

Sonoma State welcomes Brian Greene with open minds

By Ronald Pierce

The SSU sponsored lecture in Person Theater on Tues., Feb. 22 was sold out weeks in advance, with lines around the corner for tickets at the door. The theater itself was packed full of every type of person, from Professor Lynn Cominsky, chair of the Department of Physics and Astronomy and head of the NASA Education and Public Outreach group at SSU, to students needing extra credit

in their science general education courses and those just curious. The speaker was Dr. Brian Greene and it marks the first scientific guest lecturer to speak at Sonoma State on the same scale as professionals in the fields of arts, humanities, psychology, and other departments. The event was sponsored by the Associated Student Productions (ASP) and cosponsored by the Department of Physics and Astronomy. "This is the first time that an active researcher has been able to explain string theory without math," said Lynn Cominsky. "We have never really brought a scientist here before. All students pay fees, so it's good to have one of the top two or three scientists out there."

Greene is internationally well-known for his knowledge in the field of string theory and his ability to present difficult topics in ways that the average person can easily understand. He currently is hosting a three-part NOVA series adaptation of "The Elegant Universe," and planning another series based on his second book "The Fabric of the Cosmos." Dr. Brian Greene's lecture followed closely to his books. During the lecture Greene shared his ideas about scientific theories, while making it easy for the entire audience to understand. "I believe that what I do is so important because science is more than what we see in text books. There are breakthroughs, discoveries, and hardships. Science is a living, breathing thing that we experience," said Greene in a personal interview following the lecture, in which I snuck back stage and jumped into an elevator to catch him before he became absorbed into the throngs of attendees wanting autographs. Greene is genuinely thrilled to share his love of science with anyone willing to listen, be they students in the field, someone with a casual interest, or a creepy reporter who joins him in elevators uninvited.



Brian Greene with physics major Kalie Miller as Dr. Severson and Austin Powell discuss in the background.

The lecture began just after 7:30 p.m. and was thoroughly entertaining to physics majors and staff, who swooned with Greene's words. He gave information in two parts, first discussing background information that led him to his work in string theory, showing the differences between Albert Einstein's Law of General Relativity that represents the effects of gravity and the laws of quantum mechanics that govern the chaos of space

on the sub-molecular scale.

Following this, Greene went into his ideas of string theory. Greene spoke of 10 dimensions, ribbons of vibrating energy that make up all matter in the universe and answered the questions of the origins of the universe by uniting the work of the greatest scientific minds in history and used analogies with Chinese menus. Physics major Travis Tappa was pleased with the relatable style of Greene's lecture. "While a lot of scientists were there, there were others who he made it applicable to," Tappa said. "The first part was all stuff I had heard before, but it was good to see how he effectively toned it down for teaching. The second half was all new, but I could still follow."

"It was very well received. I think students are eager to explore these horizons and would appreciate more of these lectures," said Dr. Jeremy Qualls, assistant professor in the Department of Physics and Astronomy. String theory is more of a philosophy than anything. There is not enough experimental verification for my tastes but it's been out there for 30 years," said Qualls. He added that although Greene's work has not been proven yet, it's still one of the best ideas out there, and scientists continue their work to find the answers, whether or not string theory proves to be correct or wrong.

Greene, known as a master at speaking to those with little or no knowledge in the field of physics, threw in casual comedy that entertained and eased the audience. The lecture was wrapped up quickly with a question and answer session as Greene left viewers with the understanding that he is a man searching for answers to questions that have been asked since the beginning of civilization. Where did we come from? How was the universe formed? What is the future for us all? (Article adapted from original published in the SSU Star.)

THE PHYSICS MAJOR

Department of Physics and Astronomy

NASA E/PO: Cosmology Outreach

By Logan Hill ('06)

As we hurtle 200 kilometers per second around the galactic center towards the end of another school year, the NASA E/PO group, located on the third floor of the Schulz Library, has been busy with several projects, conferences, and conventions; all in pursuit of its namesake goals of education and public outreach. Headed by Dr. Lynn Cominsky, the E/PO group has helped to bring NASA-based science into the classrooms and the public arena.

For several years now, E/PO Science Education Specialist Kamal Prasad has run a MESA (Math Engineering Science Achievement) after-school program at Roseland University Preparatory High School in Santa Rosa which focuses primarily on robotics. This year, the program has been extended to Roseland



K. Prasad (right) organising MESA events.

Accelerated Middle School (RAMS) and is run by E/PO Production Assistant Logan Hill. The RAMS program has engaged students in building mousetrap cars, popsicle-stick bridges, as well as Lego robotics.

As a further extension of the MESA-allied outreach, the E/PO group helped organize and run the MESA Day event which was hosted here at SSU on April 30, 2011. In conjunction with MESA, Santa Rosa Junior College, and SSU's School of Science & Technology, MESA Day is a Northern California regional event that has high school and middle school students engaging in various science competitions, including robotics, mousetrap cars, wooden-stick bridges, and windmills.

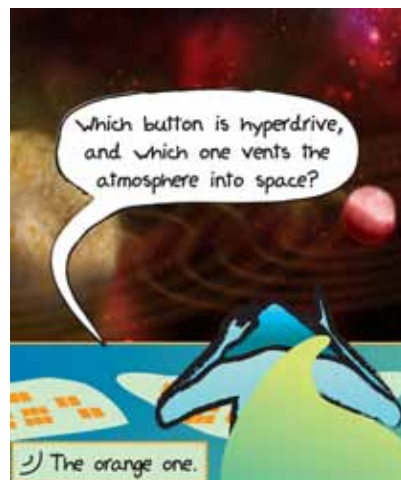
During the past year, the E/PO group had a presence at several other major conferences and conventions, including the National Science Teachers Association's National Conference, Sonoma County's Office of Education's Mini-Maker's Faire, and the USA Science and Engineering Festival in Washington, D.C.

