



The PHYSICS MAJOR

DEPARTMENT OF PHYSICS AND ASTRONOMY
2004



Dept. to Welcome New Prof

In Fall 2004 the Department of Physics and Astronomy will welcome Dr. Hongtao Shi as the newest member of the faculty. Dr. Shi comes to SSU most recently from West Virginia University where he earned his M.S. (1998) and Ph.D. (2002) degrees in Condensed Matter Physics. During the past two years he has been a Post-doctoral Research Associate at West Virginia. Dr. Shi grew up in the Nanjing region of China where he received his B.S and M.S. degrees in Physics from the University of Nanjing. He taught physics at Nanjing for four years before coming to the U.S.

Dr. Shi brings a wide range of expertise and experience to SSU. Due to his interest in optoelectronic and information storage applications, Dr. Shi has pursued research in the fields of thin magnetic films and wide band gap semiconductors by various deposition techniques including ultrahigh vacuum molecular beam epitaxy and DC magnetron sputtering. Dr. Shi is interested in self-assembly of quantum dots, nanostructures fabricated via a scanning electron microscope, exchange coupling between a ferromagnet and an antiferromagnet, spin dependent tunneling and magnetic sensor devices.

Dr. Shi will also become the Director of the Keck Laboratory, a part of the Cerent Laboratory complex in Salazar Hall. Dr. Shi has extensive knowledge in and experience with many of the standard materials characterization tools including X-Ray Diffraction, Scanning Electron Microscopy, Energy Dispersive X-Ray Analysis, Atomic Force Microscopy (Scanning Probe Microscopy) and Superconducting Quantum Interference Device (SQUID) magnetometer, some of which are already available in the Keck Laboratory.

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Dr. Cominsky to be Chair

Dr. Lynn Cominsky has been appointed Chair of the Department of Physics and Astronomy beginning Fall 2004.

"I look forward to helping the Department through the transition out of and back into a new improved Darwin Hall and to continuing to grow the number of physics majors," she says.

A member of the Department since 1986, Dr. Cominsky heads the NASA Education and Public Outreach group which communicates the achievements of several space missions to the public and has developed Space Mysteries: Interactive Web Activities that teach Physical Science and Mathematics. The group also provides science education for teachers through the North Bay Science Project.

Dr. Cominsky is an X-ray astronomer whose research discoveries include the discovery of pulsations from the first X-ray transient shown to be in a binary system, the discovery of eclipses from an X-ray burst source, which revealed the first precise orbital period for a low mass X-ray binary, and the discovery of X-ray emission from the only radio pulsar in a binary orbit with a Be star. She is a Visiting Scientist to the Particle Astrophysics group at the Stanford Linear Accelerator Center (SLAC), the headquarters for her biggest mission, the Gamma-ray Large Area Space Telescope (GLAST).

A member of the Structure and Evolution of the Universe Subcommittee of the Space Sciences Advisory Committee to NASA, she is also the American Astronomical Society's Deputy Press Officer.

Dr. Cominsky was named both SSU Outstanding Professor and California Professor of the Year by the Council for the Advancement and Support of Education in 1993.



Don Herriott Honored as Distinguished Alumnus

This year another physics graduate was honored by the SSU Alumni Association as one of the University's "Distinguished Alumni."

Donald Herriott, who received his B.S. in 1972, is the president and general manager of Roche Carolina, Inc., a company which develops new pharmaceuticals and the technology for making them. In 2001 he was honored as Business Person of the Year by the South Carolina Career Guidance and Placement Association and his company as 2001 Mid-size Manufacturer by the South Carolina Chamber of Commerce and National Association of Manufacturers.

In addition he has been very active in community service, especially in regards to education. He is currently chair of the the South Carolina Chamber of Commerce, of the South Carolina Governor's Task Force on Workforce Education, and of the School Foundation, which he founded. He serves on the boards of the Palmetto Institute, the South Carolina Chamber of Commerce Excellence in Education Committee, the South Carolina Governor's School for Science & Mathematics Foundation, and the Pee Dee Council of the Boy Scouts of America.

