



**Eighth Reunion**

The Department held its eighth reunion on April 25, 2009, to honor the retirement of Professors Joe Tenn and Bryant Hichwa.

Over 110 alumni, students, faculty, staff and friends attended the festivities in the SSU Commons.

For more photos of the Reunion, see <http://www.phys-astro.sonoma.edu/news/reunion2009/>



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**GLAST Has Launched! Long Live Fermi!**  
By Logan Hill '06

Last June the long awaited launch of the Gamma-ray Large Area Space Telescope (GLAST) was realized as the observatory was carried into orbit on a Delta II rocket from launch pad 17B at the Kennedy Space Center in Cape Canaveral, Florida.

Prof. Lynn Cominsky is a scientific co-investigator on GLAST, and has been working on the project for over 16 years. She is also the GLAST Press Officer and the lead for GLAST's Education and Public Outreach (E/PO) program, the largest source of support for SSU's NASA E/PO group. On the side of the rocket, under the United States flag, is the GLAST logo, designed by the NASA E/PO's own scientific illustrator, Aurore Simonnet.

Several of the E/PO group members tried to attend the launch, but only Dr. Lynn Cominsky was able to wait it out through a week of frustrating delays until the satellite finally took off atop the rocket. Other E/PO team members who got to enjoy the parties and a week at the beach included Aurore Simonnet, Kamal Prasad, Kevin John '07 and Laura Chase.



Successful launch marks a milestone of 16 years of dedication. Credit: NASA

After NASA successfully launches a scientific satellite it often gets renamed. For GLAST, the public suggested over 12,000 different names which were narrowed down to just a few. Finally the name Fermi was chosen, to honor the Nobel-prize winning Italian-American physicist Enrico Fermi, who built the first nuclear reactor at the University of Chicago and also suggested ways to create cosmic gamma rays through the acceleration of charged particles.

So now the Fermi Gamma-ray Space Telescope is orbiting 350 miles above us and is actively detecting gamma rays from across the universe. Fermi catches these energetic rays from many sources such as blazars and active galaxies, neutron stars, and the mysterious gamma-ray bursts, and it has even discovered a new class of pulsar. For recent news about Fermi, see:

<http://www.nasa.gov/fermi>



Credit: Educator Ambassador Linda Smith

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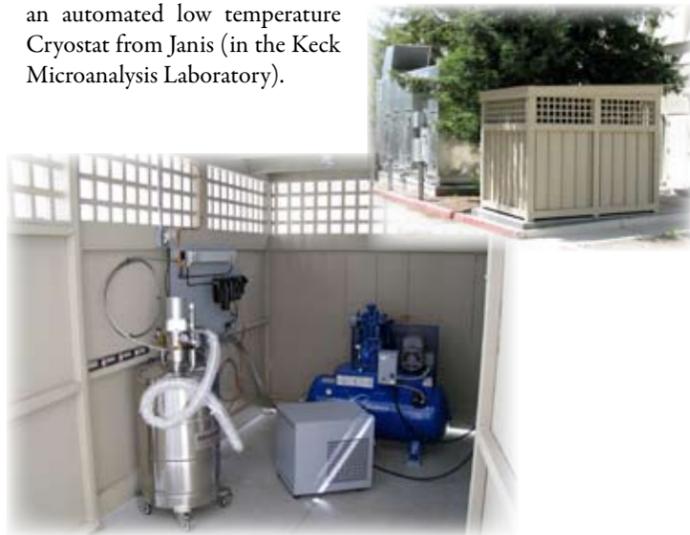


### Wow! We Got That?

By Prof. Jeremy Qualls, Prof. Hongtao Shi, and Prof. Scott Severson

The SSU Physics and Astronomy Department continues to improve its research infrastructure and capability to perform cutting edge research. This year we saw the acquisition of a number of new items into the department as well as a number of existing systems coming on line for the first time.

One of the most significant advances in our infrastructure comes from the brand new liquid nitrogen plant housed behind Darwin. The plant was built by the School of Science and Technology under the direction of Dean Saeid Rahimi. The system produced by Cryomech, a world leader in cryogen production, will produce 20 liters of liquid nitrogen a day. Liquid nitrogen is a cryogen with a temperature of 77K (-196 °C). It will be used by our department as well as Chemistry, Biology, and the Student Health Center. The nitrogen will be used for basic research, refrigeration, and instructional labs. It is a key component to cool and operate the new departmental 17 Tesla Superconducting Magnet. With the installation of the new nitrogen plant, the magnet is now finally coming online. Other significant items coming online include a large Nexus glovebox from Vacuum Atmospheres and an automated low temperature Cryostat from Janis (in the Keck Microanalysis Laboratory).



Liquid Nitrogen plant inside enclosure behind Darwin Hall.

The Keck Microanalysis Laboratory has also acquired a new scanning electron microscopy (SEM) system. The SEM uses high-energy electrons to permit the observation and characterization of organic and inorganic materials on a nanometer (nm) to micrometer ( $\mu\text{m}$ ) scale. The popularity of the SEM stems from its capability of obtaining three-dimensional-like images of a wide range of materials due to its large depth of field. The interactions between the electrons and the atoms that make up the sample surface produce signals that disclose the sample's surface topography, composition, and electrical conductivity.

Aimee Santos helps install new SEM.



