



Gustavus Physics

Physics Department Newsletter

September 2011



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Fall 2011 Dates to Remember:

Classes Begin	Sep. 6
Last Day to Register for Fall Classes	Sep. 19
January Term Registration Begins	Oct. 31
Spring Semester Registration Begins	Nov. 6
Final Exams Begin	Dec. 16

Research Facilities Being Upgraded

This past year the Gustavus physics department received a \$253,000 grant from the National Science Foundation for improving the research labs in Olin Hall.

In October 2010, **Tom Huber** and the rest of the department received a \$253,000 NSF-ARI grant for upgrading the research labs in the basement of Olin Hall. During the past year, we have developed a detailed plan and met with the architects to prepare for the construction that will take place during this academic year.

This project will accomplish several critical goals: of primary importance is modifications to the air handling system to minimize serious problems of humidity, noise and vibration that limit many of the high-precision, low- noise experiments

that we pursue in the departmental research labs. Another goal will be to complete the acoustical isolation of the new acoustics lab that was constructed to house Huber's vibrometer and acoustics research program. Huber's old lab will be upgraded for **Jessie Petricka's** research program to develop a cold molecule source. There will also be important upgrades to the electrical, network, mechanical and safety systems to enhance the productivity and safety of the research spaces. This will allow more capabilities for high-quality on-campus faculty/student research opportunities.

Student Awards

Departmental Awards for 2011-2012



Each year the physics department honors a select group of its majors with special awards. The awards for the upcoming year are nominated and decided by a vote of the physics faculty taken in late spring. A list of the honorees for 2011-2012 follows:

Jared Ferguson ('12) and **Nara Higano ('12)** will share the Milward T. Rodine Prize in Physics, which is awarded to a rising senior physics major on the basis of interests and scholarly achievements. It is generally given to the top senior physics major. This prize is named for the longtime Gustavus professor of physics who taught here from 1933-1969.

Brandon Furey ('12) is the winner of the 2011-2012 John Borneman Prize Par Excellence in Mathematics Scholarship, which is decided jointly by the Physics and Mathematics/Computer Science faculty, and is often given to a high achieving student who is a math/physics double major. This award is named in memory of John Borneman, a 1955 Gustavus graduate, by his family.

Trenton Pray ('12) is the recipient

of the Gerald & Julia Swanson Scholarship in Physics, awarded each year to a "physics student with high promise." This endowed scholarship was established to honor 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 Bendix Corporation.

Nathaniel Beaver ('12) will receive the John Mark Chindvall Memorial Scholarship in Physics, which is designated for a physics major demonstrating character and scholastic ability. This endowed scholarship was established in memory of 1970 Gustavus graduate John Chindvall by his parents and friends.

Nick Atkins ('12) is the winner of the Julian A. Crawford Memorial Prize in Physics, which is generally given to a student who has been active within the department and who has the potential to well represent physics to the larger society. The prize is named in memory of the former chair (1967-69) of the Gustavus physics department.

Elliot Bell ('14) and **Joshua Tveite (PSEO)** were the co-winners of the 2010-2011 Harold Q. Fuller and Richard M. Fuller Award in Physics. This award is given to the first-year student majoring in physics who has compiled the highest overall grade record. It was established in 1997 by Professor Emeritus Richard M. Fuller (who taught at Gustavus from 1968-1999) and his wife, Judith. The award honors Richard's late

father "HQ" (a researcher in the Manhattan Project and physics professor and dean at the University of Missouri, Rolla) for his lifetime commitment to the teaching of young people.

Nick Atkins ('12) and **David Buckley ('13)** were each the winner of a Most Improved Award (a.k.a. positive derivative award) which may be given to the sophomore or junior physics major who has shown the most improvement during the academic year (relative to earlier in the year or the previous academic year).

Trenton Pray ('12) and **John Schmidt ('12)** have been named the Physics Department Academic Assistants for Fall Semester 2011. These are paid positions awarded to students who are active within the department. These positions have a nominal expectation of four hours per week in research, course development or other activities that will assist in the work of the department.