<http://epo.sonoma.edu>

The E/PO group has produced several education guides which highlight the science of the NASA high-energy satellite missions; XMM-Newton, Fermi, and Swift. While these guides, and the science activities that they cover, are freely available from the group's website (<http://epo.sonoma.edu>), in order to publicize the materials the E/PO group uses their team of Educator Ambassadors (EAs). The EAs are master teachers from across the United States who are trained by the E/PO group and guest specialists from the Bay Area every two years at SSU. Last summer the EA Training conference included a two-day workshop on particle physics and was a huge success. Once trained, the EAs travel to regional and national conferences in order to give workshops that train other teachers on using E/PO materials in their classrooms. To date, over 50,000 teachers have been reached. The training materials are online at: <http://epo.sonoma.edu/ea/training.php>

A major endeavor on which the E/PO group is working is an introductory college-level general-education cosmology course. In conjunction with professors from Chicago State University, and the University of Nevada, Las Vegas, the course is designed to be used online or in the classroom, as a whole or in parts. Nearly one-third complete, the course will include an online textbook as well as many interactive applications, utilizing education research done by authors in order to deliver an engaging educational experience. Primary writing of the text has been done by Dr. Kevin McLin. The majority of applications have been developed in-house by either E/PO's Educational Science Support Assistant, Kevin John ('07) or Kamal Prasad.

Lastly, work continues on the ongoing Epo's Chronicles online comic strip. The adventures of the scientist Alkina and her AI controlled spaceship take place far in the future. Written by Logan Hill, Kevin John, and Kamal Prasad and illustrated by the E/PO group's in-house Scientific Illustrator, Aureore Simonnet, the comic strip has surpassed its 100th episode and is still going strong.



ALUMNOTES

Don Herriott ('72) is the director of Innovista Partnerships, the research district established by the University of South Carolina. He retired in 2009 from his position as head of Global Chemical Operations for Swiss drug maker Roche Pharmaceuticals. He has also served as chairman of the South Carolina Governor's Task Force on Workforce Education, the South Carolina Chamber of Commerce, and the School Foundation. He was one of SSU's Distinguished Alumni in 2003.

Barbara Allen Greene ('75) passed away 23 March 2008. She studied in the Energy and Resources Group at the University of Califor-

nia, Berkeley and earned a master's degree in psychology at SSU. She worked in alternate energy and computer programming.

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 lives in Florida.

Lance Erickson ('80) a professor of applied aviation sciences at Embry-Riddle Aeronautical University, has been selected for a Fulbright fellowship to teach in Kiev, Ukraine next year. He will teach from one of his own texts: *Space Flight: History, Technology, and Operations*, which he published in 2010. He earned his Ph.D. in astronomy at the University of Florida in 1987.

SSU Public Viewing Nights

By Jack Horowitz

This has been an exciting 2010-2011 season for the Observatory Viewing Nights Program. Especially with the addition of our newest and largest telescope yet, the Meade DS-16 generously donated by Valerie Cummings in honor of her late husband, James Cummings. The Meade telescope that contains a 16" diameter mirror was assembled and tested by student Daniel Kelley. Another donation was a 4.5" Tanzutzu telescope, made anonymously and coordinated by SSU Media Relations Coordinator Jean Wasp. These new additions have increased the quality of experience in observing astronomical objects to both the public and students during Viewing Nights. With the 16" Meade, 14" Mathis, and several other telescopes 8" and below, visitors to Viewing Nights can now have up to five telescopes in use in one night to make the viewing options more abundant and enjoyable.



Daniel Kelley and the Cummings 16" telescope

The Viewing Nights program has continued this past season to provide unique opportunities to observe rare astronomical objects that are normally hard to see with the human eye in the suburban area, such as nebulae, globular clusters, and even galaxies. Along with these viewing experiences provided by the telescopes, the public and students also were treated to fun and interesting lectures

from Assistant Professor Scott Severson. They also were introduced to and shown live astronomical imaging being done by physics and astronomy students, as well as observing past imaging done by former and current students. Finally the student docents and other interested physics and astronomy students gained invaluable experience and knowledge in operating telescopes such as the Mathis. They also became good at navigating and locating objects in the night sky; and showing their fellow student body as well as the public about astronomy, and how much fun it can be.

There are normally 4 Public Viewing Nights scheduled each semester as well as several more for students taking astronomy classes. Please join the Observatory Viewing Nights program when it returns in Fall 2011 for more journeys through the night sky.

Students Jack Horowitz and Crystal Ewen using the Tanzutzu telescope at an Observatory Viewing Night



For more information please visit:

<http://www.phys-astro.sonoma.edu/publicviewingnight.shtml>.

ALUMNOTES

Kevin Ablett ('83) is a software engineer for Bender RBT Inc. **Jennifer Wright ('83)** is a quality engineer at JDSU, Santa Rosa.

Antoinette "Toni" Davis [formerly Matthies] ('84) is the executive director of the Activities & Attractions Association of Hawaii, where she directed the creation of a Central Reservation/Global Distribution system for Hawaii's activities & attractions. She earned an M.B.A. at the University of Hawaii in 2002.