Herriott and the other two distinguished alumni spent a day on campus in October and were presented with their awards at a banquet that evening. Don expressed great pleasure at seeing the campus again and reminiscing with professors Dunning, Poland, and Tenn, whom he recalled from his student days. He was duly impressed with the changes on campus, including the Cerent Laboratories.

Previous physics graduates honored as Distinguished Alumni were Roberto Ramirez ('72) in 2002 and Rick DeFreez ('80) in 1995.

Alumnotes

JOHN C. NELSON ('76) is a Senior Research Specialist with the 3M Microreplication Technology Center in Petaluma.

Darwin Hall to be Remodeled

In 2002 California voters approved a bond issue including \$26 million to renovate and remodel the aging Darwin Hall. Since that time a number of faculty, including our own Drs. Enrique Izaguirre and Bryant Hichwa, have been working with a team of architects and SSU facilities personnel to accomplish a complete makeover (SSU's own reality show). The plans to date provide for modernization of laboratory facilities, better use of space, and classrooms which will enable us to make use of modern communications technology. Darwin will be vacated by the end of the Fall 2004 semester. The inside of the building will be completely gutted starting in January 2005 and rebuilt. It is scheduled to open for the Fall 2006 semester.

In the interim the Physics and Astronomy faculty and laboratories will be located in the far northwest corner of campus in two small buildings (formerly the Tech High School), Carignane and Chalk Hill. Fall 2004 will be a transition semester for us. We will continue to teach our classes in Darwin for the entire semester. However, we will be moving our introductory laboratories to Carignane in late August. Our offices will remain in Darwin until mid-November, when we will complete our transition to Chalk Hill. Steve Anderson, the Department technician, with the assistance of the faculty and some students will be sorting through 40 years of laboratory equipment and lecture demonstrations this summer. We will be selling some of these "classics" on eBay. Come by and lend a hand or visit us in the fall in our new location near the Environmental Center and the NASA EPO group.

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Edited by Joe Tenn

Written by David Gray, Bryant Hichwa, Reza Khosravani, Phil Plait, Peter Quinliven, Gordon Spear, Joe Tenn, Tedman Torres, Kris Tyson.

THOMAS BARBOUR ('78) manages network architecture for the BioScience Division of Baxter Healthcare, supporting clinical trials for new medical products.

I best remember the tremendous classes with Sam Greene, his humor, the free exchange of alternative ideas and the great field trips to Yosemite and Canyonlands. It was the computer classes I took at Sonoma State that fueled my lifelong interest in computers and programming which has been very beneficial in every phase of my professional career.

BRUCE ODEKIRK ('78) is vice president of engineering of Zeus Semiconductor in Vancouver, WA. He earned his Ph.D. in applied physics at the Oregon Graduate Institute of Science & Technology in 1982.

Grads Making Plans

This academic year will see the largest number of SSU physics graduates since 1993. There were three graduates in December and may be as many as eleven more in May and August.

Of the December grads, Tom Bittancourt is working for Corbin in the research and development of motorcycle technology, while Robert Chavez is currently teaching three physics courses at SSU and one engineering class at College of Marin.

Tedman Torres has accepted a graduate assistantship in physics at Arizona State University, while Ashley Wiren has accepted an assistantship in aerospace engineering at the University of Colorado.

Peter Quinliven will be a teaching assistant in physics at the University of California, Davis. He reports, "As a former Gulf War veteran and contractor, I feel that I have benefited the most from my experience here at SSU. As a direct result of my physics training, I was given the opportunity to work for NASA last summer on the deployment system for the Mars Explorers. I can truly say that dreams can be made reality here at Sonoma State."

Jesse Campagna is applying to graduate programs in fine arts, while Corey McCarthy intends to attend graduate school in aerospace studies for a year before joining the Navy. Patrick Kelly is seeking a teaching credential.

Michael May will continue working as a mechanical engineer for General Dynamics in Healdsburg.

Tiffany Borders, Michelle Curtis, Vivian Pierre-Louis, and Gray Slater are seeking employment, which some will follow with grad school.

