

Kris Tyson is 2005 Newkirk Awardee

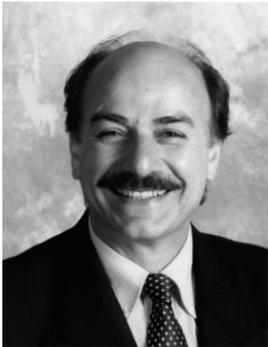
By Kris Tyson

I have been fortunate enough to be awarded the Horace Newkirk Assistantship to continue my research under Dr. Bryant Hichwa for the spring of 2005. We started our exploration into the capabilities of Fiber Optic Latching Switches in January 2004 and intend to continue our analysis through this academic year. Before working with Dr. Hichwa on a variety of research projects I didn't fully grasp what the applied physics field could offer. Working in the labs over the past few years has really been a mind opening experience for me. SSU has offered me the chance to work with state of the art equipment used in industry today and it would have been foolish of me not to jump at this opportunity. Integrating the technology available to me with pure research alone can take a lot of time and patience, but this where I have the most fun. Learning the "ins and outs" of digital oscilloscopes and optical spectrum analyzers has been an

experiment within an experiment and has provided me with an education I could really only obtain otherwise by working in the industry. With these tools Dr. Hichwa and I have gathered incredible amounts of information which we have used to formulate significant results. From the analysis of baroque bassoon reeds to research involving thin films I have certainly gained a well rounded schooling in the applications of physics.

Over the next year I plan to take full advantage of the amazing tools available to me before my graduation this fall. Opportunity struck last fall and I plan on spending the upcoming summer months as an intern in Minnesota doing research for 3M's Optical Systems Division. This, however, leaves me with a limited amount of time to complete my research of the optical switches and determine their optimal efficiency parameters. Fortunately, in working with Dr. Hichwa I have learned that the everyday experience in the lab adds up to be far more valuable than a single result.

Prof. Rahimi Honored With "Spirit of Sonoma" Award



The North Bay Technology Roundtable chose Saeid Rahimi, Dean of the School of Science and Technology, and Professor of Physics and Astronomy at Sonoma State University, as the honoree at its "Spirit of Sonoma" luncheon on Dec. 2, 2004. The "Spirit of Sonoma" honors outstanding people from different organizations throughout the county. The Roundtable found Rahimi's contributions to the NBTR and his efforts with his staff and faculty in establishing a Bachelor of Science in Engineering Science at SSU outstanding and worthy of recognition.

This year marks the fourth annual Spirit of Sonoma event. The honorees are chosen for their contributions to the economic development and enhancement of the communities in which they live and work. All previous winners of the award have been business leaders in Sonoma County – this is the first time an academic has been selected for the award.

New Equipment for Applied Nuclear Lab

By John Dunning

Applied Nuclear advances with the arrival of an intrinsic Germanium gamma ray detection system and a Si(Li) alpha particle detector from Canberra.

The Genie 2000 gamma ray system has the finest resolution and gain stability I have had the pleasure of working with. Many of you may remember the frequent recalibrations needed with the older Ge(Li) system in place from 1979 to 2001. Now resolution of 1.8 keV FWHM is routine using Cobalt-60 and gain stability is stable to within +/-0.2 keV over weeks.

Stored gamma spectra of neutron activated hair samples from the SSU class of 2002 are being used as an introduction to the software.

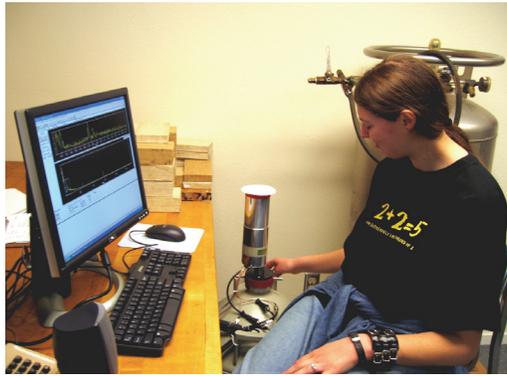
Currently we are using the gamma system to measure airborne radioactivity attached to particulate matter. Our filter paper traps these particles much as the lungs do. Most of what we detect arises from intermediaries in the naturally occurring Uranium 238 series. This same system can be used to detect airborne radioactivity from nuclear events.

The alpha particle detector includes a vacuum chamber, amplifier and USB port to couple to the computer. It is being used to sample airborne alpha activity arising from both the Uranium and Thorium series.

New experiments will utilize a positron annihilation system composed of two opposing NaI detectors.

The electronics purchased for this experiment can also be used for a cosmic ray muon coincidence experiment. Many of you may remember our older cosmic ray demonstration system which employed plastic scintillators about 30 cm long.

Currently, the “Low Level Counting Laboratory” occupies a first floor room with windows in our transition home, Carignane.