Norman Basham ('85) is writing apps for the iPhone and iPad.

Ben Burruss ('85) is at the Chabot Space and Science Center in Oakland, where he is a staff astronomer and content developer. Formerly head observer at the Naval Prototype Optical Interferometer Observatory, an editor and writer on NASA's Stratospheric Observatory for Infrared Astronomy, and a telescope operator on the Kuiper Airborne Observatory, he has also taught high school mathematics and physics as a Peace Corps Volunteer in Cameroon.

Victoria Moore Hewitt ('87) and her husband own and operate a thoroughbred horse farm, Arundel Farm, in Paris, Kentucky. They are also authors, whose first novel won the Pinnacle Book Achievement Award for fantasy and romance. She was formerly the principal of Lawrence Cook Middle School in Santa Rosa.

Kerry King ('87) passed away in November 2007 after tutoring mathematics, chemistry, and physics at Santa Rosa Jr. College for

many years. She earned a degree in accounting and worked in that field before coming to SSU. She was proud to be an SSU physics graduate.

Kenneth Ritley ('88) is a manager with SBB, the Swiss National Railway. He formerly worked for Hewlett-Packard-Consulting in Germany, for whom he spent much of each year working in India. Formerly a postdoctoral researcher at the Max Planck Institute for Metals Research in Stuttgart, he earned a Ph.D. in physics at the University of Illinois in 1998.

Phil Cullen ('89) is a senior consultant with Manex, a non-profit NIST affiliate, helping small to mid-sized manufacturers to be more competitive. He earned an M.B.A. degree at Santa Clara University in 2008.

Robert Greeson ('89) is a Commander in the U.S. Navy. Formerly a naval pilot, he now uses his physics background to conduct analysis on underwater acoustics.

Francis Moraes ('90) is an author, some of whose work may be read at <http://www.franklycurious.com/>. He earned a Ph.D. in atmospheric physics at the Oregon Graduate Institute of Science & Technology in 1995.

Raymond Ubelhart ('91) is a software scientist for Harris Corporation in southern California. He earned an M.S. in computer and engineering science at SSU in 2004. He has also worked in the Communications Solutions Group at Agilent Technologies and at Sola Optical USA Inc., Petaluma.

Saeid Rahimi Serves as Interim Provost

For the past year, Physics & Astronomy Professor Saeid Rahimi has been serving as Interim Provost, Vice President for Academic Affairs, and Chief Academic Officer for SSU. Rahimi's appointment followed Provost Eduardo Ochoa's departure from SSU for the position of Assistant Secretary of Education in President Obama's administration. Rahimi served as Dean of the School of Science & Technology since 2000. During his decade as Dean, he initiated new and innovative programs in Engineering Science and the Summer High School Internship program. He also adopted the Math, Engineering and Science Achievement Program (MESA) for economically disadvantaged students; led the SSU student retention, satisfaction, and graduation initiatives and efforts; oversaw the academic transition of the



School of Natural Sciences to the School of Science & Technology and the academic transition of the school through the \$30 million renovation of Darwin Hall. Rahimi's prodigious fund-raising efforts secured millions of dollars of research and development grants through Federal, State, and local agencies, organizations and individuals, and he was instrumental in securing the donation of the 3,600 acres Galbreath Wildlands Preserve and creating the new SSU Field Stations and Nature Preserves organization.

Although his year as Interim Provost was an interesting experience, Rahimi did not apply for the permanent position, and intends to return to the classroom and the laboratory to "have some fun" and work on some projects that he believes will help the students. Working with students has always been his greater passion. An inspiring teacher, he was a recipient of Excellence in Teaching awards from SSU, as well as from the Santa Rosa Chamber of Commerce.

ALUMNOTES

Jeff Kavanaugh ('94) was promoted to associate professor of earth and atmospheric sciences at the University of Alberta this year. He is also the director of the university's field research office. His research in glacier dynamics has taken him to the Yukon, Antarctica, and points in between. He earned his Ph.D. in earth and ocean sciences at the University of British Columbia in 2000.

Bill Oakes ('96) is an engineering manager at Medtronic in Santa Rosa. He was formerly a manufacturing manager at JDSU in Santa Rosa.

Danny Paulson ('02) is a Realtor in Sebastopol. Formerly a science teacher at Maria Carrillo High School in Santa Rosa, he earned his teaching credential at Sonoma State University in 2003.

Michael May ('04) is a project design engineer for Alliant Techsystems in Maryland working on missile and launch vehicle programs.

Marta Fuentes-Filp ('05) will begin study in the teacher credential program at San Francisco State University in Fall 2011. She was formerly a graduate student and teaching assistant in physics at the University of Iowa and later worked in business.

Sean Greenwalt ('05) performs construction management, procurement, and logistics for Genesis Renewable Energy in Sebastopol.

Roman Hewette ('05) is working on biomedical equipment as a member of the U.S. Air Force at Nellis Air Force Base.

Tim McKernan ('05) is a research and development engineer working on solar electric inverters for Fronius in Wels, Austria.

Kris Tyson ('05) is a senior application engineer in 3M's Optical Systems Division in St. Paul, MN. He is also pursuing a master's degree in management of technology at the University of Minnesota.

Danielle Beddow ('07) is an engineering technician at Sirrus Technology, Inc. in Santa Rosa.

Jeremy Dixon ('07) is a processing and mechanical engineer with Soladigm, Inc. in Milpitas.