Nine New Members Inducted into the Gustavus ΣΠΣ Chapter

On the evening of May 5, the physics department held its annual banquet and induction ceremony for Sigma Pi Sigma, the national physics honor society. ΣΠΣ 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 guest speaker for the evening was **Dr. Eric Montei ('89)** from Seagate Corporation in Bloomington. The topic of his talk was “Disk Drive Technology 101”. He gave a marvelous explanation of the technological challenges that confront hard-disk manufacturers whose drive heads suspended over spinning platters “are like a 747 flying at 500 mph six inches above



Dr. Eric Montei ('89) gives a talk on disk-drive technology



Students enjoy the banquet

your lawn counting each blade of grass.”

Membership in the Gustavus chapter of Sigma Pi Sigma is earned through a combination of academic, research, and service activities. The nine students inducted this year, all from the graduating class of 2011, were **Bryce Bjork, Sam DeFranco, Quentin Ebner, Justin Helps, Amanda Hochstatter, Erik Huemiller, Annie Kleinschmidt, Dan McDougall and Dan Mellema.**

Gustavus Society of Physics Students

Gustavus is home to a very active Society of Physics Students (SPS). SPS is a professional association explicitly designed for students. Membership, through collegiate chapters, is open to anyone interested in physics. The only requirement for membership is interest in physics. Twice in the past five years, our chapter has been recognized by the SPS national organization as an “outstanding SPS chapter”.

The Gustavus SPS conducts weekly social activities every Friday evening throughout the year, including football, softball, ultimate frisbee, etc. Eleven students presented summer and academic year research at SPS meetings. This past year we also had six outside speakers and a panel of physics professors discussing their research and opportunities for students to become involved. In addition, we had meetings where faculty and students presented information about internships and graduate school preparation.

SPS also involves students in community service and



Twice a year the Gustavus SPS cleans a section of US Highway 169



SPS October camping trip to the Soudan mine

outreach activities. Each fall, during the College’s annual Nobel Conference®, the SPS students put on a physics demonstration show for the general public. They also participate in Gustavus’ Science on Saturday program which attracts area students from elementary and middle schools. For an afternoon each spring, the SPS plays host to the entire sixth grade from St. Peter North Intermediate School.

The Gustavus SPS chapter participates in the Minnesota Department of Transportation’s “Adopt a Highway” program, and in building activities for Habitat for

Humanity.

The SPS club also makes field trips. This past year they visited the Soudan underground mine in northern Minnesota (home to the MINOS neutrino experiment) and also to the Bakken Museum of Electricity and Magnetism in Minneapolis.

For 2011-2012, the Gustavus SPS officers are:

Co-presidents: **Nara Higano ('12)** & **David Buckley ('13)**

Secretary: **John Schmidt ('12)**

Treasurer: **Jared Ferguson ('12)**

Activities Coordinator: **Brandon Furey ('12)**

Sophomore Representative: **Roman Mays ('14)**



Gustavus SPS students fire their “potato cannon”, much to the delight of the elementary school students at “Science on Saturday”

Faculty Summer Happenings



Ileana Dumitriu says, “My summer was spent on research and some travel. In late spring, **Amy Audette ('12)** and I participated in an experiment focused on interaction of negative ions with X-rays at Berkeley National Laboratory. The experiment was conducted in collaboration with the Western Michigan University AMO group. During the summer we worked on the collected data, mainly using the Interactive Data Language (IDL) software to design an interface for just-in-time data analysis. I am looking for students interested in working on research projects studying the interaction of negative ions with X-rays. Negative ions are a special class of atomic systems with properties very different from neutral atoms and positive ions. Understanding negative ions could offer a more general understanding of systems such as nanostructures and superconducting materials. I spent a few weeks in Michigan visiting my husband. This was my first summer in Minnesota, and I wanted to explore its outdoors. I've fallen in love with the north part of the state; the Boundary Waters Canoe Area is such a fascinating place. Since discovering it, I did two camping trips and am looking forward to the fall colors there.”