STEPHAN R. CRANDALL ('82) manages a team of engineers for Polaris Networks, a late stage start-up company which focuses on Broadband and Wideband applications, in San Jose.

I have found my studies at SSU have been a very important part of my success at high profile companies such as Xerox and Cisco as well as lessor known companies like Atari, Stratacom, and now Polaris. I think that the reason my education at SSU (and especially in Physics) was so fundamental to my success was because this is where I learned how to think, and how to see and analyze from multiple perspectives.

JOANNE DEL CORRAL ('83) teaches part-time in the SSU Department of Physics and Astronomy. In the past two years she has been honored by two student groups, the Order of Omega and the SSU Ambassadors, for outstanding teaching.

TERESA BIPPERT-PLYMATE ('84) is now working at Steward Observatory as Interferometry Technical Specialist for the Terrestrial Planet Finder Testbed project. She was formerly the technical writer for the SOLIS project at the National Solar Observatory.

TIMOTHY FINNEGAN ('84) is a self-employed tax consultant in Kansas. He earned an M.S. in nuclear engineering at the University of Wisconsin, Madison, in 1986.

ANTOINETTE MATTHIES DAVIS ('84) is executive director of the Activity Owners Association of Hawaii. She earned an M.B.A. at the University of Hawaii in 2002.



The World of Terabits/sec

"Photonics and optical communications are changing the world of telecommunications and the way people interact" says Reza Khosravani, who joined SSU in 2003. Dr. Khosravani teaches primarily in Computer and Engineering Science, but is currently a member of the Department of Physics and Astronomy and taught Electricity and Magnetism in Spring 2004.

Dr. Khosravani received his Ph.D. from the University of Southern California in 2000, and his B.Sc. and M.S. degrees from Sharif University of Technology, Iran, in 1993 and 1996, all in electrical engineering. At USC, he worked on polarization mode dispersion and fiber nonlinearities at the Optical Communication Laboratory. He then joined Phaethon Communications as a photonic scientist working on tunable dispersion compensation technologies.

Dr. Khosravani is determined to conduct serious research at SSU. "If you understand the physics of light, optical fiber and photonic devices", he says "you can enter into the world of terabits/second transmission." Several terabits/second transmission over fiber has already been demonstrated. Pushing the limit further requires increased understanding of the physics of optics and materials.

Research in photonics and communications is conducted in the Agilent Technologies Communications Laboratory and the Rolf Illsley Photonics Laboratory, both part of the Cerent Engineering Science complex in Salazar Hall. Dr. Khosravani and Dr. Bryant Hichwa oversee the activities and research conducted in these two labs. The labs' equipment currently include state-of-the-art instruments valued at more than two million dollars.

"We are so fortunate that we have such high-tech equipment to work with," says Jane Liu, a student who works under Dr. Khosravani's supervision. Local industry has been very generous in supporting the labs.

Dr. Khosravani has authored and coauthored over 20 publications and obtained four patents in optical fiber communications. His research interests include high capacity optical fiber communication systems and networks; fiber degrading effects including chromatic dispersion, polarization mode dispersion, and nonlinearities; wavelength division multiplexing; and photonics technologies. Dr. Khosravani is constantly looking for talented and motivated students to work in his research group.

NASA-EPO Group Active

Phil Plait

Hey! Hello? Yeah, hi, over here! Remember us? We're the NASA Education and Public Outreach Group, and just because we've moved way over to the northwest corner of the campus doesn't mean we've slowed down. Far from it. In fact, this past year has been our busiest ever, and if things work out, we'll be even busier soon. Our whole plan is to create educational materials based on NASA space science, and there are a lot of people out there who should be learning about this stuff. So busy is good. Here's what we've been up to since last year:

1) We made it through a full year of having moved to the extreme suburbs of SSU. Moving from Darwin Hall to the old Tech High building has given us all a little more desk space and freedom to work. The official name for our building is now Viognier, which, is pronounced VEE-oh-nyay, or, as we like to pronounce it when we call Ameci's for pizza delivery, "The Old Tech High Building."