Zachary Nuño ('07) is a graduate student and teaching assistant in physics at California State University, Long Beach, writing his master's thesis on Apertureless Near-Field Scanning Optical Microscopy. He will begin work on a Ph.D. at the University of California, Merced in Fall 2011.

Patrick Brown ('08) is a project engineer at Depositions Sciences, Inc. in Santa Rosa.

Dakota Decker ('08) is a development engineer in the propulsion department at SpaceX in Hawthorne, CA. He earned an M.S. in mechanical engineering at UCLA in 2009.

Adam Dye ('09) entered the College of Optical Sciences at the University of Arizona with a Biomedical Imaging and Spectroscopy fellowship upon graduation. After a year there he transferred to the University of Nevada, Reno, where he is now pursuing an M.S. in mathematics. He has attended the Center for Adaptive Optics summer school at UCSC, built a binocular stereoscope for the Visual Perception Lab at UNR, and currently consults on the optical development of a solar energy system at SunScience Corporation.

Chris Johnson ('09) is a graduate student and teaching assistant in the Department of Physics and Astronomy at San Francisco State University.

Eric Lundy ('09) is a coating technician with Sirrus Technology, Inc. in Santa Rosa.

SPS: Going Strong

By SPS President Austin Powell



What a great year for the club! We have been very active in outreach and have done some fun activities together. Over the past two semesters, our members have done a lot to help young scientists at events such as MESA Day and Seawolf Day. Our club was a strong contender in Geek Week, (an event organized by the chemistry club) where we competed against all the science majors for the first-ever Darwin Trophy.

Club spirit has been especially high this spring. Members have been active both individually and as a group in promoting physics. Headed by SSU Society of Physics Students member Kathleen Morrison, a video was developed to briefly explain how some physics demos work and was shown at our Seawolf and MESA Days. On Pi Day, one of our professors, Dr. Qualls, made the greatest sacrifice in the cause for physics by sitting in front of a firing line

of merciless cream pies in order to raise funds for the club.

Nearly all club members were participants in Geek Week. Inspired by Greek Week, the SSU Chemistry Club organized Geek Week with multiple competitions in which a winner would emerge to claim the first trophy of Darwin. The Physics club was a strong contender, dominating in the tug-o-war, and gaining extra points in some of the event's sub-competition. We were particularly proud of our egg drop contraption which utilized two balloons in the shape of a p-orbital. We also managed to find some time for a field trip to San Francisco's Exploratorium and enjoyed a great talk by renowned string theory physicist, Brian Greene.

Last fall, a few members visited the Roseland Accelerated Middle School and enjoyed sharing some cool physics demos with the students and watched them build their mouse-trap cars. We also



Prof. Qualls takes a few pies for the club!

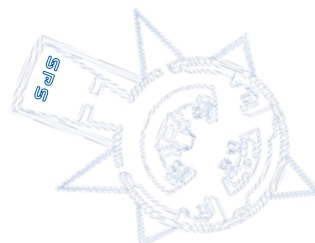
reached out to younger students at the Santa Rosa Mini-Maker Fair. This spring, despite stormy weather, our members were very successful increasing interest in our physics and astronomy program at Sonoma State at the Seawolf Day.

I am excited by how much the club has grown this year and can't wait to see what happens next year!

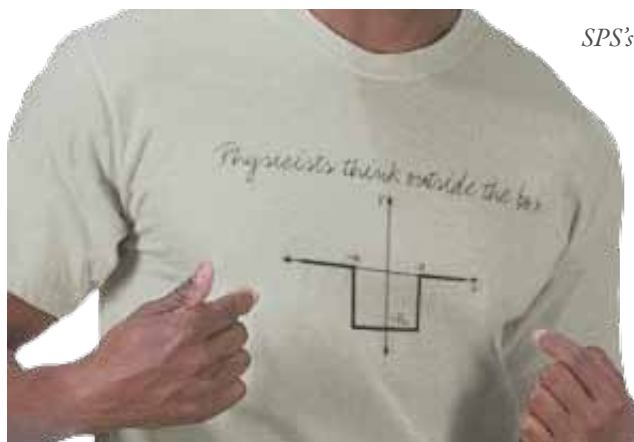
Students interested in joining SPS should go to <http://www.students.sonoma.edu/clubs/sps/index.shtml>. Prospective and current physics majors are encouraged to view the web site for any news and upcoming events.



*Top Row: Brooks Hanley, Crystal Ewen, Jude Rowe, Austin Powell, Jack Horowitz
Bottom Row: Josh Stortz, Kathy Morrison, Kalie Miller, Cristhyan Alfaro*



SPS's awesome 2011 T-Shirt!