Tom Huber is returning from an intense, year-long, on-campus sabbatical and summer of research. He had a very productive year studying acoustics and vibration of objects with the goal of developing high-quality on-campus faculty student research opportunities. During the summer, he had NSF-sponsored funding that allowed him to work with three Gustavus physics students: **John Schmidt ('12)**, **Amanda Hawkinson ('13)** and **James Trevathan ('14)**. One particular highlight was studies of vibration of micro-cantilevers that were only 1/4 mm in length. Because of the capabilities of the state-of-the art Polytec PSV-400 scanning vibrometer purchased last year, they were able to study ultrasound-radiation force driven vibration of these cantilevers with resonance frequencies up to 2.5 MHz; the previous published upper limit that Huber was able to study using his older vibrometer system was 200 kHz. Huber will be looking for students to participate in acoustic research this academic year.

Steve Mellema had a wonderful summer, which began with double graduations: older son Dan from Gustavus (see the photo on page 7) and younger son Jacob from St. Peter High School. These were followed by a one-month family trip to Malaysia, where they visited

family and friends and also went hiking in the rainforest and snorkeling on a coral reef. Steve also paid a visit to his old Peace Corps town of Pasir Puteh, Kelantan, where he gave a talk to a group of high school students on the importance of science and mathematics education.



Steve Mellema returns to his former Peace Corps home (Pasir Puteh, Kelantan, Malaysia, 1972-76) to speak to a group of high school students

Part of his time in Malaysia was also spent investigating the possibility of creating a Gustavus semester-long study-abroad program in that country. Soon after returning to the USA, Steve attended a workshop on “Using Astronomy to Teach Physics” at the University of Nebraska. In addition to his teaching responsibilities, Steve will again be the Chair of the Gustavus Faculty Senate this year.

Jim Miller spent lots of time this summer working on the physics department's computer infrastructure. He migrated the physics domain controller, file sharing, and web server functionality to a new virtual server (Windows Server 2008-R2). He also updated the computers in the physics library; later in the fall there will be new desk spaces in the library to support five computers. Much of his summer was spent in part-time work for Pacific Northwest National Laboratory, enhancing a web-based system simulator for roof-top commercial air conditioners. Jim writes, “As usual, our family made it up to Mille Lacs lake for a summer break. We finished up with a nice four-day canoe trip from Sea Gull to Ogishkemuncie in the Boundary Waters Canoe Area.”

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Graduating Class of 2011



Back Row: Chuck Niederriter, Tom Huber, Jessie Petricka, Adam Snyder, Paul Saulnier, Quentin Ebner, Sam DeFranco, Bryce Bjork, Ben Wolf, Drew Hedlund, Dennis Henry, Jim Miller, Steve Mellema. Front Row: Will Grant, Dan Mellema, Amanda Hochstatter, Annie Kleinschmidt, Dan McDougall, Justin Helps, Erik Huemiller. Not Pictured: Jeremy Hendrickson

At the 2011 Commencement ceremony, which took place on May 29, fourteen students graduated from Gustavus having completed a major in physics. That made it a typical year, with the graduates heading off in many different directions. Some of them have written to share their memories and future plans and some words of advice based upon their experiences here.

Bryce Bjork says, "I am currently studying Atomic and Molecular Optics as a graduate student at the University of Colorado at Boulder and have been thoroughly enjoying both the department and the climate. I've been asked to offer

some advice to current undergraduates, so I will describe two things that I have learned over the past couple of months that might be helpful. First, know that you are truly in a top-notch program with many options following graduation. Do not be afraid to strive for what you want. Second, relish the opportunity to be in such a unique department. The faculty, my classmates and friends, and the intimate nature of the department have all helped me to grow as a physicist and as a person. The close-knit physics community at Gustavus is not a part of all institutions, so enjoy it while you can."