2) This year we produced educational materials and distributed them to teachers, scientists, and others across the country:

... an educational guide for high school students which uses galaxies with monster black holes in their cores to teach topics like the size and scale of space, and how to use a plot to measure phenomena;

... another educational guide which uses huge cosmic explosions to teach about how astronomers classify objects, how timing an event can tell you its direction, and how the energy of these objects can be determined;

... a "magic cube" which displays different astronomical objects seen by one of our space satellites called the Gamma Ray Large Area Space Telescope, or GLAST for short. The cubes are less annoying than Rubik's cubes, and you're less likely to be branded a geek for having one;

... a beautiful color tell-all brochure about GLAST, sure to be the basis of a TV mini-series next fall.

3) We greatly expanded our successful "Educator Ambassador" program, which uses top-notch teachers from around the country to help us develop and distribute our materials. We went from 10 teachers last year to 23 this year, covering 18 states and one Canadian province. Many have won prestigious national awards, and we're mighty proud of them.

4) We hired another astronomer, Dr. Kevin McLin, of UC Davis, to spend part of his time helping us develop new materials. He's already put together an exercise where students fiddle with dangerous radioactive elements in quantities that could fry the Earth. Really. But it's all done in an Excel spreadsheet, so it's unlikely to cause any real damage without crashing Windows first.

5) We have a new robotic telescope up and running.

6) Our full-time artist and scientific illustrator, Aurore Simonnet, put out a book with her husband, Kamal Prasad, which teaches elementary school students about gravity. Called "Why Can't I Jump Very High," it gives a lucid and clear account of, um, why I can't jump very high.

7) We now employ a whole passel of student assistants, including Dakota Decker, a high school student (who volunteers so we don't break any child labor laws). Tiffany Borders, Gray Slater, and Ashley Wren are graduating, and we wish them the best. The other students—Melissa Crain, Logan Hill, Kali Nugget, Zack Nuño, and Schell Scivally—are still doggedly working for us.

8) And as if this weren't enough, we are submitting four separate proposal to do even more work, and have another (big) one coming up. This means we will have more funding to create additional materials to educate the public, but, more importantly, it means we'll have more to write about next year for *The Physics Major*.

Keeping track of all this is easy. Just go to <http://epo.sonoma.edu>, to see just what we're up to.

TOMAS VERA ('84) is a senior software engineer with Yosemite Technologies in Fresno. He served as an officer in the U.S. Navy immediately after graduation from SSU.

BRENTON WHITE ('84) is the principal of Brenton White Company, LLC, a distributor of maps and education and travel posters in Loveland, CO. He was for many years a product manager in measurement and automation software technology for Agilent Technologies.

JON JURGOVAN ('85) is senior patent attorney in Atlanta in the electronic engineering/computer sciences patent solicitation group of Alston & Bird LLP. He earned his J.D. at Washington & Lee University and his M.S. in electrical engineering at California State University, Fullerton.

PAULA BENNETT ('86) is a nurse in an intensive care unit at a hospital in Louisville, KY.

PETER ROONEY ('86) is the deputy staff director of the House of Representatives Committee on Science. As the American Physical Society's Congressional Fellow for 1998 he worked in the office of Senator Joe Lieberman of Connecticut. He earned his Ph.D. in physics at the University of California, San Diego, where he was a teaching assistant and an IBM fellow. He is featured at <http://www.physicscentral.com/people/people-03-08.html>.

SSU does a particularly excellent job teaching physics.

VALERIE LEPPERT ('87, physics & chemistry) is an assistant professor in the Division of Engineering of the new University of California, Merced. She earned her Ph.D. in materials science and engineering at Northwestern University in 1993. She holds a previous B.A. in biology from SSU.

LINDA RAREY ('88) a nuclear medicine technologist doing PET scans for Molecular Imaging Corporation. She taught in the Radiologic Technology Program at Santa Rosa Junior College for 18 years. She earned a master's degree in an interdisciplinary major, Aging and Medical Facilities, at SSU in 1997.