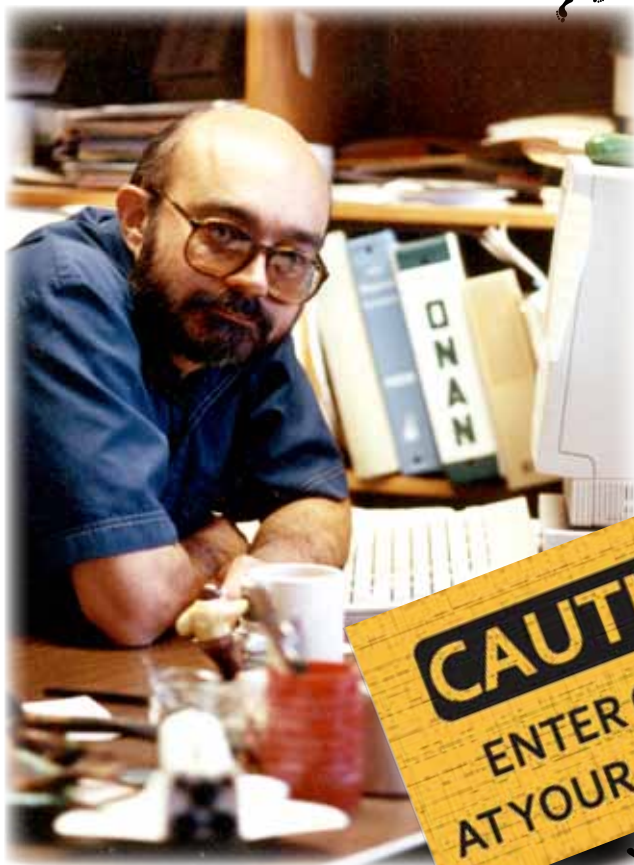
SSU's Founding Observatory Director Gordon Spear Retires

By Prof. Lynn Cominsky

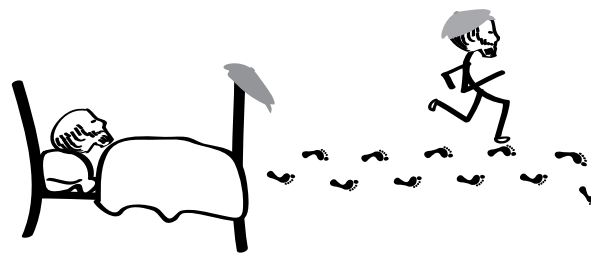
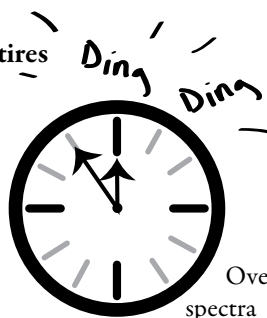


After 37 years, Dr. Gordon Spear is retiring from SSU. Spear was the first SSU P&A faculty member to earn degrees in Astronomy, rather than Physics. He came to SSU in 1974, after 2.5 years at NASA's Johnson Space Center studying ultraviolet stellar spectra, and quickly took charge of a new project to build an

on-campus Observatory. Professors George Johnston and Joe Tenn had obtained a small grant and built a concrete pad with a pier for a telescope in the football field, and they were overjoyed to have a real astronomer come and take over the design and construction of a building. Spear invigorated the Astronomy course offerings in the Department, developing new courses such as, "Astrophotography" (A331) and "Advanced Observational Astronomy" (A482), and doing astronomical research with students. Dedication of the SSU Observatory occurred on April 22, 1976, including a new 14-inch Celestron telescope, and permanent mounting of the Department's older 10-inch Celestron telescope, and Spear was named SSUO's first Director. Public Viewing Nights at SSUO followed shortly thereafter, and remain a regular and popular offering to the public.



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Over the years, Spear's research focus shifted from ultraviolet spectra to the studies of variable stars. Noted students who worked with Spear for many years included: Ron Bleau ('79, now retired from Lockheed), Claude Plymate ('81, site manager at National Solar Observatory), Miriam Carolin* ('82), Jim Pisano, ('82, now working at NRAO), Stephanie Snedden ('83, now an astronomer at Apache Point Observatory's Sloan Digital Sky Survey), Donald W. Martin ('83, who later became a telescope operator at KPNO), Teresa Bippert-Plymate ('84, former interferometry specialist at Steward Observatory), Tom McMahon ('85, project manager for the University of Arizona Large Binocular Telescope Interferometer, as well as for two instruments for the Giant Magellan Telescope), Benjamin Owen ('93, now Director of Penn State's Center for Gravitational Wave Physics), Ryan McDaniel ('07, an associate engineer at Deposition Sciences, Inc. who still frequently volunteers at SSUO) and most recently Katy Wyman ('09 who just earned her Master's degree at Wesleyan).



Getting students to use bigger telescopes was another innovation pioneered by Dr. Spear. He regularly took students to use Mt. Laguna observatory, run by San Diego State, in Southern California. In June 1979, Spear, together with Dr. Tenn, organized and hosted the annual meeting of the Astronomical Society of the Pacific that was held at SSU, featuring five papers based on work by Spear and his students. The meeting also brought famous astronomers to campus, including Halton Arp and Alan Stockton, who disagreed on the distances to quasars as measured by interpreting their redshifts.

As times changed, so did SSUO, due to Spear's insistence on keeping SSUO's technology at modern levels. This is no coincidence – Spear taught the Computer Programming for Scientists (P381) course for many years, and was the Department's resident expert in this area. As time marched on, Astrophotography gave way to Digital Imaging in 1988 when Spear got the first CCD camera for SSUO. Spear was even farther ahead of the times when he became the first person to get a NeXT computer for a faculty workstation, and also helped obtain a Sun workstation to support the CCD image processing in 1989. Yet another Sun workstation came to the Department's cluster in 1991, courtesy of a \$122k NASA grant to Dr. Spear to analyze data taken by the Infrared Astronomical Satellite (IRAS) to search for variable sources. In 1993, SSUO leaped into the computer age when Spear acquired a new 10-inch Newtonian telescope with a computerized control system – one of the first small telescopes to use this technology. The new robotic mount revolutionized the Advanced Observational course and made the lives of many students much easier!



