramento, serving as Minnesota section representative, learning what is new in physics and astronomy education, and visiting with alumni and colleagues from across the country. In addition to camping trips in Minnesota, Chuck and his family visited the grandparents in Pennsylvania and his sister in Arizona.

Chuck continues as Advisor to The Society of Physics Students Chapter and Sigma Pi Sigma. He serves on the new Review Committee for faculty appeals, among other commitments. He will again be supervising the department's tutoring program, and the evening observatory schedule.

Dennis Henry spent most of the summer in St. Peter, putting in time on department and faculty committee work, making lab manual revisions, reviewing manuscripts for *Am. J. Phys.*, and catching up on projects at home. The last category included editing and narrating family and railroad digital film files for DVDs and tape, and designing new model railroad products, on-line and printed catalogs. Computer hardware and software upgrades and repairs ate up way too much time, as usual. The model railroad rooms got gas heat at the end of the summer, which may (or may not) encourage more construction activity.

Travels were limited to short trips to the Twin Cities and Chicago, with a focus on museum exhibits in transportation and technology. (Memories of snorkeling around St. Croix U.S. Virgin Islands in January will have to suffice for that sort of water activity this year.) He plans to attend the annual meeting of the Lex-

ington Group in Transportation History in Kansas City in late September, where he will preside at one of the sessions and handle sign-ins. During January Term he will teach his course "Railroads in American History", for the first time since 1998.

He is teaching Classical Physics III with two labs in the fall semester, and probably Electronics and Instrumentation I in the spring. He is completing the third year of his fourth term as department chair this year. He was re-elected to represent the Academic Operations Committee on the Instructional Infrastructure Advisory Committee, and will chair the latter again this year.

As his sabbatical year draws to an end, this has been a busy summer for **Tom Huber**. At the start of the summer, he went on a 3,000 mile road trip with the family. First they spent a few days in Knoxville, TN while his daughter competed in the global finals of Destination Imagination. Then they spent four days in Washington, DC visiting the monuments and museums. This was a wonderful family vacation - both enjoyable and educational.

For the remainder of the summer, Tom was working with **John Purdham ('05)** on acoustics projects. The major project was to develop methods for measuring the vibrations of small objects, such as the reed from reed-organ pipes, or the suspension for a hard-disk head. During his sabbatical, Tom collaborated with researchers in the ultrasound group at the Mayo Clinic to develop a non-contact method for exciting vibrations in these small structures. This fascinating technique uses the interference of a pair of ultrasound sources, that are driven at different frequencies, to produce an audio-range beat frequency. To measure vibrational modes requires a \$150,000 scan-

(Continued on page 5)



Faculty Activities (concluded)

(Continued from page 4)

ning vibrometer; while the group at Mayo can afford a unit like this, it is well out of the price range of Gustavus. By combining the used single-point vibrometer purchased a few years ago, along with a lot of items purchased on eBay, John and Tom have developed a system that can take the same measurements as a scanning vibrometer. As of this writing, they have started to make measurements using their ultrasound sources and their "bargain-basement" vibrometer. Stop by the lab sometime to see this system in action. Also, let Tom know if you are interested in working on any projects in acoustics.

Other projects that Tom worked on this summer include preparing the lab manual for General Physics, working on the NCATE teaching accreditation documentation, and getting ready to teach courses that he has not taught for several years: General Physics, Statistical Mechanics, and Senior Seminar. He was appointed as faculty representative to the Web Advisory Committee, and continues to serve as the dual-degree/pre-engineering advisor, and as the department's liaison to Folke Bernadotte Library.

Paul Saulnier reported a summer filled with research, class prep, committee work, and even a family vacation. The research consisted of three main projects; time-resolved photon correlation spectroscopy, spatially modulated light imaging, and the use of radial distribution functions as a means to study swarming behavior in nature. The first of these projects involves studying the behavior of small particles suspended in a fluid using femtosecond light pulses. The second study deals with imaging absorbing structures inside a highly scattering media using spatially modulated light. Finally, the radial distribution function work entailed investigating the organizational structure of zooplankton swarms of different species. Paul

and the five research assistants had fun and managed to learn a great deal.