The JEOL JSM-5400LV SEM recently donated to us by Medtronic Vascular in Santa Rosa is a great addition to the existing Hitachi SEM in the Keck Microanalysis Laboratory. It can be used to probe specimens up to five inches in length. The system is designed such that the electron gun and optical system are kept under high vacuum and the specimen is differentially evacuated to low vacuum by another pumping system, allowing even non-conductive samples to be observed. Physics major Aimee Santos is currently refurbishing the system. This unit will be another tool to support the on-going and new research programs involving thin films. Upper division classes such as Intermediate and Advanced Experimental Physics will benefit from the instrument.

The Department was the recipient of a generous gift of two astronomical telescopes from Sir Peter Michael, the owner of Peter Michael winery here in Sonoma County. The gift acceptance and placement at the Sonoma State University Observatory was coordinated by Kevin McLin of the NASA Education and Public Outreach group. The telescopes are a Celestron C-8 and a C-10 and have made an immediate impact to the Department's programs. The larger telescope is equipped with a GPS system, which allows rapid set-up and selection of astronomical objects. The telescopes have been integrated into our Public Viewing Night program to increase the number of objects visitors can view, and to create multiple viewing areas to ease congestion in the main observatory. The telescopes are also being put to use for our Astronomy classes and are available for use at the observatory by our majors.



### Thank You For Your Support!

Another year has passed and we reflect back on those that have help make it possible. We thank our Donors for helping the Department maintain its traditions and offering new opportunities. Private donations have been crucial in the growth and continuation of excellence in the Department of Physics and Astronomy. As the State of California struggles with its budget and continues to make deep cuts into education spending, it is donations from private individuals that allow us to maintain a healthy program.

The "What Physicists Do" lecture series is supported entirely through donations. This highly successful program has now completed its seventy-seventh semester. The series has been tremendously successful and brought some of the foremost physicists in the world to our campus to share their thoughts and research. The series founder, Dr. Joe Tenn, will be stepping down this year and Dr. Scott Severson ([scott.severson@sonoma.edu](mailto:scott.severson@sonoma.edu)) will now spearhead and organize the series. Please feel free to contact Professor Severson with any questions or suggestions that you might have.

This year we received a number of generous donations which support not only our "What Physicists Do" lecture series, but also came in the form of support for undergraduate researchers. The Horace L. Newkirk Endowed Assistantship and the Mike and Sheila McQuillen Summer Research Award continue to support students to do research with faculty. The research experience has a dramatic impact on the students, providing them with experiences that propel them onto graduate programs and successful careers in science. Other scholarship funds, such as the Physics and Astronomy Scholarship, the Sol and Edith Tenn Scholarship, and the Joseph S. Tenn Scholarship, also support and provide students with opportunities they would not have if not for the generosity of donors.

If you would like to support our program and students please see <http://www.phys-astro.sonoma.edu/PublicSupport.html> or contact the SSU Development Office at (707) 664-2712 or contact the Department.

#### Current Funds:

##### #C0141 Public Programs

Richard M. Bell, Ed. J. Le Du, Lewis Epstein, William & Lucy Kortum, Francis & Patricia Marshall, Mr. & Mrs. Bernard H. Meyers, Joe & Eileen Tenn, Robert S. Tuttle, Ray Ubelhart ('91).

##### #C0142 Physics & Astronomy Equipment and Supplies

David C. Munton ('82), James L. Aroyan ('87).

##### #C0143 SSU Observatory

Jo-Ann Smith.

##### #C0144 Student Development Program

Lynn Cominsky & Garrett Jernigan, Donald E. Herriott ('72), Bryant P. Hichwa, Michael and Sheila McQuillen, Benjamin J. Owen ('93), Roberto M. Ramirez ('72), Hongtao Shi, Tedman A. Torres ('04), Bradley N. Yearwood ('09).

#### Endowment Funds:

#E0208 Horace L. Newkirk Memorial Student Assistanship  
Established by Nadenia Newkirk in memory of her father to support student research.

##### #E0231 Physics & Astronomy Scholarship

Lynn Cominsky and Garrett Jernigan

##### #E0269 Science at Work Fund

Established by John Max to support What Physicists Do.

##### #E0304 Sol & Edith Tenn Scholarship

Joseph S. Tenn

##### #E0305 Joseph S. Tenn Scholarship

Daniel W. Tenn

### NASA Education/Public Outreach News

By Logan Hill '06 and Kevin McLin

Hot on the heels of the launch of the Fermi Gamma-ray Space Telescope, the NASA E/PO group hosted their fourth, bi-annual, Education Ambassador's Conference here at SSU. The event brought together sixteen master teachers from across the country, including two new members to the EA team, Neta Apple and William D. Panczner, in order to hone education outreach skills.

The five day conference involved live demonstrations from E/PO members and the EAs alike, showing off the best of the best presentations of NASA science and math content, developed here at SSU. The best aspects of each presentation were expanded upon and ways to strengthen weak spots were discussed. The training materials are online through the E/PO group's website:

<http://epo.sonoma.edu/>



Our team of Educator Ambassadors at the July, 2008 training

Once the conference was over, the E/PO group went back to normal every-day education and public outreach; attending 2008's California Science Teachers Association conference in San Jose, the 213th American Astronomical Society meeting in Long Beach, and the National After-School Association conference in New Orleans, as well as delivering local talks here at SSU and Active Galaxy pop-up presentations to elementary and middle school students throughout the Bay Area.

With 2009 being the International Year of Astronomy (IYA), the E/PO group helped organize many events, including "From Earth to the Universe" banners and lectures on campus, as well as co-sponsoring the 100 Hours of Astronomy with events such as Public Viewing Night at SSUO and a special lecture by UC Berkeley Professor Alex Filippenko (See accompanying article by Katherine Wyman about IYA at SSU).