In 1996, computers entirely took over Spear's life, when he took a four-year leave to work as the campus' first Instructional Technology guru. Helping other faculty to implement their courses using computer technology was a huge job, and one which Spear handled with his usual enthusiasm. When he returned to the Department in 2000, he was greeted by the arrival of a new, greatly improved CCD system for SSUO. This new system also included a filter wheel, which allowed for the acquisition of multi-color images of objects via electronic control. In 2002, Spear began to campaign for a new site for a larger telescope, when the campus began construction on dormitories that he thought would further increase the already significant light pollution at SSUO. Upgrades at SSUO in 2004 included both a new mount and a CCD-powered spectrograph for the computer-controlled 10-inch telescope, and the end of a decade-long wait for high-speed Internet to the Observatory. Also in 2004, Spear presided over the "first light" of a new 14-inch telescope at Pepperwood Preserve that was funded by my NASA E/PO group. However, "GORT" is not large enough to do everything that Spear envisioned. It merely served as a stepping stone to a much bigger and better plan he developed in 2006, courtesy of the Johnson family's donation of the beautiful 3600+ acre Galbreath Wildlands Preserve to SSU. Spear was named the project director for the Galbreath Wildlands Preserve Observatory, developing the initial plans for this off-grid, environmentally sustainable 1-m class telescope at a site that is located in one of the darkest areas in California.



Gordon and Barbara Spear at the 2009 Reunion

Since Dr. Spear's entry into the Faculty Early Retirement program in 2006, Asst. Prof. Scott Severson has taken over directing SSUO, running Public Viewing Nights and also working on the GWPO. However, Spear leaves behind a huge legacy of work on many generations of astronomical equipment at SSU, and bright plans for the future. We hope to someday fulfill his dreams of a 1-m telescope and welcome all contributions to the Observatory Fund in honor of his retirement.

FACT
**Carolyn was a mainstay of SSUO, logging more hours at the facility than any student ever, and faithfully sketching sunspots for many years. She also co-authored four research papers with Dr. Spear.*



The Early Years: Gordon Spear with Paul Avellar

Newkirk Assistantship 2010: Photoluminescence Spectroscopy Analysis of ZnO

By Cristhyan Alfaro

Light is one of the most amazing fields of study in physics since scientists can use specific types of light to measure certain properties of matter, excite and study the nature of electrons, and then move forward towards applications. There are many materials that are used to make lasers and other devices that can output light in the visible range from ~ 700 nm (red) to ~ 400 nm (violet). Recently, much research has been done in the ultraviolet (UV) range (< 400 nm) due to the potential applications in the UV optoelectronics. Zinc oxide (ZnO) is one of the semiconductors that has caught much attention to possibly make UV LEDs and laser diodes due to its outstanding optical properties.

During spring 2011, I have been working with Dr. Hongtao Shi on the photoluminescence spectroscopy analysis of ZnO doped with different amounts of phosphorous. Samples are doped so that we can study how impurities could affect their optical properties over a range of temperatures from 20 K to 300 K. We used to use a pulsed laser to excite the sample in order to measure the optical properties. The disadvantage of this method is that the UV emission from the sample was not steady at all. To solve the problem, I have spent much time exploring other options to replace the pulsed laser with a continuous UV light source. Needless to say, aligning an optical system is a lot of work. With a xenon/mercury lamp to be shipped to us soon, we can quickly move to the second phase of the project, which is to characterize the electrical properties of ZnO-based devices we make in the lab. What I am working on now is to use LabView to write a program so we can automate these measurements.

During the past few months, I have learned a great deal from working on this project; sometimes physics students spend so much time learning theory that it becomes hard to imagine how to develop an experiment and apply physics concepts to such an experiment. The experiences that I have learned through this assistantship will help me throughout my career and my life. Special thanks to the Newkirk family for funding this excellent program dedicated to the memory of Horace L. Newkirk.



Cristhyan Alfaro in deep concentration

MESA Day

by Crystal Ewen

During the 2011 spring semester, Sonoma State University hosted MESA (Math, Engineering, and Science Achievement) Day for the first time. Since 1970, MESA has helped many first generation and low-income college students bridge the gap into higher education. It is wonderful to have increased MESA activities here at SSU. Middle school and high school students from around northern California competed in an egg drop from the roof of a three story building and raced miniature cars built from mousetraps and also participated in a number of other STEM (Science, Technology, Engineering and Math) activities.

In between events, a few of the science clubs on campus set up extra activities for the students. For the physics activities, the Society of Physics Students (SPS) set up demos involving total internal reflection, electric potential, center of mass, angular momentum and Q&A with the students. The favorite among the students was using a bike wheel and a spinning chair to firsthand experience the conservation of angular momentum. Throughout the day, approximately 100 students came to the extra sponsored activities.



What Physicists Do: 80th and 81st Series

By Kalie Miller

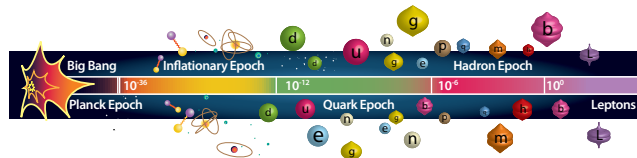
As many students begin their college career they often wonder what they intend to become at the end of their four-year track. For me, I changed majors multiple times until recommended to take the *What Physicists Do* lecture series for credit. Courses such as this one are the reason many students become so fascinated with different subjects and actually figure out what they propose to do with their lives after graduation. Leaving college and entering the real world is beyond frightening for some, and through this lecture series students are able to make connections with speakers that come to Sonoma State and possibly make a decision on what they really hold a deep passion for.