Beth Harmony using the Germanium Gamma-ray detector

When the Darwin remodel is completed we will have a first class nuclear facility on the third floor for both wet chemistry and sealed source work. The facility includes a gowning room and a hood. An upgraded liquid scintillation counter for beta counting will enable us to again offer a full spectrum of applied nuclear experiments including the popular hot hair laboratory.

SPS has Active Year

By Kris Tyson, SPS President

The Society of Physics Students is a national organization and club on the SSU campus aimed at bringing students interested in the field of physics together to collaborate and discuss the latest gossip in the field and around campus. SPS has been active at Sonoma State for several decades and year after year has continued to offer students the opportunity to visit scientific institutions, national research labs, and many other exciting locations. Last fall I assumed the role of President, Melissa Crain as VP, Patrick Colbus as Secretary, and Ryan Quitzow as the Treasurer.

Together we SPS members meet bi-weekly, inhale huge amounts of pizza, and plan future trips. Last semester we had the opportunity to take a tour of the Stanford Linear Accelerator complex (SLAC); our first trip of the year and a great experience for everyone that attended. In March of this semester SPS

visited Lawrence Berkeley Laboratories (LBL) and explored the labs moderated by Dr. Carl Haber. Dr. Haber is a particle physicist and specializes in the detection systems and software for massive particle accelerators. During our tour of his research and development laboratories we also got a full breakdown on techniques that can be used to recover and enhance old vinyl records, a side project of Dr. Haber's. His particle detection software can be used to track and store tiny vinyl groove variations with the use of intense light beams.

SPS provides an opportunity for students to actively explore research being done in the field and relate it to what they have learned in college and how they could use it after graduation. I insist anyone that's interested in physics and its applications, or just the chance to grab some free pizza, to drop by one of our meetings.

ALUMNI NOTES

Eileen Philips ('74) is a retired programmer living in Novato.

Arthur B. Flynn II ('76) retired in 2004 as the director of the US Department of Energy National Training Center in Albuquerque. He is now a professional consultant for various companies including Sandia National Laboratory.

Bruce Odekirk ('78) is Director of SiC Engineering at Advanced Power Technology in Bend, OR. Former positions include vice president of engineering of Zeus Semiconductor and vice president of technology for Sarif, both in Vancouver, Washington. He earned his Ph.D. in applied physics at the Oregon Graduate Institute of Science & Technology in 1982.

Stephan Crandall ('82) is now an art student at San José State University. Until recently he managed a team of engineers for Polaris Networks in San Jose.

David Goldkind ('82) is a consultant on management and process engineering with Zinfandel Advocates & Producers in Grass Valley. He also does consulting in optics.

Jeff Porter ('83) is doing high energy physics research in the Center for Experimental Nuclear Physics and Astrophysics at the University of Washington. He was formerly database leader for the Solenoidal Tracker At RHIC (STAR) experiment at the Relativistic Heavy Ion Collider at Brookhaven National Laboratory. He earned his Ph.D. in physics in 1995 at the University of California, Davis while participating in the DiLepton Spectrometer experiment.

Jason I. Alexander ('92) is CEO of a startup company, Vivaray, in San Jose. Formerly a marketing manager of organic light emitting diode (OLED) displays for OSRAM in San Jose, he earned an M.S. in physics in 1995 at Indiana University -Purdue University at Indianapolis.

Things that Blink in the Night

By Sean Greenwalt

At the end of last semester, I didn't even know that a Senior Project was required of me (those who have met me will not be surprised by this information; it's a wonder I can find my classes...). After overhearing many discussions of projects, however, I began to wonder if maybe I wasn't missing something. I asked a few questions, and soon discovered that I could look forward to doing a Senior Project in the Spring.

During our first meeting this semester, Dr. Spear handed me a thick stack of papers covered with Julian Date (a way to count days) and delta Magnitude (change in brightness) numbers, for Z Draconis, an eclipsing binary system's axis of rotation is nearly (or actually) orthogonal to the plane of observation, it will, as each star takes its turn occluding the light of the other, appear to be a single star whose magnitude changes over time; this is one example of what we call a "variable star" (there are other kinds — look it up!). The data were acquired "...sometime in the sixties..." accord-

ing to Dr. Spear, and the Yellow band data (550 nm) were already on his computer. As an aside, what we are here calling "Yellow" would probably seem more orange to the eye.

My first task was to type the data for Blue (440 nm) into Excel, correct the time of minimum (and thus correct the phase as well, where "phase" is the fraction of one orbital period having passed at the time of the observation), and graph it. Having done these things, I was then required to study a program called "Binary Maker 3" (BM3) and learn to move these new data to BM3 files for analysis. Finally, having acquired some radial velocity information for the system ZDra, I must phase correct the Yellow data and combine them with Blue in BM3 to generate an animated model of the system.

Dr. Spear has informed me that we will be publishing this work in the Journal of the American Association of Variable Star Observers. It is my understanding that this is new research, never before seen. This means that I will be the first to present this model to the public, a prospect I find very exciting. I just hope I can remember the date of the talk and find the room.