Sam DeFranco writes, "I went to

Alaska for quite some time and have recently returned. My experience at GAC was a lot of fun and very fast. I really enjoyed my time as a swimmer and in the physics office. I plan on enjoying this next year off, and then returning to school for a Masters degree in some type of engineering, I'm not really sure what kind yet, but that's what this time off is for. My advice: enjoy every minute because you miss it when you are done; even the late nights working on labs and homework."

Quentin Ebner says, "My immediate plan is to enter graduate

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school in physics at the U of M Twin Cities, where this summer I am a research assistant in a biophysics lab that studies the information processes and mechanics of DNA, RNA, and proteins. Words of wisdom: working in groups is the cornerstone for finishing the major well. Late nights (about 2ish) working on E&M and Mechanics will be the most memorable parts of physics. The junior/senior level labs are a blast. And Sam and I almost discovered anti gravity during the Millikan oil-drop experiment until we found our focal point was misplaced causing an inverted image. Also, SPS does a lot of fun stuff. Finally, do research with professors during the school year.”

Will Grant writes, “Overall my experiences at GAC were very influential in shaping who I am. I consider my choice of major in physics to be one of my wisest decisions. I must admit that I struggle to grasp things the first few times I am learning them. But my exposure to a wide range of systems and problems throughout my time at Gustavus has helped me enter into new problems with the mindset that I've seen things like this before. In my work at Bosch Security Systems / Electro-Voice, characterizing complex mechanical and acoustical systems becomes simple when you realize that almost everything can be explained in terms of harmonic oscillators and equivalent electrical circuits. The strong foundation that Gustavus provided in the fundamentals of circuits and the physics of why passive electronic components behave certain ways has greatly helped me become a valuable asset to the engi-

neering team here.”

Drew Hedlund writes, “My experience at GAC was simply amazing. I firmly believe that no other institution is able to offer the experience which GAC did every year. Not only did GAC provide a challenging and stimulating academic curriculum, but an incredible sense of community and friendship. I am now attending the U of M with the goal of obtaining a MS in Mechanical Engineering. I am also working in the NOvA lab which is investigating the neutrino. My main word of advice is really get to know your professors. They are amazing and always willing to help and advise you.”

Justin Helps says, “I'll be starting my PhD in Materials Science at the University of Minnesota in just a few weeks. My plans for afterward are still quite up in the air. My best advice for younger students is to ask questions freely. If something doesn't make sense, don't be shy. My tendency was always to just keep quiet and think about it some more, but by the time I figured it out or gave up, I had usually missed a part of lecture and put myself behind even more, or spent half the night working on one homework problem when I could have collaborated with others and seen their way of thinking. As long as you make sure you understand the subject by yourself afterward, getting help can give you a quicker, easier, and better understanding.”

Jeremy Hendrickson writes, “My future plans in the short term are to work for MetLife as a financial services representative and am in the process of getting the rest of my licenses in order to solicit and



A special moment: Professor Steve Mellema (Gustavus physics major '72) presents a diploma to his son, Dan Mellema (physics major '11)

sell Life Accident and Health insurance as well as annuities, mutual funds, etc... Words of wisdom: Get involved! Go to the tutors, ask questions of your profs, especially in physics, and really bust your hump to learn the basics and it will help you tremendously in the later courses.”

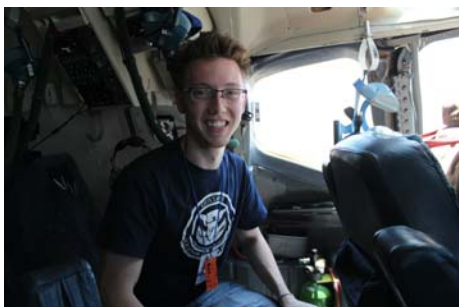
Amanda Hochstatter says, “My favorite physics memory was the bonding that took place over sophomore spring semester with my class as we learned how to work together. This year I will be working as a volunteer (program coordinator) with St. Martin Lutheran Church in Port Huron, MI. I will be in charge of planning and carrying out the activities for many different generations ranging from preschool to seniors. Part of my position will be helping teach low-income children and adults how to read at a nearby public school (and

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2011 Student Summer Internships

Every summer, a number of Gustavus physics majors obtain internship positions across the country in areas related to their studies. It's a great way to experience first-hand what a particular job or career would be like after graduation. This year at least ten Gustie physics majors worked in a variety of programs in Minnesota and across the country. Many of them have written to share their experiences.