Epo's Chronicles is nearing its one-year anniversary, and the comic is also celebrating the IYA with monthly special episodes dedicated to IYA objects such as Venus, the Whirlpool Galaxy, and the Andromeda Galaxy. Look for these special "Eposodes" on the first Monday of each month throughout 2009 at:

<http://eposchronicles.org>

The 2008-09 school year also marked the rise of the robots for the E/PO group. At Roseland University Prep School in Santa Rosa, Kamal Prasad has led students in a course in robotics, and at Cali Calmecac in Windsor, Kevin John and Logan Hill ran an after

school robotics class for the 4th grade students. As a culminating robotics event, in partnership with the SRJC and SSU MESA programs and sponsored by the Agilent Foundation, the E/PO



MESA students practice for an event.



group hosted Robo Rally in May. Bringing together Sonoma county high school MESA students to build robots and compete in challenges with stipend rewards and event prizes was great fun!

Dr. Kevin McLin has been keeping GORT, SSU's Gamma-ray Optical Robotic Telescope, up and running with the help of students Katy Wyman, Eric Lundy, and Blaine Gilbreth. In addition, Dr. McLin has begun working with Professor Kim Coble at Chicago State University to incorporate GORT observations into their astronomy curriculum. GORT was also a featured guest at two "Thursday Nightlife" sessions at the California Academy of Sciences in San Francisco. The first was during the IYA 100 Hours of Astronomy event over April 2 - 5. The second was as part of the Yuri's Night party hosted at the Academy and cosponsored by NASA Ames Research Center. Dr. McLin also operated GORT at Nightlife on April 30, when the theme at the Academy was robots.



GRB081203A

GORT also had a "first" this past December. On the morning of December 3rd, GORT caught its first gamma ray burst (GRB). These elusive objects emit blasts of gamma rays typically lasting only a few tenths of a second, or in some cases a few tens of seconds, after which they are never seen again. Sometimes it is possible to see a rapidly fading optical or x-ray afterglow to the GRB:

This is what GORT saw on December 3rd, the fading optical counterpart to the burst. And this was quite fortuitous because other telescopes around the world that were positioned so that the GRB was above the horizon were either already in daylight or experiencing stormy weather. If not for GORT, this GRB afterglow would not have been seen at all.

Laura Chase continues to keep the E/PO group running on a daily basis, even after giving birth to her second beautiful daughter, Abigail. She has helped to ensure the bills are paid, the files are filed, and materials get shipped to teachers across the country, all with the help of her army of students including Sabrina Colias, Billie Jo Hoyt, and Diamante Rueda.

### Student Achievements

By Prof. Scott Severson

It has been a busy year for our current students and we would like to acknowledge some of their outstanding plans for participation in summer internships, post-graduation employment or graduate study.

In the summer, Adam Dye will be attending the SPIE Optics and Photonics Conference and Short Courses as well as the Center for Adaptive Optics Summer School. Jarod Fahle will be working in NASA E/PO group here at SSU. Bill Garcia will be conducting summer research at the National High Magnetic Field Laboratory in Tallahassee Florida. Blaine Gilbreth was selected for the San Diego State University Research Experiences for Undergraduates (REU) program in Astronomy. Brooks Hanley will be working with Dr. Qualls supported by the McQuillen scholarship. Jay Hubbard and Austin Powell will also be working with Dr. Qualls this summer. Bryce Terrell will be studying Energy Auditing and be completing independent study in Green Sustainability Technologies. Katherine Wyman will be studying Non-Radial Oscillations in Radio Pulsars at the NRAO in Green Bank, West Virginia.

In the fall, Michael Duncan will be attending the Physics Masters program at Fresno State University. Adam Dye will be attending the Optical Sciences Ph.D. Program at the University of Arizona. Chris Johnson will be attending the Physics & Astronomy Masters program at San Francisco State University. Aimee Santos has been admitted to the School of Education credential program at Sonoma State University. Katherine Wyman will be attending the Astronomy Masters program at Wesleyan University.

Kevin Bransford will be taking part in California's IMPACT teaching program. Kenneth Martinelli will be joining Sonoma Photonics in Santa Rosa. And finally, Bradley Yearwood will be returning to industry following his degree by joining Calix Networks in Petaluma. We wish all of our students the best of luck this summer and in all their future endeavors!



Brad Yearwood presented his work at the 23rd Annual CSU Student Research Competition.

## ALUMNOTES

**Paul Goodwin ('71)** was chief scientist of Variance Dynamical Corp. in Kasilof, Alaska when he passed away on October 21, 2008. He earned a Ph.D. in geophysics at the University of Alaska, where he taught courses in philosophy and developed a physics program for the Alaska native community. He was at one time president of Earth Science Consulting and Technology Corp. and of the Fairbanks Native Association, Inc.

**Frederick Arioli, Jr. ('75)** is a systems integration and test/project engineer for the Space and Exploration Systems Division of Lockheed Martin in Sunnyvale.

**Peter Conwell ('76)** has been promoted to associate professor of physics at Westminster College in Utah. He earned his Ph.D. in computational physics at the University of Utah.

**Doug Morris ('78)** is the vice president of operations at Imara Corporation, a Menlo Park start-up company developing a new high-power lithium ion battery for power tools, outdoor equipment and electric vehicle applications.

**Ron Bleau ('79)** retired in 2008 from Lockheed Martin Aeronautics Company in Ft. Worth, Texas, where he was a senior staff research engineer conducting system engineering and research and development for product improvements. He now raises cattle and works on vintage motorcycles.