KATHERINE RHODE ('89) earned her Ph.D. in astronomy in 2003 at Yale University, where she held a NASA Graduate Student Researchers Program fellowship. She is now an NSF Astronomy and Astrophysics Postdoctoral Fellow, dividing her time between Yale and Wesleyan University, where she earned an M.S. in astronomy in 1997.



A Tale of Two Observatories

Gordon Spear

Yes, as indicated last year, things will be changing for observational astronomy at Sonoma State University. For most of the year, the venerable old Celestron-14 was removed from the campus observatory (SSUO) and replaced by a new Celestron-14 with a large format Apogee CCD camera on a Paramount computer-controlled German equatorial mounting. This instrument was acquired by the NASA E/PO group under the direction of Professor Lynn Cominsky and was undergoing engineering testing and evaluation at SSUO on its way to becoming a robotic telescope system to support the Global (formerly GLAST) Telescope Network (GTN) and various NASA space missions.

This year an agreement was finalized to allow SSU to become a tenant at the Hume Observatory operated by the California Academy of Sciences at the Pepperwood Nature Preserve north of Santa Rosa. This is a dark site that is normally above most of the coastal fog.

We have completed the construction of a 3-meter computer controlled dome at this facility along with a control room within the Hume Observatory building. Construction was undertaken and supervised by Tim Graves ('01). During spring break the new telescope system was moved to its new home at the Hume Observatory. This system will be known as GORT (Gamma-ray Optical Robotic Telescope). Integration is proceeding on schedule and first-light should occur during early summer 2004. As soon as high-speed internet access becomes available at the Hume Observatory, GORT will be accessible and controllable over the Internet. In addition to supporting several NASA programs, this instrument will be available for research and instructional use by SSU students.

Through contributions and some grants, we have been able to purchase a new computer-controlled Mathis fork mount for the campus observatory. This mount will be delivered during the summer and will provide a mounting for the old Celestron-14 on the east pier of SSUO. Thus SSUO will soon have two computer-controlled telescope systems, the other being the existing Epoch 10-inch system with our ST7 CCD camera on the west pier. We are seeking additional contributions and grant funding to support the acquisition of a CCD camera system and spectrograph for the Celestron-14.

During the year blazar observations were obtained by students Gray Slater, Tiffany Borders, and Jen Price; plus E/PO staff members Tim Graves, Phil Plait; and me. Student Ryan McDaniels has been working on obtaining light curves for some minor planets.

Observational astronomy is looking good at SSU. Anyone interested in applying for telescope time?



Ashley Wiren & Tiffany Borders with new telescope at SSUO.

Donations Ever More Valuable

Private donations again made a big difference to the Department of Physics and Astronomy this year.

Donations from Nadenia Newkirk and from Michael and Sheila McQuillen supported students doing research during the spring and summer. A number of donors contributed to keeping the weekly "What Physicists Do" series going for the 66th and 67th semesters. A total of 1663 people attended the 25 presentations in fall and spring, with the largest crowd turning out for Dr. Claire Max's spring lecture on Black Holes in the Cores of Nearby Galaxies.

Donations by several individuals over the years, most of them graduates, helped in the purchase of the new mount for the SSU Observatory's main telescope

This year we thank the following donors:

Physics & Astronomy Public Programs: Stephen and Elizabeth Bursch, Anthony & Joan De Bellis, Donald J. Farmer, Robert A. Fisher, Forestville Mini Storage, James ('71) and Judy Hill, Gary & Lynn Imm, Kay Jablonski, Francis and Patricia Marshall, Bernard & Barbara Meyers, Robert and Bertha Rains, Robert S. Tuttle, DDS.

Physics & Astronomy Equipment & Supplies: James Aroyan ('87), Marvin & Elfi Chester, David Goldkind ('82), Martha ('88) & Alex Hunt, Duncan & Marion Poland.

SSU Observatory: Jo-Ann & Joseph Smith, Miriam Tobin ('90).

Physics & Astronomy Student Development Fund: Robert and Lois Gottlieb, Michael and Sheila McQuillen, Robert and Bertha Rains.