Nick Atkins ('12) writes, "Participating in the NASA Student Airborne Research Program has truly been an amazing experience. A highlight of the internship so far has been flying down low from 1000 to 1500 feet over the Central Valley in California while in the cockpit, as well as doing a missed approach over LAX in order to collect air samples. (A missed approach is when the airplane stays about 100 feet above the runway instead of landing.) This internship has given me a



Nick Atkins ('12) in the cockpit of a NASA research plane

chance to do real research, to create my own project and run with it. My own research project is dealing with the hydrocarbon seeps in the Santa Barbara Channel. Specifically, I'm using the MASTER imagery to both qualitatively and quantitatively locate and analyze the location of Hydrocarbon seeps.

I'm also tying this together with High Frequency Radar information (HF Radar) from the UCSB Ocean Current Mapping Project to see if I can model the path of the Hydrocarbons using sea current data. As for the future, this internship has both helped define my interests as well as enlighten me to how much more NASA does than just launch people into space. Earth Science is an interesting and dynamic field that I could easily see myself involved with as a career."

Amy Audette ('12) worked at Gustavus this summer with Professor Chuck Niederriter under the auspices of a National Science Foundation grant. She says, "The main objective of this summer's research was to create, reproduce and finalize introductory and intermediate labs used in Gustavus' class rooms to create an awareness of the environmental impact of students' lifestyles. The research, though focused, was not limited to intermediate levels; advanced research topics were also explored. A new geothermal loop installed outside of Olin Hall, is used to cool and heat the building by taking advantage of a natural reservoir. A reservoir eight feet under the new West Mall has a predicted constant temperature year round. To take advantage of this constant temperature, a heat pump is used to pump heat into the reservoir in the summer and cool the building and the reverse in the winter to heat. One of the contributions we made to this design was the research on which temperature sensors to use, and then to produce pipes, full temperature and moisture sensors that are installed underground near the loop for future research on the

reservoir. This research will be focused on determining if a geothermal loop does allow for the ground temp to be constant and how far from the pipe does the ground temperature remain constant."

Nathaniel Beaver ('12) spent the summer at the Minnesota Supercomputing Institute doing research development for the OpenKIM project (openkim.org). Most of his time was spent writing C and Fortran code to implement models of potentials of silicon atoms. Nathaniel writes, "The U of M is the size of a small town. I didn't use any remarkable equipment, I'm afraid—just code. I actually didn't even need to use the supercomputers, which are big, noisy, and cooled by many gallons of cold water per second. But, I got to see 'H.M.S. Pinafore' at the Guthrie and the King Tut exhibit at the science museum, took the GRE, and even tried some fencing. Today I'm doing a polka party!"

Jared Ferguson ('12) says, "This summer I worked under a NSF-REU grant at Louisiana State University with Dr. Thomas Kutter and Dr. William Metcalf studying neutrinos, specifically determining the new upper limits on their mass and velocity using results from the T2K experiment. From Tokai to Kamioka (T2K) is a long baseline neutrino experiment located in Japan. The large number of neutrino interactions created in T2K, the efficient energy reconstruction of neutrino events, and the precise GPS time synchronization (to the nanosecond) of the near and far detectors, made it ideal for calculating neutrino mass and velocity.