**John Philip Cabaud ('80)** is the principal of Serve Rite, an engineering services firm in Sonoma.

**Brett Morgan ('82)** is an independent computer programmer in San Diego.

**Michael Rogan ('84)** is a real estate agent with Paragon Real Estate Group in San Francisco. He retired after many years with Maxon Precision Motors, Inc., Burlingame, where he was vice president of electronics sales and marketing.

**George Amorino ('86)** died of cancer 13 September 2008. He was an assistant professor in radiation oncology at the University of Virginia, where he did research in the radiosensitization of prostate cancer. He earned his Ph.D. in cellular and molecular radiobiology at Colorado State University in 1995 and his M.S. in biomedical engineering from California State University, Sacramento in 1988.

**Chris Ray ('87)** was promoted in 2007 to professor of physics and astronomy at St. Mary's College of California. He earned his Ph.D. in physics in 1994 at the University of California, Davis.

**Christopher Cook ('88)** is director of nanotechnology at Axsun Technologies in Billerica, MA. He previously built a thin film laboratory at MIT's Lincoln Laboratory.

## What Physicists Do 76th and 77th Series

By Jack Dillon

The breadth and depth of the fields of physics were on display in Darwin Hall most Mondays as the What Physicists Do series entered its thirty-ninth year. From “Physics for Future Presidents” to “Cosmic Colliders”, the series offered something for everyone. Every colloquium was unique, insightful, thought provoking and (at least for geeks like me) entertaining. You have to agree, whenever you combine cutting edge science with coffee and cookies, you’re bound to have a winner. It’s no wonder that large audiences of SSU students and other physics fans gathered to hear distinguished and renowned scientists present their latest work and answer questions.

Are you curious about astrophysics or cosmology? There were a dozen different presentations dealing with the latest observations and theories of the universe we inhabit. We heard about planetary science in results from the Mars Phoenix Lander and in plans for the Kepler planet-finding space telescope. We learned about the history of large optical telescopes in California and progress with the Large Binocular Telescope in Arizona, topics particularly appropriate for the 400th anniversary of Galileo’s first astronomical observations. We found out about recent efforts to detect cosmic dark matter through gravitational lensing, x-rays from hot interstellar gas, and subterranean cryogenic particle interactions. We got exposed to the latest observations of extreme phenomena by the Fermi Gamma-Ray Space Telescope. We heard new theories about the probability and explosive effects of collisions between massive stars, white dwarfs, and neutron stars. And we gained an appreciation for the convergence of particle physics and cosmology in questions about missing antimatter in the universe and about particles predicted in the standard model, answers to which are hoped for in results from the soon-to-restart LHC collider in Europe.

Are you interested in materials science and solid state physics? We learned about investigations into nanoscale materials where smaller means stronger and thinner means defect free and where new materials like graphene are showing novel characteristics for advanced electronics. We were told of new exploratory methods using antineutrinos, x-rays, and gamma rays to detect and image atomic characteristics. And we got updates about how novel catalytic surfaces and ultra-short laser pulses can be used in commercial applications.

Do lasers and optics catch your fancy? We heard about new lasers developed to emit precise, high-frequency photons to scan bulk materials for particular atomic elements, like scanning a mountain for gold. We learned how x-rays, generated by lasers and synchrotrons, can be used to study the properties of nanoscale phenomena, like the electron structure of thin metals and the geometry of atomic surfaces. And we learned how a local company has developed rack-mountable, precision laser devices for use in nanoscale manufacturing operations.

Are you concerned about science and public policy? We were told about energy policy in Denmark and how that country is using technology, conservation, and its own renewable resources to become energy independent. And we learned what our politicians should (but probably don’t) know about climate change, energy options, and technologies that could help protect us and the planet.

All in all, it was a great year of learning What Physicists Do. And like the cookies, each presentation just made you want more. I, for one, can’t wait to see what the next series will cover. But for now, it is satisfying just to remember each of the terrific presentations and try to digest all the information they provided.

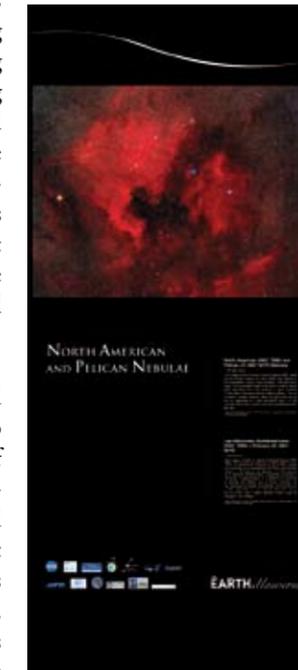


## Celebrating the International Year of Astronomy at SSU

By Katherine Wyman

The year 2009 marks the 400th anniversary of that momentous year when Galileo turned his telescope towards the sky and discovered things yet undreamed of. To celebrate modern astronomy’s quadricentennial, Sonoma State participated in “100 Hours of Astronomy,” a worldwide event in which astronomers across the globe opened their observatories for a little over four days of continuous viewing as nighttime swept around our planet. Beginning on April 2, “100 Hours” was a part of the yearlong celebration of the evolution of the telescope and our corresponding comprehension of the universe in which we live. Sonoma State’s Physics and Astronomy Department joined in on the festivities by hosting two lectures, a Public Viewing Night at the campus observatory, and “From Earth to the Universe” – a photographic display of beautiful large-scale astronomical images.