Horace L. Newkirk Memorial Student Assistant Fund: Nadenia Newkirk.

Physics & Astronomy Scholarship (current): David Munton ('82), Joe Tenn.

Physics & Astronomy Scholarship (endowment): Lynn Cominsky and Garrett Jernigan.

Sol & Edith Tenn Scholarship: Joe Tenn.



David Gray with donor Nadenia Newkirk

David Gray is the 2004 Newkirk Assistant

David Gray

After growing up in Chicago, I came to California in 1990 for my first tour of duty in the United States Navy. I attended Chapman University during my off duty hours and obtained my Associate of Arts degree. While assigned to the U.S.S Ranger CV-61, an aircraft carrier out of San Diego, I completed tours in the Persian Gulf and traveled around the world. I remain affiliated with the U.S Navy Reserves.

In spring of 2000, I enrolled at Sonoma State as a physics major. Following the September 11, 2001 attacks, I was recalled to active duty and forced to cancel my current semester and miss the next two. I spent over a year overseas assigned to a military police unit. I returned to SSU for the spring 2003 semester to continue along my previous educational path.

Beginning in June of 2003, I started conducting research with the faculty at Sonoma State. In January of 2004 I was awarded the Horace L. Newkirk Assistantship which enabled me to continue my research throughout the spring semester of 2004. This research, supervised by Dr. Enrique Izaguirre, involved the construction of a point projection microscope. This project, once completed, will enable our research group to better characterize phospholipid tubules and other self assembled molecules/macromolecules. This is important because it will allow us to probe the structure and many of the physical properties associated with these molecules. These properties are of great interest to the fields of biophotonics, nanotechnology, and molecular electronics.

I've thoroughly enjoyed doing research and believe that research is an invaluable experience at the undergraduate level. The Department of Physics and Astronomy at SSU offers continuous support and direction to those undergraduate students who have the desire to further their educational experience through research. I strongly recommend that more students take advantage of these research opportunities that are offered by the physics and astronomy faculty at SSU.

Biophotonics Projects

Tedman Torres and David Gray

Exciting projects in the SSU Biophotonics Lab are being developed under the direction of Dr. Enrique Izaguirre with the aid of student researchers Tedman Torres, David Gray, Krege Christison, Drew Rapoport, Jessie Campagna, Michael May, and Winston Fisher. In the past Farzaneh Rasti, Mark Loguillo, and Dan Gospe also contributed. The goal of these projects is to form a biomolecular characterization and analysis lab to investigate the physical characteristics of proteins, phospholipids, and other biological macromolecules of current interest to the physics community. Two of these experiments will be described here:

The Plasmon Resonance Experiment, being developed by Tedman Torres, involves interaction of polarized laser light at the interface between a metal thin film and a dielectric. The apparatus consists of a prism, coated on one side with a thin film of metal. A laser is sent through the prism and undergoes total internal reflection. At a critical angle, energy is coupled from the beam into the thin film, setting up a plasmon wave, which is basically an oscillation of groups of electrons. At this angle, a decrease in reflected intensity is registered. The shift in this peak produced by adding a thin film of biological molecules such as lipids or proteins on top of the metal thin film can then be used to discover important optical properties of the biological thin film. Many of the preliminary tests have been made, and the project is in the state of fine-tuning and adjustment.

The Point Projection Microscopy Experiment involves the building of a prototype Point Projection Microscope to characterize self-assembled tubules using phospholipids. The microscope, currently being built by David Gray and Michael May, will use an electron source located a short distance from the sample to generate an image from a shadow pattern. The image will be obtained with the use of a multi-channel plate, a phosphor screen, and a CCD camera. We will use it in the characterization of phospholipid tubules and other self-assembled organic membranes. One important aspect of the PPM is the use of a low energy electron system in order to reduce or eliminate organic sample damage. The data we will obtain holds great potential for future application in biophotonics, nanotechnology, and molecular electronics.