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To determine the velocity of neutrinos we looked at arrival times at the near detector and compared them to arrival times at the far detector ~300 km away. After factoring in delays caused by electronics and fibers, the time it took for light from the interactions to reach the sensors, and the uncertainties in the GPS and internal clocks, we determined the time of flight (TOF) for the neutrinos between the near and far detector. Comparing this to the expected TOF of ~1msec if neutrinos were massless, we arrived at the new limit on neutrino velocity. In addition, using reconstructed energy of Charge Current neutrino interactions and relativistic equations, we were able to set an upper limit on the mass of a neutrino.”

Brandon Furey ('12) was also a participant in the NASA Student Airborne Research Program. He writes, “I spent five weeks at the University of California-Irvine and one week at the Dryden Aircraft Operations Facility. The program was divided into three groups – the air, ocean, and land groups. I was assigned to the land group whose overarching goal was to develop tools to better monitor crop water status of almond and pistachio orchards to avoid overwatering so that irrigation can be more efficient. Water is a scarce and expensive resource in California and so efficient irrigation in farming is practically mandatory. At the start of the second week, I flew in the NASA DC-8 flying laboratory, a 4-engine jet with several scientific instruments on board. By imaging in wavelengths that the human eye can't see, from the infrared



Brandon Furey ('12) measures ground reflectance using an \$80,000 spectrometer backpack

through the visual spectrum, information can be obtained from the ground about surface temperature, the presence of vegetation, and even the fraction of leaves covering a certain area of ground. Our research flights took us over the almond and pistachio orchards of Paramount Farms in the Central Valley of California at 13,000 feet. Once we had our data, we moved back to Irvine for the data analysis. I focused on developing a model that uses surface energy balance algorithms to calculate evaporation and transpiration from the ground. Having very little experience in earth system science and never having used some of the computer programs that the program utilizes before, I was still able to jump right into working on my project. This was because of the problem solving skills and mathematical way of thinking that the Gustavus physics department has taught me.

As a result, this internship has opened up a lot of doors for me and allowed me to make many connections and, most importantly, it has been an incredible learning experience.”

Amanda Hawkinson ('13), John Schmidt ('12) and James Trevathan ('14) spent the summer working in Professor Tom Huber's Ultrasonic Acoustics lab at Gustavus. John writes, “James, Amanda, and I studied cantilever and micro-cantilever acoustics. For part of the summer I designed an application for documentation. I have spent the other part of my summer analyzing the eigenfrequencies of a macroscale cantilever in both water and air. The water experiments were performed at Mayo Clinic and the air experiments at Gustavus. I am actively making a COMSOL model of the cantilever in a fluid and have also found an analytical model of the experiment which matches reasonably to what was found experimentally. I have really enjoyed my work this summer.”



James, Amanda and John with the scanning laser vibrometer

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Parting Words from the Class of 2011

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recruiting retired teachers to help). As for long term plans, I may re-submit my application to Peace Corps (it's on hold for a year), but I may want to do something else. Words of Wisdom: Learn to laugh at yourself frequently. Accept mistakes as part of the learning process, but more importantly grow from them. Celebrate small accomplishments daily."

Erik Huemiller says, "I will be attending the University of Illinois U/C this fall. I have a teaching assistantship for the first full year that should be a great chance to refresh and solidify the basics. I am studying for a first shot at the physics Qualifier exam in early September. As for words of wisdom, I would just say that you should do what you really want to do. Academics are important, but there is more to life than reading text books and solving differential equations."

Annie Kleinschmidt writes, "Gustavus is a wonderful school and the physics department is even better. Working with amazing professors and other hard-working and fun-loving students made the four years just fly by. My experience at Gustavus was great! I loved how easy it was to get help from a professor if needed and meet people who were interested in similar and different things. I just started a part-time job at 3M working as a technical aide (lab assistant) and hope to later get a full time job there working in a division that is more suited to my physics field of study. I would like to leave you

with a bit of advice. Don't forget to leave time to have fun as well as studying. Physics is difficult and time-consuming but is well worth the work, effort, and money you put in. In the end you will come out with great problem solving skills, wonderful friends (from all the time spent working together), and a degree that is sure to impress!"