This year's series contained a plethora of different physicists from a variety of different work forces. Whether a student or someone purely attending in order to learn about physics and astronomy, the different subject matters varied in amazing ways to tend to every listener.

From the eightieth series, vast information about physics and astronomy was presented. As for the physics realm of the talks, students and the community were amazed by presentations that demonstrated how to use physics to develop sustainable communities and to understand the human brain's activities. Along with those two interesting topics, the series also introduced physicists that were out to discover what seemed to be the impossible. Researchers from the University of California, Berkeley, and the University of California, Davis, for example, dove into deep discussions of the search for particles that have yet to be found. Using colliders and neutrino beams, scientists discussed their search for infinitely small particles that, so far, exist only in theory.

Not only does the What Physicists Do lecture series bring in researchers from these universities, but in the eightieth series students were also exposed to researchers that were looking for students to help complete research by their side. This created extra opportunities in which students could actually get involved in and receive hands on experience in the field of physics. This semester's series also included some physicists that did not continue through school to receive their Ph.D., but worked for local industries in their field. Having this information presented to students was very worthwhile, for some undergraduates do not have plans to attend graduate school.

As for astronomy, the eightieth series also contained many speakers that are, in fact, astronomers and astrophysicists. Interested in how the universe was created? Or how astronomers can even see some of the objects in the night sky? This lecture series featured many speakers, including one from Stanford University, that discussed the formation of our universe and the telescopes and techniques that allow us to observe these things.



Although the eightieth series was more breathtaking than could ever possibly be described, the eighty-first followed right behind. From this exciting semester, students and the community were once again astonished with amazing talks in both the physics and astronomy fields. The series celebrated Hubble's twentieth year in operation, presenting films and discussions on its remarkable discoveries throughout the past two decades.

As the semester continued, prestigious researchers presented their research topics and investigations stumbled upon throughout their post-undergraduate careers. Popular topics included the Large Hadron Collider as well as the dark matter and dark energy contained in our Universe. One speaker even presented information and advice that she "wishes she knew when she was an undergraduate," thus expressing advice when conducting research and being a physicist. These physicists and astronomers do not only come to Sonoma State University to explain their jobs to students, but also come in order to assist students by giving advice to those following their same career paths.

Along with giving advice within their lectures, speakers in this series volunteer to come early and sit down for pizza lunches with Sonoma State University (SSU) students to discuss or answer any questions they may have. Speakers even stay for dinner to discuss their lecture and work, along with any questions the audience may have had about their presentation. This is extremely important and both question sessions are definitely something that SSU undergraduates are very fortunate to be able to experience.

Although I am unable to explain in detail each lecture presented to students, the community, and faculty at SSU, it is easy to say that the *What Physicists Do* lecture series is undoubtedly one of the most captivating lecture series on campus, and one that each student should try to attend at least a few times every semester. Even coffee, cookies, and tea are available before every lecture as an appreciation of your attendance! So, with all being said, I recommend coming to these lecture series every Monday at 4pm in Darwin 103 next semester to start off the eighty-second series and learn about what physicists and astronomers really do, combined with their astonishing discoveries. Along with all of the students, faculty, and community that attend the *What Physicists Do* lecture series, I look forward to the topics this next year has in store for everyone, and cannot wait to see you there!

For more information on previous series or for the current schedule please visit:

<http://www.phys-astro.sonoma.edu/wpd>

Kenneth Martinelli ('09) is a quality assurance technician with Sonoma Photonics (now part of Northrup Grumman) in Santa Rosa.

Mark Wiedeman ('09) is a remote solar designer for Sungevity Solar Home Specialists in Oakland, CA. He uses satellite imagery to remotely determine the solar potential of rooftops and uses point recognition software to design and place digital solar arrays.

ALUMNOTES

Katherine "Katy" Wyman ('09) earned a master's degree in astronomy at Wesleyan University in 2011. She did research in radio astronomy at the National Radio Astronomy Observatory in summer 2009.

Bill Garcia ('10) is a laser technician with RMI Laser in Lafayette, CO.

McQuillen Scholar 2010: Creating Low Dimensional Crystals and Examining Interface Physics

By Austin Powell

I had a great time last summer. For most people, a great summer would not include spending all day in a lab trying to grow crystals, but for me, working in Dr. Jeremy Qualls' lab was like being in a playground. The reason I was able to spend so much time in the lab was thanks to the extremely generous Michael and Sheila McQuillen Summer Research Assistantship. As a student aspiring to continue on to graduate school, it was a unique opportunity to practice the skills and disciplines that would certainly benefit me in my future education.

The goal of my summer research was to study electron behavior in two specific carbon-based crystals. More specifically, the crystals I was interested in were known to be superconductive and very sensitive to defect content and external parameters like pressure and temperature. Another key benefit of organic superconductors is that their electronic properties can be adjusted much more easily than their metal and ceramic counterparts. This makes them ideal candidates to study for future room-temperature superconductors. I wanted to perform some tests on them to better understand how the conduction electrons and the superconducting states behaved and the impact of purity and how the electronic states behaved at the interface between two different superconducting crystals. Although superconductivity can be achieved in many different materials, it remains elusive as a practical benefit to society because of the low temperature constraints. Thus far, the highest superconducting temperature for a material is still nearly 200 degrees C below zero. So not only was my work of academic interest it also addressed a technological desire. I am especially interested in the future applications of superconductivity in medical physics. One way higher temperature superconductors could be used is in a SQUID (superconducting quantum interference device) which is used in medical physics to measure biomagnetic signatures. Using this device, magnetic fields of femtoTesla emanating from the human brain can be measured, but this is only if the SQUID is superconducting.