Paul was elected as chair of the Faculty Personnel Committee, and will continue to direct the Faculty Shop Talks series on campus.

Jennings Ellis reported spending a quiet summer in St. Peter. He will share duties for the General Physics labs with Tom Huber this year, while the labs undergo redevelopment.

Benjamin Bousquet served this past year as visiting assistant professor and Tom Huber's sabbatical leave replacement. He taught General Physics I & II, Nuclear Physics, and Modern Physics this past year. He received his Ph. D. in December in experimental high energy physics at the University of Minnesota, and has accepted the position of assistant professor of physics at Wartburg College in Waverly, Iowa. Congratulations, Ben!



Chuck Niederriter registers Amit Bohara into Sigma Pi Sigma at the award ceremony during the spring picnic.



Student Summer Research and Internships

At the end of the spring semester we had received information from more than a dozen students about summer research appointments and internships. We expect to hear many interesting SPS talks based on their work and experiences. The following appointments were known at press time:

Amit Bohara ('04), funded research with Jan Wotton, GAC Psychology Department

Cory Christenson ('05), REU in Infrared Astronomy, University of Wyoming

Scott Ernst ('04), GAC research with Paul Saulnier, supported by PRF grant

Alan Evans ('05), REU in Mechanical Engineering, University of Minnesota

Carl Ferkinhoff ('05), REU in Astrophysics, Cornell University, Ithaca, New York

David Fowler ('05), GAC research with Paul Saulnier, supported by NSF-RUI grant

Joshua Jacobson ('06), GAC research with Paul Saulnier, supported by PRF grant

Sharon Jaffe ('06), internship in Meteorology, WBBM-CBS in Chicago

Jolene Johnson ('05) REU in Physics, University of Minnesota

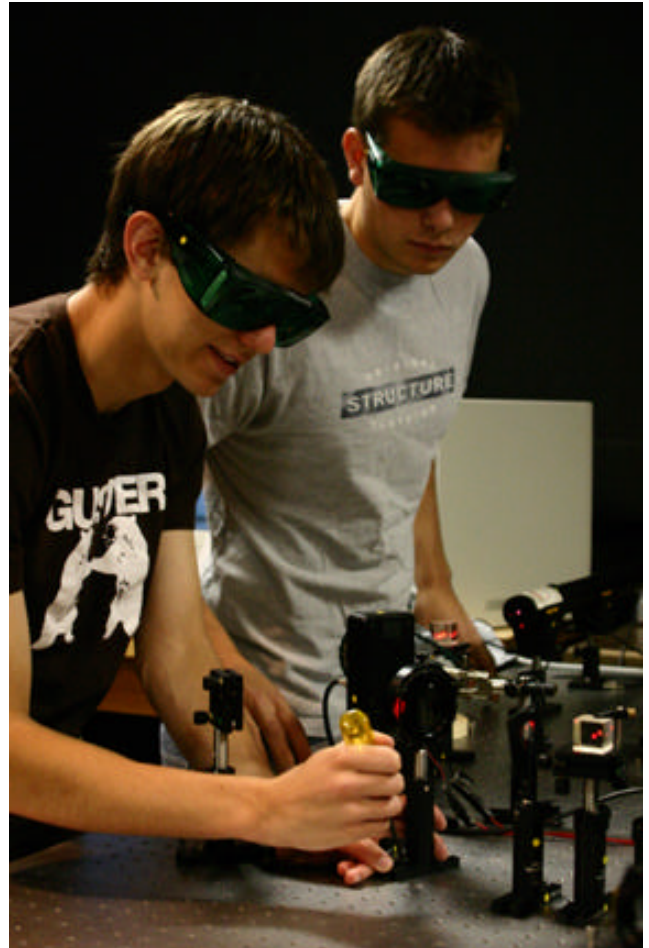
Nathan Johnson ('04), GAC with Paul Saulnier, supported by PRF grant

Brendan Johnston ('05) NSF-RUI with Paul Saulnier

John Purdham ('05) GAC Presidential Faculty-Student Research Collaboration in Acoustics with Tom Huber

Dorea Ruggles ('06) SURF Fellowship, NIST, Washington, D.C.