Dan Mellema says, "I am a Ph.D. candidate at the Mayo Graduate School in Biomedical Engineering and currently rotating in a MRI lab. I would highly recommend looking for programs with rotations as they allow me to join 3-5 labs for 8 weeks and test if the projects fit my interest and if I'm compatible with the mentor. I have found that the rigor of the classes offered at Gustavus has prepared me well for graduate school by teaching me how to work hard and think critically. And even though I'm learning a lot of new things on the fly, I've been able to keep my head above water and am enjoying this experience."

Adam Snyder writes, "I had an amazing time at Gustavus. As I am working and living out in the 'real world' I am amazed by how well Gustavus prepared us to live well and achieve whatever desires we may have. We are definitely ahead of the game on our abilities to make a change in the world. Currently, I am working as an Assistant Manager at Hammer Residences, a group home in Minnetonka. I am also working part time as a project estimator for a commercial and industrial general con-

tractor, Construction Results Corporation. I plan on probably going to grad school for engineering in a year or two from now. Grad school may happen in Australia, because I am working on plans to move there for a few years either working at a job in physics or completing my Masters. My "words of wisdom" for the physics students: enjoy the experience you have there. When you're gone, you will realize what amazing opportunities you had there. Whether it is working one on one with a genius professor in lab, living and enjoying your time with your best friends who live right next door to you on campus, or trying something you have never done before. There are always people there at Gustavus to support you in anything you do."



Faculty Summer Activities

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Ambrose Thomas Petricka

Jessie Petricka writes, “We are happy to announce the birth of Ambrose Thomas Petricka. He was born on August 12, 2011, weighing 8 lbs 9 oz at Duke Hospital, Durham, NC. Jalean, Ambrose and the family are doing well. Leif is very excited to be a big brother. We are tired but are now planning the final move back to Minnesota at the end of the month.”

Chuck Niederriter had a productive, but busy summer full of lab development and Nobel Conference work. He reports, “We are well prepared for this fall’s Conference, *The Brain and Being Human*, with eight great speakers and a variety of preview and post-conference activities.” This was his second summer of work on the NSF-funded project to improve science education at Gustavus and colleges across the country by taking advantage of increased student interest in energy, sustainability, and the environment. Chuck had help from two students, **Amy Audette (’12)** and **Kevin Clark (’12)**, and colleagues from biology, chemistry, and the Johnson Center for Environmental Innovation in

developing new laboratory experiences for introductory and advanced science classes with a sustainability focus. He presented a paper on this work at the summer meeting of the American Association of Physics Teachers, which was held at Creighton University in Omaha. Chuck has also been preparing to teach the Cosmic Universe course for the first time. The new first course in our introductory sequence will include a collection of material that doesn’t require a background in calculus and will be wrapped up in an astrophysics theme. Along with Steve Mellema, Chuck attended a conference this summer on “Using Astronomy to Teach Physics” where, he says, “We found out our idea wasn’t entirely new. We came away with a lot of new ideas and the hope that there will be a textbook in the not-so-distant future.” There were some opportunities to get away this summer, too. Chuck, and wife Debbie and daughter Gretchen did a little camping in the mountains of Colorado with son Robert, who is studying physics at UC Boulder. The whole family visited the grandparents in Pennsylvania for ten days and Chuck drove with their oldest son, Brad, to Berea, Kentucky, where he is attending college. This will be a busy year for Chuck, continuing as the Director of the Nobel Conference, teaching the Cosmic Universe and one lab, and serving on the compensation sub-committee of the Faculty Senate and on the College’s Budget Committee.