Comprised of images taken with both ground and space-based observatories, “From Earth to the Universe” (FETTU) showcases a number of astronomical images ranging from planets, comets, and stars to whole galaxies, star clusters and nebulae. Each image is accompanied by a short caption (in English and Spanish) that describes the science behind how the images were taken. FETTU was displayed in a variety of locations around campus, accompanying Dr. Cominsky’s



One display of the exhibit:  
“From Earth to the Universe”

and Dr. Filippenko’s lectures, as well as drawing a crowd at the NASA E/PO booth on Seawolf Day.

On March 23rd, Dr. Lynn Cominsky gave a lecture on new results from the recently re-named Fermi Space telescope, which launched in June 2008, as part of the department’s ongoing lecture series “What Physicists Do.” On April 2nd, SSU’s NASA-funded robotic telescope GORT was operated by Kevin McLin as part of the “100 Hours” activities taking place at the California Academy of Sciences in San Francisco.

SSU’s direct involvement with “100 Hours of Astronomy” began on April 3rd at 9pm with a special Public Viewing Night at the Sonoma State University Observatory. Sonoma State students, professors, and amateur astronomers participated in the worldwide star party by peering at the sky through the many on-site telescopes, or by watching SSU student Katherine Wyman remotely operate GORT to take images of nebulae and galaxies from her computer at the observatory. Also on display at the PVN were the “100 Hours” webcast, and a slideshow of astronomical images and descriptions compiled by another Physics and Astronomy student Chris Johnson.

On April 4th, award winning UC Berkeley professor Alex Filippenko gave a free public lecture in Warren Auditorium on campus entitled “Dark Energy and the Runaway Universe.” Dr. Filippenko is the 2004 recipient of the Carl Sagan Prize for Science Popularization, and was also selected as the Carnegie/CASE Professor of the Year among doctoral institutions. Known for his energetic teaching style, Professor Filippenko has also contributed much towards the discovery of Dark Energy, the poorly understood force that is accelerating the expansion of our Universe.

## ALUMNOTES

**Bill Kobabe ('90)** is teaching sixth grade at the Greenwood School in Mill Valley, CA. He has been the principal of Bill Kobabe Woodworking in Petaluma and a teacher of woodworking and physics at several schools, including Sunridge and Sebastopol Independent Charter.

**Michael Fink ('93)** teaches mathematics and science at Cooley Middle School in Roseville. Formerly a teacher at Cross & Crown Middle School in Rohnert Park, he earned his teaching credential at SSU in 1994.

**Greg Sprehn ('93)** provides technical and scientific consulting services to medical device startups. He has been a physicist in remote sensing, chief scientist in radiological imaging, and vice president of engineering in ophthalmic imaging. He has been awarded several patents in image processing and fiber-optics.

**Mallory Roberts ('94)** is an astrophysicist with Eureka Scientific. He was formerly a postdoctoral researcher at McGill University. He earned his Ph.D. in astrophysics at Stanford University in 2000.

**Willie Rodriguez ('97)** is District Manager of Burney Water District in Burney, CA. He was formerly a product safety engineer at Agilent Technologies in Santa Rosa.

**Alan Witten ('99)** retired from his position as manager of inside sales at DEY L.P., a pharmaceutical manufacturer in Napa, in 2003. He is now active in community and charitable organizations in Lincoln, CA.

**Brooke Haag ('01)** is a physics instructor at Hartnell College. She is also working on completing her Ph.D. in nuclear physics at the University of California, Davis, where she received her M.S. in 2004.

**Tyana Stiegler ('03)** is a graduate student and research assistant in physics at Texas A&M University. She is currently working on the LUX (Large Underground Xenon Detector) Project, a dark matter direct detection experiment in South Dakota. She earned a master’s degree in physics at the University of California, Davis.

## ALUMNOTES

**Tiffany Borders ('04)** is a research and instrument analyst working with the WFC3 team at the Space Telescope Science Institute. She earned her M.S. in astronomy at San Diego State University in 2008. Formerly a telescope operator at the Very Large Array of the National Radio Astronomy Observatory in Socorro, NM, she worked at NRAO and also at the Hubble Space Telescope during summers while a student at SSU.

**Ashley Wiren ('04)** is a nuclear engineer managing mixed waste at the Puget Sound Naval Shipyard in Bremerton, WA.

**Ryan Quitzow-James ('05)** is a graduate student in physics at the University of Oregon, where he earned his master’s degree in 2008.

**Daniel Nicholas ('06)** is a technical services engineer at EandM in Healdsburg.

**Danielle Beddow ('07)** is a senior engineering technician for Soladigm, Inc in Santa Rosa.

**Jeremy Dixon ('07)** is a senior laboratory technician with Soladigm, Inc. in Santa Rosa.

**Kevin John ('07)** is an educational science support assistant in SSU’s Education and Public Outreach Group.

**Zachary Nuño ('07)** has been admitted to the graduate program in physics at California State University, Long Beach, where he has already taken some classes while working at CDG, a Boeing company, in Cypress, CA.

**Ryan Olson ('07)** is currently traveling after spending some time as a teacher naturalist teaching outdoor environmental education at Caritas Creek and working for another nonprofit organization in San Francisco.

**Alexander Sevilla ('07)** works on the design and construction of electric vehicles for Thunderstruck Motors in Santa Rosa.

**Dakota Decker ('08)** is a graduate student in mechanical engineering at UCLA.

## Newkirk Assistantship 2009

By Adam Dye



Adam Dye and Nadenia Newkirk at the annual Newkirk Award Luncheon

The Physics and Astronomy Department is establishing an observatory at the Galbreath Wildlands Preserve in southern Mendocino County. The equipment will be used for advanced astronomical research, undergraduate

instruction, and K-12 educational outreach at Sonoma State University. During ground-based astronomical observation, the atmosphere can bend light coming from space and cause aberrations of stellar images seen in a telescope. Dr. Scott Severson, Assistant Professor and GWPO Director, wants to determine how well stars, planets, and galaxies are viewed from the proposed location.