My goal was to study how electrons behaved in the two crystals. I was using the organic crystals TTF-TCNQ (tetrathiafulvalene-7,7,8,8-tetracyano-p-quinodimethane). These crystals had long been known to possess superconducting properties and although they had been well-studied, they still had not undergone certain tests. Initially, I gained interest in these crystals through the senior research project of previous SSU student Brad Yearwood, who investigated their properties for his senior research project.

My goal was, first of all, to grow viable samples. Both materials had their own personality and all of my initial attempts ended in crystals that were either too small and fragile, or ones that had defects. Since the tests I hoped to perform would only be relevant on crystals without any defects, growing viable samples proved to be a mixture of a science, art and just plain luck. After attempting several different methods, I obtained single crystals (crystals without defects) using a liquid diffusion method for TCNQ and supersaturation for TTF. My summer project had quickly turned into an exercise in chemistry and even when I was not growing crystals in lab, I was practicing growing any crystals I could, even sugar crystals at home!

Thanks to this assistantship I was able to become familiar with utilizing resources in a lab and growing some samples I would be using in my senior project. I am currently measuring the electrical properties of the materials down to 4.2 Kelvin and will present my results this year during capstone presentations.



Austin Powell in the Magnet Lab

Physics Graduate Patrick Colbus Injured in Agilent Accident

On April 26, 2011, Patrick Colbus ('05) was critically injured when the Molecular Beam Epitaxy machine that the company uses to produce high quality samples exploded at Santa Rosa's Agilent facility. Patrick was hospitalized at the UC Davis Medical Center for treatment to burns to his face and upper torso. The explosion rocked the building, caused major damage to the lab where it occurred and left Colbus with serious injuries. Long a big supporter of the Physics and Astronomy Department, Colbus was responsible for several important donations to our laboratories, including an optical table, and a Hall system which has been used in upper division laboratories. He was a standout student while enrolled at SSU, taking one or two courses each year while working full-time at Agilent. His senior project involved renovating a thermal evaporator that is still being used in Dr. Shi's laboratory, which took the advantage of his expertise in vacuum system design and testing. We wish him a full recovery!

Thank You for Your Support!

Another year has passed, and we reflect back on those that have helped 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 budget worsens, the cuts into education spending deepen further. It is donations from private individuals that allow us to maintain a healthy program in these difficult times.

The *What Physicists Do* lecture series is supported in part through donations. Dr. Scott Severson (scott.severson@sonoma.edu) is now running the series, and welcomes any suggestions that you might have for future speakers. We have just completed our 81th semester of the popular series.

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. A new summer research assistantship has been generously funded by Professor Emeritus Bryant Hichwa and Diane Hichwa. The research experience has a dramatic impact on the students, providing them with experiences that propel them into 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.shtml>, contact the SSU Development Office at (707) 664-2712 or contact the Department.

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#E0231 Physics & Astronomy Scholarship

Lynn Cominsky and Garrett Jernigan

#E0269 Science at Work Fund

Established by John Max to support What Physicists Do.

Gifts In Kind:

Valerie Cummings: donated a Meade DS-16 telescope in memory of her late husband James Cummings.

Anonymous: 4.5" Tanzutzu telescope.

Cominsky Joins LIGO Science Collaboration

With over 800 members from institutions around the world, the Laser Interferometer Gravitational-wave Observatory (LIGO) Scientific Collaboration (LSC) makes NASA's Fermi Gamma-ray Space Telescope Large Area Telescope collaboration look small (at only 350 members). Nevertheless, with the potential for the discovery of gravitational waves (GW) right around the corner, Prof. Lynn Cominsky has decided to join the LSC. Much to her delight, two SSU grads (Ben Owen, '93 and Ryan Quitzow-James, '05) were there to cheer her on as she recently presented her application and proposed plan of work at an LSC collaboration meeting near Pasadena in March. Owen is the Director of Penn State's Center for Gravitational Wave Physics, where he is currently also an Associate Professor. Quitzow-James is a graduate student at University of Oregon

in the GW group, where he has been awarded a 2011-2012 LIGO Fellowship for his project: Developing Tools to Recognize and Predict Upconversion and Similar Noise Sources. The Fellowship includes a \$5000 stipend, support for travel to the research location and two trips to his home institution, as well as support for incremental living expenses while at the research site.

Cominsky had been serving as a member of the LIGO Program Advisory Committee for the past three years. After her advising service ended, she was so interested in GW astrophysics that she decided to join the project. She will now try to expand the work of SSU's E/PO group to include developing formal educational materials about GWs. Advanced LIGO is now under construction, with first light expected sometime after 2014. For more information about LIGO and the LSC, visit <http://ligo.org>



Department of Physics & Astronomy
Sonoma State University
1801 E Cotati Avenue
Rohnert Park, CA 94928-3609

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Sonoma State University
Rohnert Park, CA 94928-3609
(707) 664-2119
phys.astro@sonoma.edu
<http://phys-astro.sonoma.edu>

Edited by: Jeremy Qualls

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