DANIEL WILCOX ('89) is a research support specialist at Cornell University's Space Sciences Lab. He was for many years an electronics technician at the Canada-France-Hawaii Telescope in Hawaii

BILL KOBABE ('90) is the woodshop teacher at both Sunridge and the Sebastopol Independent Charter schools. He is also self-employed in a woodworking business, designing and fabricating merchandise display and store fixtures.

STEPHEN K. MOSIER ('90) is a clinical anesthesiologist and an assistant professor in the Department of Anesthesia and Critical Care at the University of Pittsburgh. He earned his M.D. at the State University of New York at Brooklyn in 1998 and completed his residency in anesthesiology at the University of Pittsburgh in 2002.

Kris Tyson Wins McQuillen Summer Research Award

Kris Tyson

I'm an undergraduate student at SSU majoring in physics with a concentration in applied physics and minoring in business administration. I began my studies in the fall of 2000 after moving to California from a rural area of New Jersey. I am fortunate to be working with Dr. Bryant Hichwa on various exciting research projects ranging from the study of thin films and the analysis of fiber optic switches to baroque bassoon reeds. This year I have been awarded the Michael and Sheila McQuillen Summer Research Award to continue research into the summer months.

These research endeavors have allowed me to become accustomed to state of the art hardware and software for use in the analysis process. Over the summer I will continue the examination of a 2×2 Latching Fiber Optics Switch that I have been working on since January 2004. This switch allows laser light (i.e. a stream of data) to travel in through two fiber leads of the device and out either of the two other optical leads by triggering a miniature mirror. The goal for this device is to determine the most efficient parameters needed for the switch to perform optimally. To do this I will need to be familiar with optical spectrum analyzers, digital oscilloscopes, and frequency generators from Agilent Technologies and Hewlett Packard. Using these instruments with specially written software, a voltage waveform can be derived that allows the optical switch to run at maximum efficiency and allows the mirror to switch correctly.

My hope is that, with the results from research this summer, more advanced and technically superior optical switches can be manufactured for commercial use. The Department of Physics and Astronomy at Sonoma State has numerous exciting research opportunities yet to be undertaken by willing students. I urge anyone who enjoys hands-on experiments, solving real-world problems, and using high tech instruments to invest some time in the offered studies

JEFF SANDBERG ('90) is a Program Coordinator for the City of Portland, Oregon Bureau of Water Works. He works in the engineering department performing water efficiency surveys and providing technical assistance to the commercial sector.

Studying physics teaches a method of learning and looking at problems that is beneficial in many areas of work and study. Simply holding a degree in physics provides opportunities that may not have otherwise been available. SSU's program at the time provided small class sizes and direct access to outstanding professors—a significant advantage over larger Universities and programs. My only regret is in not having pursued the more challenging courses and programs.

KEITH WAXMAN ('90) is teaching astronomy at SSU, Santa Rosa Jr. College, and San Francisco State University, where he earned an M.S. in earth and space science in 1994.

My major at SSU (Physics) and minors (Astronomy and Mathematics) prepared me for my graduate work at SFSU. My studies at SSU also taught me many important ideas and techniques which I currently incorporate into the courses I teach.

Dr. Tenn Cutting Back

In the fall Dr. Joe Tenn will reduce his load to half-time teaching as he completes his term as chair and starts easing toward retirement.

"Highlights of my three year term as chair include the successful recruitment of two new faculty members, Drs. Bryant Hichwa and Hongtao Shi, the raising of funds to support students doing research here in summers, the opening of the Cerent Laboratory complex (with heroic efforts by Steve Anderson), and the steady growth of majors to approximately sixty, the highest percentage of undergraduates in the California State University system. The Department has also worked hard on planning for the remodel of Darwin Hall and surviving the construction period (with Drs. Enrique Izaguirre and Bryant Hichwa taking the lead), has revamped its curriculum, and has weathered some serious budget cuts."

"Now I intend to join Dr. John Dunning in the Faculty Early Retirement Program. I plan to continue maintaining contact with graduates but to give up most of my other activities beyond teaching."