Kelly Younge ('05) SURF Program, Mayo Clinic, Rochester, Minnesota



No these are not the Men in Black preparing to erase the memories of witnesses. Rather, they are Josh Jacobson and David Fowler making adjustments to their experiment in Paul Saulnier's optics research lab. The red laser beam is only for alignment purposes. The normal beam is a (very) bright green. Paul's image (in orange) is seen below on a student's Halloween sculpture.





Visiting Speakers

The physics program is enriched by colloquia given by distinguished scientists and engineers from universities, national laboratories, and industry. These complement talks at SPS meetings given by students and faculty about their internships and research. Paul Saulnier coordinated our colloquium series last year, when we hosted the following speakers:

Dr. William H. Butler, University of Alabama and Theory Group Leader, Metals and Ceramics Division, Oak Ridge National Laboratory, "Applications of Chemistry, Physics, and Materials Science to Advanced Data Storage Technologies" September 19, 2003. Joint Chemistry-Physics Seminar.

Dr. Nimmi Ramanujam, Department of Biomedical Engineering, University of Wisconsin, "Non-invasive Optical Detection of Breast Cancer," November 6, 2003.

Dr. Michael DuVernois, Department of Physics, University of Minnesota, "Chasing the Highest Energy Particles in the Universe: Adventures in Argentina, Antarctica, and Space", February 25, 2004.

Dr. James Brooks, National High Magnetic Field Laboratory and Department of Physics, Florida State University, "Diamagnetism- The Less Well-known Force and the Levitating Frog" and "Extreme Physics in High Magnetic Fields", March 29-30, 2004.

Dr. Eileen Friel, National Science Foundation Division of Astronomical Sciences, "How old are you really? How Elements Form" and "A Walking Tour of the Galaxy", sponsored by the Harlow Shapley visiting lectureship program, April 20-21, 2004

Recent Visiting Faculty Update



Dr. Todd Coleman and Dr. Rellen Hardtke celebrated the birth of their first child, daughter Anika Hardtke Coleman, on May 26, 2004. Todd and Rellen were with us as visiting assistant professors in the 2002-03 academic year, and moved to assistant professor appointments this past year at Claremont-McKenna and Scripps Colleges (Todd) and Cal Poly (Rellen) in Pomona, CA. The proud parents and daughter attended the AAPT Summer Meeting in Sacramento, and the former will return to their academic duties in Pomona this fall. Welcome, Anika!

George O'Clock, professor of electrical engineering at Minnesota State University-Mankato joined us as adjunct professor this spring to teach our Condensed Matter Physics course and laboratory. George is taking early retirement from MSU-Mankato and is interviewing for research and adjunct positions in this area and California. This summer he contributed his time to compiling a laboratory manual for the course he taught here. Thank you, George.



Graduating Class of 2004



The Class of 2004 and faculty posed on Commencement Day, May 30, in Olin 103, where it all began with Classical Physics I almost four years earlier. They are identified below, with their post-graduate plans (from left to right.)

Koft Ntim, Graduate Studies, Actuarial Science, University of Louisville

Chuck Niederriter, Professor

Kristi Hermansen, Post-B.A. studies before dental school, University of Minnesota

Steven Mellema, Professor

Kathlyn Wells, Graduate Teaching Assistantship, Astrophysics, Wash. University, St. Louis

Paul Saulnier, Associate Professor

Scott Ernst, Graduate Teaching Assistantship, Physics, University of Oregon

Andy Konicek, Graduate Teaching Assistantship, Physics, University of Wisconsin

Dennis Henry, Professor and Chair

Nathan Johnson, Graduate Assistantship, Atmospheric Physics, University of Arizona