We are using a Hartmann Differential Image Motion Monitor (HDIMM) technique to calibrate simultaneously recorded data from an instrument called a seeing monitor. The seeing monitor is a commercially available device that tracks the change in apparent luminosity of a star. On the other hand, the Hartmann Mask method employs a concept known as wavefront sensing to interpret the shape and alteration of incoming light. A wavefront is an imaginary surface joining all points in space that are reached at the same instant by a wave propagating through a medium. The wavefront sensor measures aberrations of an optical wavefront via spots formed on the CCD detector, which is therefore indicative of the original wavefront shape.

Over the summer, I wrote computer algorithms in Interactive Data Language (IDL) to reduce and analyze data from atmospheric turbulence measurements. My computer program code assimilates our Hartmann Mask data into a three dimensional (3-D) array of coordinates, measures the shifts in independent spot locations, and calculates the characteristic seeing condition of the night sky. Atmospheric turbulence is characterized by the Fried parameter  $r_0$ , pronounced "r-naught", and is a measure of seeing quality. Using equations from Sarazin and Roddier (1990) and a given wavelength ( $\lambda$ ), sub-aperture diameter ( $D$ ), and separation distance ( $d$ ), my program calculates the spot variance ( $\sigma$ ) and plots  $r_0$  over time.

At the time of this writing, we are currently looking for evidence of a correlation between the seeing monitor data plot and the  $r_0$  data plot. There is a noticeable correspondence, by visual inspection, of the atmospheric behavior shown in our results with the contemporaneous seeing monitor full-width-half-max (FWHM) recordings. The next step is to utilize existing data analysis tools for finding correlation patterns of these plots analytically, but writing new computer code from scratch may be necessary to handle such a task. We plan to publish this work in an appropriate scientific journal when complete and I sincerely hope that my computer algorithms will become a viable contribution to astronomical instrumentation of the future.

## Mike and Sheila McQuillen 2009 Research Award

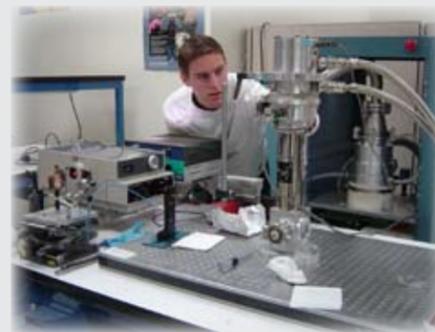
By Mark Wiedeman

Summer research opportunities are an integral part of any physics student's time outside of class, especially the summer before senior year. This is a time when students can get crucial hands-on experience in an actual research setting. A student can discover what fields of physics appeal to them and can even give an idea for topics in their senior capstone course as well as what to focus on for graduate school.

After being notified that I had received a research grant, thanks to a donation by Mike and Sheila McQuillen, I set to work immediately with Dr. Hongtao Shi and John Collins in the setup of a very low temperature vacuum pumped refrigeration system from Janis Technologies. This cryostat, as it's called, has a very wide temperature range. It can go from over 300 Kelvin (room temperature) all the way down to about 10 Kelvin (-263 degrees Celsius). To get the low temperature, the system cycles compressed helium gas. To rise to a given temperature, a small copper coil heater around the vacuum chamber is used. A small temperature controller is utilized to regulate the temperature. One end of the cryostat known as the "cold head" has optical windows leading right into the sample holder which can hold small samples of various metals. As the system temperature fluctuates we can measure changes of certain optical and physical properties of the sample. These changes can tell us which temperatures and pressures optimally affect a given sample.

My objective was to build a setup to hold the cryostat and all of its electronic components and to write software that would take data as the system is pumped down. In the beginning, this task enabled me to work quite a bit with John Collins in the Darwin machine shop. We were able to build a cabinet that would hold the pumps and electronic components of the cryostat and even a stand to hold the cryostat itself. After the cryostat found a permanent setting, I set to work on getting all the components to communicate with each other using a programming language called LabVIEW. This gave me very valuable real-world experience in a language that is frequently used by many companies. I was able to write a program that allows the user to input a desired temperature, take real-time measurements, and then plot a graph of temperature vs. time.

There is so much that can be done with such an instrument that I was able to continue my research and design of the cryostat as my senior capstone project. The project will be completed by May 2009 with the hopes that future students can use my program and system to conduct their own research.



Mark Wiedeman working on his research



Exploring the Academy of Sciences

The Society of Physics Students, SPS, completed another successful year.

This year has been an exciting one for SPS club members. As many students are graduating the club has spent a good portion of our efforts this year in getting new students to become physics majors and reaching out to incoming students. With the number of students graduating the SPS club is undergoing somewhat of a new beginning at SSU, as the club will be comprised mostly of new students in the next academic year. We hope that we can maintain the same dedication to our field of study and continue promoting the phys-

## SPS and Proud of It

By SPS chapter President Bill Garcia

SPS members smashed the competition in the SSU scavenger hunt



ics major here at SSU. The year gave SPS several opportunities to meet new and incoming students with events such as Seawolf Day, the 100 Hours of Astronomy, and the VEX robotics competition. The club hopes that we reached enough students to keep our physics program thriving at SSU.