The summer of 2011 was filled

with preparation for the new and old responsibilities that **Paul Saulnier** will be charged with during this coming academic year. Paul will serve as the physics department chair and the Kendall Center faculty associate for new faculty programming. As department chair, Paul will try to keep the administrative gears turning and will work with the rest of the department to implement a revised introductory sequence to the physics major among other initiatives. As a Kendall Center associate, Paul will be responsible for the new faculty mentoring program and all orientation and training sessions. Additionally, Paul will also be serving as an at large member of the Faculty Senate as well as coordinating the Faculty Shop Talk series (at this series of talks faculty present their research, scholarship, and creativity). Also, during this summer Paul visited Washington, D.C. to review proposals for the National Science Foundation (NSF). He also worked on drafting a NSF proposal of his own. Finally, he went to Wisconsin Dells for a couple of days with his youngest son and one of his son’s friends --- can you say full contact go-karting?



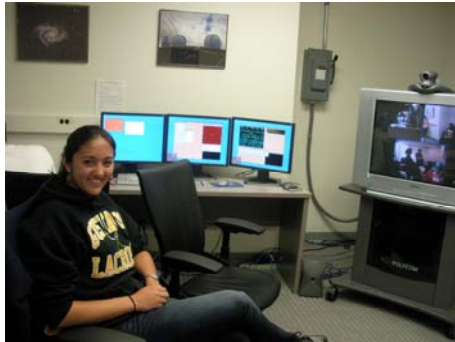
Summer Internships Enhance Students' Experiences

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James adds, "My role in these projects was programming modifications to the Ultrasound Waveform Generation program, and creating the "Huber Data Management System," which allows downloading and viewing data, graphing data, and adding new data to the database through a website interface."

Amanda explains, "The acoustics lab itself is top of the line. We have two air ultrasound transducers, and only four or five have ever been produced that can produce this magnitude of waves. Also in the lab, we have a scanning laser vibrometer. It is a very nice machine that we use to take measurements of the movements of our cantilevers. It can scan a micro-cantilever smaller than a hair, and measure very large movements (millimeters) or very small movements (fractions of an angstrom)."

Nara Higano ('12) writes, "I am participating in the Physics and Astronomy REU program at University of California, Los Angeles. I work with Dr. Andrea Ghez and her research scientist Dr. Leo Meyer, and my astrophysics project focuses on the radiation we see emitted from the supermassive black hole at the active galactic center of our own Milky Way gal-



Nara Higano ('12) communicates with the Mauna Kea research team from the remote observation room at UCLA

axy. In particular, I focus on intriguing flare phenomena that we observe in the time-series data of the radiation flux at particular wavelengths. It seems that there is a time-lag between these flares that is wavelength-dependent. The mechanisms behind these phenomena are not well understood, but one proposed model attributes such flares to regions of expanding plasma that radiate as part of the black hole's accretion disk outflow. I use cross-correlation analysis to quantitatively evaluate these time-lags in the hope of providing further characterization of our mysterious black hole. The UCLA Astronomy Department maintains a very strong relationship with the Keck Telescopes on the Mauna Kea summit in Hawaii, which are the largest optical telescopes in the

world. With the help of Keck and its powerful adaptive optics system, we are able to look through the dust that obscures much of the Milky Way plane and observe the very dim galactic center. I was very lucky to have the opportunity to partake in the UCLA Physics and Astronomy research program."

Nick Tolrud ('13) writes, "I'm working at Primera Technology. They produce disc printers and label printers and cutters for businesses. I'm doing programming for tech support, creating utilities that make it easier to collect and analyze data in order to diagnose problems with products. I've primarily been using Visual C#. It's the first time I've used a .net framework or C#. I caught on quickly since it is similar to Java, which I learned last year in Computer Science II. I'd say I've enjoyed the experience so far. Certainly a lot different than anything in school. In most cases, no one knows exactly what you should do so you just have to figure it out yourself. It's kind of fun to attack a problem from a more creative perspective, although I still don't think I want to program for a living. It's kind of mentally exhausting. I'd certainly like to learn about and work more with electronics and computer hardware in the future."

This Newsletter is issued at the beginning of the fall semester for the benefit of students, alumni, faculty and others interested in the physics program.

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