Benjamin Bousquet, Visiting Assistant Professor

David Kupka, postponing graduate studies in favor of technical employment or teaching

Colin Bosman, Graduate Studies, Mechanical Engineering, Marquette University

Matthew Treichel, Graduate Studies, Electrical Engineering, University of Minnesota

Mark Berger, Law School, University of Minnesota

Joshua Steffenson, Graduate Studies in Secondary Science Education, University of New Haven

Amit Bohara, Graduate Research Assistantship, Mechanical Engineering, Vanderbilt

Joe Rodriguez, Graduate Assistantship, Electrical Engineering, New Haven University

A. Jennings Ellis, Adjunct Instructor

Jason Crnkovic, Graduate Teaching Assistant, Physics, University of Illinois-Urbana

Not pictured:

Nathan Aul, Graduate Fellowship, Transportation Engineering, University of Minnesota

Tom Huber, Associate professor

From the Class of 2003:

Jeremiah Jazdzewski, Graduate Teaching Assistantship, Astrophysics, University of Minnesota



Physics Alumni Lead Career Panel at SPS Meeting



Physics grads Ross Schermer ('99), Jon Bentley ('97), Peter Hultgren ('91), Aaron Schmidt ('95), Kris Fredrick ('96), Brent Harrold ('96), and Karl Erickson ('96) talked about their education and careers on May 4 to a large and very interested group of current students and faculty.

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, Eng-

land, 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.

Students interested in studying abroad should talk with their academic advisors. 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).

Photo Gallery



Physics majors from the classes of 2005-2006-2007 were well represented at the President's Ball in the International Market Square in Minneapolis on March 13, 2004 .



“Pirates” John Purdham and Jared Lee pursue the Treasure of the Milikan Oil Drop in Experimental Modern Physics. Their reward was approximately 1.6×10^{-19} Coulombs per small drop, which isn't much charge.



Photo Gallery



Seniors David Kupka, Scott Ernst, Jason Crnkovic, and Kristi Hermansen generously assist Ben Bousquet in solving the problem of consuming the cake he was presented at the spring picnic in the Interpretive Center.



Carl Ferkinhoff ('05) supplied this photo, which he entitled "Physics Majors Road Trippin' to Lake Superior". The chilly dippers, all from the Class of 2005, are (L-R) Seth Hayek, Jolene Johnson, Cory Christenson, and Carl Ferkinhoff.

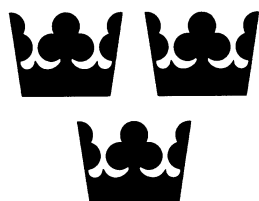


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We're on the web!
<http://physics.gac.edu>

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 receive copies of the current physics curriculum and advising guide and a users' guide to the physics software on the department's computer network. Seniors have received copies of the second edition of the AAPT brochure "Planning for Graduate Studies in Physics and Related Fields", written by Dennis Henry, and juniors will receive copies this fall.

All students are reminded to visit with their faculty advisor early in the fall semester, to discuss their plans for the year, research opportunities, pre-professional and graduate studies, study abroad, or any other items of mutual interest.

January Term 2005

Three physics faculty will offer January Term courses this year.

Chuck and Debbie Niederriter will lead PHY-112 Astronomy in Southern Skies.

Tom Huber will teach PHY-310 Electronics and Instrumentation II. This course fulfills the project requirement component for the major, and will have a thematic emphasis to be announced before registration.

Dennis Henry will offer HIS-103 Railroads in American History.

Steve Mellema and Paul Saulnier are taking leaves this January, and will be working on a variety of research and curricular projects.

Research or Internships?

A high percentage of our majors will complete at least one research internship or experience before they graduate. These experiences most often take place during the summers following the sophomore and junior years, but there are programs that will accept first-year students.

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 appointments described by students in SPS meetings this year sound interesting, talk to your advisor or to Tom Huber, who is the department's internship coordinator. Check the bulletin board outside room 206 and the department web pages for announcements.