In addition to its traditional pizza lunch parties, many members engaged



Yosemite National Park was gorgeous in other

er activities such as an indoor soccer tournament, campus wide scavenger hunt, camping at Yosemite National Park, and a tour of the brand new California Academy of Sciences in San Francisco..

SPS has been instrumental this year in putting students in contact with on-campus research opportunities. We had more students working in the labs this year than we have had in the last few semesters. With the help of Dr. Qualls, Dr. Severson, Dr. Spear and Dr. Shi there has been an abundance of research opportunities at SSU.

## Chapter of Sigma Pi Sigma Installed

By Prof. Hongtao Shi, Advisor, Society of Physics Students

Sigma Pi Sigma ( $\Sigma\Pi\Sigma$ ) is the honor society for physics housed within the Society of Physics Students (SPS). Both organizations joined forces under the umbrella of American Institute of Physics in 1968. After a long petition process and the approval of the Sigma Pi Sigma National Office, SSU was granted a charter. During the April 25<sup>th</sup> retirement party for Professors Tenn and Hichwa, our chapter was installed. Patrick Brown ('08), Adam Dye ('09), Katherine Wyman ('09), and Bradley Yearwood ('09) are among the first to be inducted into this Society for their outstanding academic performance, scholarship activities, and dedication to serving the community. As the advisor of the student club, I was much honored to be inducted as well. So congratulations to all inductees!

I would like to thank Prof. Hichwa for being the Installing Officer. He joined this honor society many years ago when he was at Hope College. When the Installing Officer designated by the National Office had to cancel the trip due to a last-minute conflict, Prof. Hichwa exemplified the mind

$\Sigma\Pi\Sigma$   
SIGMA PI SIGMA  
PHYSICS HONOR SOCIETY



set of a Sigma Pi Sigma member as he served in this role. The induction ceremony was very meaningful and it inspired me and many others, especially our students. Consequently, this event will always remind me of the right-hand rule in physics and its ability to turn up unexpectedly.

A Sigma Pi Sigma Chapter may elect into its membership those students, faculty members and other qualified persons, either in or nearby the institution in which the Sigma Pi Sigma Chapter is located, who attain its standards of high scholarship in physics and other subjects, and who give evidence of professional merit, proficiency, and distinction. To qualify to be a member of this distinguished group as an undergraduate student, one shall have completed at least three semesters of full-time college work, shall rank higher than the upper one third of his college class in overall scholarship, and shall have completed at least three semester courses in physics. We certainly look forward to seeing more students become members of Sigma Pi Sigma in the future.



### The End of an Era: Joe Tenn Retires

By Professor Lynn Cominsky

After 39 years on the SSU faculty, Professor Joe Tenn is retiring in May 2009. One of the first faculty hired into (what was then called) the Department of Physics, Dr. Tenn established almost all of our department's most cherished traditions in the role of Departmental Advisor, a duty he performed so well for nearly 30 years. In 1971, Dr. Tenn established the "What Physicists Do" series of public lectures, which has just concluded its 77th semester with his lecture entitled "Thirty-Nine Years of Physics and Astronomy at Sonoma State University."

This extremely popular series was the first to be established at SSU and has been organized by Prof. Tenn for 63.5 of the 77 semesters. More than 900 scientists and engineers have spoken in the series, including 13 Nobel prize winners. (See: <http://www.phys-astro.sonoma.edu/wpd/wpdHistory.html>)

One of the many ties worn by Prof. Joe Tenn to introduce the What Physicists Do weekly colloquium.

A little before the SSU campus had a web presence, Dr. Tenn took over our department's website on "yorty," a Sun UNIX machine acquired by Prof. Gordon Spear, and on which Dr. Spear and student Amanda Tunison had begun the department site. Far beyond its humble beginnings, the website now includes profiles of approximately two-thirds of the De-

partment's graduates, which are compiled every year by – you guessed it – Dr. Tenn. This information is a source of great Departmental pride, as Joe often points out graduates' accomplishments through the link "What can you do with a Bachelor's degree in Physics?". Photos of each year's crop of graduates is another favorite Departmental tradition arranged by Dr. Tenn, who then posts the photos on our website. He also maintains extensive lists of summer opportunities for physics students, job opportunities and resources, and other useful links and information about careers and educational opportunities in physics and astronomy. These resources are used extensively by both SSU students and members of the world-wide physics community.

Our two Department Research Awards, the Horace L. Newkirk Assistantship and the Mike and Sheila McQuillen Summer Research Award (see accompanying articles), have resulted directly from contacts made between the sponsoring families and Dr. Tenn. Retired physicist Horace L. Newkirk was a regular attendee at the "What Physicists Do" series for many years, and in 1979 he gave a lecture in the series, describing how he developed a method to damp out the tumbling of one of the first American satellites in space. The Newkirk Assistantship, created by his daughter Nadenia, in her dad's memory, has now funded 14 physics students to do paid research with a departmental faculty member. Mike McQuillen first became associated with the Department by taking Physics 314 (Introduction to Physics III) from Dr. Tenn and has also been a regular What Physicists Do attendee. He and his wife Sheila have been generously supporting summer research for the past seven years.



Rick DeFreez, '80 and Prof. Joe Tenn.



Katy Wyman '09 and Adam Dye '09.

support of his nomination, with comments such as "Bryant Hichwa has to be the best teacher that I have ever had, not only on this campus, but in my entire academic career" and "As a teacher he goes above and beyond the call of duty. Knowing him has made me a better person." He was also the driving force behind the donation of considerable amounts of laboratory equipment from OCLI and other companies to establish SSU's photonics laboratory within the Cerent Complex in Salazar Hall. SSU students continue to benefit from hands-on experiences with this state-of-the-art equipment, and Dr. Hichwa designed and taught several innovative courses in telecommunications and photonics in these facilities. He also mentored many student capstone projects, such as "Eliminating Optical Bounces in a 2x2 MEMS switch" (Kris Tyson 2005), "Optical Design to Enhance Lamp Arc Stability" (Andrew Clawson 2005.)