Dr. Tenn's other activities have included founding the "What Physicists Do" public lecture series and directing it for 51.5 semesters (he will continue in the fall), founding and producing all but one issue of this newsletter, and maintaining the Department website.

SCOTT McWILLIAMS ('91) is director of laser development at Photodigm Corp. in Richardson, TX, where he develops indium phosphide-based surface-emitting lasers for telecommunications applications. Formerly senior engineer at nLight Photonics in Vancouver, WA, he has also worked on diamond research at Crystallume Corp., Menlo Park. He earned a master's degree in electronic materials and devices at San José State University in 1996.

DAVID PIAZZA ('91) is teaching physics at Hokkaido International School in Sapporo, Japan. He earned a master's degree in science education at the University of Washington in 1999. He has taught physical sciences at the Branson School in Ross and at El Molino High School in Forestville since earning his teaching credential at SSU.

PAUL KOHLMANN ('92) is a senior engineer and manager of the Coating Development and Applications Labs for Flex Products, a division of Optical Coating Laboratory, Inc. in Santa Rosa.

STEVE GROSSBERG ('92) will be teaching high school mathematics, including International Baccalaureate courses, at the European School in Heredia, Costa Rica starting in Fall 2004. He taught math and science at Geyserville Educational Park, along with numerous courses for Sonoma State University's PreCollege Programs, from 1992-2002.

GEOFFREY SYPHERS ('93) is the director of KEMA Green. Based in Cotati, he provides green building consulting to cities, counties and states on the design and construction of their buildings. He earned an M.S. in energy engineering in 1994 at the University of Massachusetts, Lowell.

DAVID LAMB ('94) is a senior research physicist at 3M Company in Minnesota, where he develops brightness enhancement products for LCD backlighting applications. He received his Ph.D. in physics at the University of Alabama in Huntsville in 1999.

New Prof

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Dr. Shi is well known in the field of X-ray diffraction. His work with collaborators at the National Institute of Standards and Technology has been well received by the scientific community. Dr. Shi was the first person to study the exchange coupling force in thin NiF₂ films, which are weakly ferromagnetic. His work has published in a number of prestigious journals including *Physical Review Letters*, *Physics Review B*, and the *Journal of Applied Physics*. He has authored and coauthored more than 30 papers in peer-reviewed journals.

Dr. Shi is very excited about getting undergraduate students involved in his research work at SSU. As the Fall semester begins we expect to see a lot of new activities in the Keck Laboratory. If you haven't had a chance to visit the Keck Lab or the other Cerent Labs please make it a point to contact him or Dr. Hichwa.

GREGORY MADRUGA ('96) is a senior systems engineer with Science Applications International Corporation (SAIC) in San Diego.

RODNEY G. LEE ('97) teaches chemistry, physics and math at Regis High School in Stayton, OR. He formerly taught at Marin Catholic High School. He earned his teaching credential at SSU in 1999 and an M.S. in astronomy at Swinburne University of Technology in 2003.

I have found that the physics, astronomy, and math preparation I received at Sonoma State to be excellent preparation for my work with students.

AMY WEBER MADRUGA ('97) is a full-time mom in San Diego. Until recently she was a hardware engineer at Cisco Systems, Inc. in Petaluma.

ALAN J. WITTEN ('99) has retired as manager of inside sales at DEY L.P., a pharmaceutical manufacturer in Napa.

MARCUS ASARO ('01) is a graduate student and teaching assistant in physics at San Francisco State University. He has accepted a fellowship for doctoral study in physics at the University of California, Riverside beginning Fall 2004.

DANIEL PAULSON ('02) is a science teacher at Maria Carrillo High School in Santa Rosa. He earned his teaching credential at Sonoma State University in 2003.

MICHELLE BECKET [JONES, VALENCIA] ('03) is a laboratory associate in the energy technology department of the Aerospace Corporation in El Segundo.

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Classes related to optics, photonics, electronics, and experimental physics prepared me well for the work I'm doing. It is extremely important to the corporation to document a thorough lab book for possible patent documentation; all the lab classes where professors focused on how to keep proper lab notes and write ups have made a world of difference to me as a professional.

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