Dr. Hichwa's interests at SSU were wide-ranging - he taught both introductory level and upper division courses in Physics and revived a long dormant general education course, the Physics of Music. He served as Department Advisor for several years, offering stu-

There are also two Departmental scholarships named for members of the Tenn family. Prof. Tenn started the Sol and Edith Tenn scholarship in memory of his parents. This scholarship is awarded to an entering physics major and can be renewed for up to four years provided the student makes satisfactory progress toward a degree in physics and maintains grades in the top 25% of physics majors. Other members of his family started the Joe Tenn scholarship in his honor. This scholarship is awarded to a new or returning physics major.

The issue of the Physics Major that you are now reading is the Department's 34th edition. Prof. Tenn started the yearly newsletter in 1974, and served as editor for 29 issues. Even though early editions were mimeographed (and had to be scanned in), all issues are, of course, available online. One of the recurring articles, "AlumNotes" is really a series of short updates on the recent accomplishments of our graduates, and is always compiled by Dr. Tenn who corresponds with all the graduates each year and knows almost all of them personally.

An engaging lecturer, who (with three exceptions) has steadfastly avoided teaching any laboratories, Prof. Tenn has most enjoyed teaching courses in mechanics; modern, mathematical, statistical, and quantum physics; and astronomy and astrophysics. His lectures are always replete with historical insights into the personalities and circumstances behind the equations, as befits a scholar who is active in several different historical organizations. From 1993-1999, he chaired the History Committee of the Astronomical Society of the Pacific (ASP). Dr. Tenn also is an Associate Editor for the *Journal of Astronomical History and Heritage*, and currently serves as Secretary/Treasurer for the Historical Astronomy Division of the American Astronomical Society. His long-standing interest in history led to writing more than 30 magazine articles on the modern history of astronomy, most of them profiles of winners of the ASP's Cate-

rine Wolfe Bruce gold medal, and creating a popular website with biographies of all of the Bruce Medalists.

On a more personal note, Joe Tenn was responsible for me joining the SSU faculty. After inviting me to speak in "What Physicists Do," he arranged for me to teach part-time as an emergency hire in 1982, and encouraged me to apply for the tenure-track position which opened up in 1986. I have endeavored to follow in his footsteps as Department Chair (even if he only served one term), and have struggled to maintain the Department's traditions to the best of my ability. I have never hesitated to ask him for advice about SSU policies and rules, or to consult him about any problem, no matter how large or small. He has always been there for me, as he was for so many generations of physics students. Prof. Tenn has defined and shaped this Department for the last 39 years. I don't know how we will get through the next 39 without him. Congratulations on a well-deserved retirement!



Prof. Cominsky and Siana Alcorn '97.



Chris Johnson '09, Ken Martinelli '09 and Mark Wiedman '09.

### Farewell to Bryant Hichwa

By Professor Lynn Cominsky

Professor Bryant Hichwa has retired after five years of full-time teaching starting in 2002 and a semester in the early retirement program in the Fall 2007. Dr. Hichwa's involvement with SSU started much earlier, in 1990, when he began teaching part-time while directing Research and Product Development at Optical Coating Laboratory, Inc.(OCLI) in Santa Rosa and subsequently serving as President and Chief Operating Officer (COO) of MetroPhotonics (USA), Inc., a Santa Rosa outpost of a Canadian telecommunications company.

An inspiring and passionate teacher, Dr. Hichwa was awarded the 2005 SSU Excellence in Teaching award. A dozen students wrote in



Prof. Bryant Hichwa



dents the benefit of his experience in both the industrial and academic realms. Dr. Hichwa's knowledge of both musical instrumentation and photography are legendary – inspiring a multitude of student capstone projects as diverse as "Acoustic Research on Elephant Hearing" (Daniel Nicholas 2006) and "Real-time Depth of Field Image Compensation" (Melissa Crain 2007). His April 27, 2009 lecture in the "What Physicists Do" series, entitled "The Acoustics of Baroque Bassoons" summarized research that he has been doing around the world in mathematically modeling these 250-year old instruments. This work has been done in collaboration with world renowned concert bassoonist David Ranchor. Dr. Hichwa is also an active member of the Galpin Society, a professional organization in Europe that studies historical musical instruments.

Any SSU student or faculty member who has had the pleasure of

working in our recently remodeled upper- and lower-division laboratories has directly benefited from all the hard work that was done by Dr. Hichwa in designing these spaces and selecting the equipment. He led our Department's effort in reconfiguring our facilities, working tirelessly through years of committee meetings to make sure that our new laboratories would be sufficient for our needs for many years to come. They are perhaps his most lasting legacy to the Department.

On top of all his accomplishments in the worlds of optics and electronics (where he holds 33 patents), teaching physics and music, Bryant has somehow found time (with his wife Diane) to be extremely active in many environmental organizations in Northern California, including the Madrone Audubon Society, a chapter of the National Audubon Society, The Sonoma Land Trust and Audubon Canyon Ranch. We have been treated to his breathtaking slide shows of birds and other wildlife both locally and from trips to Africa. Dr. Hichwa is the quintessential renaissance man, and we will not forget his many and varied contributions to the Department.