Donations Make a Big Difference

Private donations to the Department of Physics and Astronomy play an important part in supporting our public programs, and our students. Donations from Nadenia Newkirk and from Michael and Sheila McQuillen again supported students doing research during the spring and summer. Many donors contributed to keeping the weekly "What Physicists Do" series going for the 68th and 69th semesters, allowing us to bring in several lecturers from outside the Bay Area. A total of 1151 people attended presentations in the fall, with the largest turnout for Dr. Jill Tarter of the SETI Institute on the search for extraterrestrial intelligence. Due to our move out of Darwin 108 and into a smaller room in Stevenson Hall (on an unfamiliar day) for the spring semester, the attendance was smaller, but there were crowds standing at the back of the room for talks by Dr. Natalie Roe of LBNL on the SNAP mission, Dr. Tilman Sauer of Caltech on Einstein and the riddle of his creativity, and Dr. Bruce Schumm of UC Santa Cruz on the beauty of particle physics.

This year we thank the following donors:

Physics & Astronomy Public Programs: Richard M. Bell, Stephen and Elizabeth Bursch, Matthew ('93) and Sharon Davis, Renee Dertner, Donald J. Farmer, Robert A. Fisher, Ed J. Le Du (Forestville Mini Storage), Lucy and William Kortum, Francis and Patricia Marshall, John Max (Max Machinery Inc.), Bernard and Barbara Meyers, Jeremy and Laura Nichols, Robert and Bertha Rains.

Physics & Astronomy Equipment & Supplies: Don Herriott ('72) and the Roche Carolina Matching Gifts Program, Valerie J. Leppert ('87) and Ronald Simenauer.

SSU Observatory: Jo-Ann and Joseph Smith.

Physics & Astronomy Student Development: William ('95) and Robin Dover, Mike and Sheila McQuillen, Katherine L. Rhode ('89), Miriam Tobin ('90), Robert S. Tuttle DDS.

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

Physics & Astronomy Scholarship (current): William ('77) & Joan Kramer.

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

Sol & Edith Tenn Scholarship: (current) Joe Tenn.

A Fond Farewell

...from Jeanie Mar

As I look back on my time at SSU, I know that I have gained so much. I grew up here. I transferred to SSU in the Fall of 1997 and graduated in May 2000 with a degree in Math and Psychology. I was hired as a Learning Skills Specialist at SSU the following semester. While working, I began studying physics out of curiosity and fell in love with it after taking Dr. Hichwa's 214 class. Now five years later, I will be receiving a B.A. in Physics.

It's been one hell of a ride. My experiences in the Math Department confirmed that I chose the right school. The school was small but the heart was enormous. The nature of the Math and Physics & Astronomy Departments was warm and caring. Always supportive and helpful, I could see that they really wanted me to succeed. For me, these qualities proved to be some of the defining factors of my success.

I have made wonderful friends and connections here and it will be very difficult to leave. Some of the things that I loved most were spending time working on homework with friends and classmates. I will miss the beautiful campus and the silly moments we had shared in our journey of learning and enlightenment. What I won't miss are the long nights finishing take home exams, but I suspect that grad school will only bring more long nights than I want to think about right now. I am proud of all my accomplishments and am very grateful to all those who have helped and supported me along the way. Despite the frustration, anguish and long hours, I wouldn't trade my experiences here for anything. I know that it has been worth it, and I am well prepared to handle anything that comes my way. I will miss SSU, but I am extremely excited about the prospect of a new beginning and look forward to all the challenges that I will face as I start my doctorate program in the Mechanical Engineering Department at University of Colorado at Boulder working as a TA.

My advice to future students looking to pursue graduate school and life in general is to not limit yourself and leave your options open. You don't know what life will bring or where you will end up, so give yourself the chance to explore the possibilities. You may just surprise yourself. I DID!

ALUMNI NOTES

Richard K. DeFreez ('80) is principal scientist for photonics at MesoSystems Technology. He formerly held a similar post at Hach Homeland Security Technologies in Grants Pass, OR. He has also been on the faculty of Linfield Research Institute and the Oregon Graduate Institute of Science and Technology, where he earned his Ph.D. in applied physics in 1985. He was honored as one of Sonoma State University's Distinguished Alumni in 1995.

Tina Dearmin Rosenberg ('92) is a preschool teacher at the Santa Rosa Junior College Children's Center.

Matt Davis ('93) is in his ninth year as physics teacher at Santa Rosa High. The physics program has grown a great deal at SRHS during this time. He writes that this is a credit to the excellent physics education he received at SSU.

Alan Duquette ('93) is a quality supervisor at Amy's Kitchen in Santa Rosa. He was formerly the quality manager at Dynatex International, a manufacturer of semiconductor equipment and materials in Santa Rosa.

Daniel R. Hale ('96) is a graduate student in nuclear physics at the University of California, Davis. He also teaches at Diablo Valley College.

Gregory Madruga ('96) is a senior systems analyst with Science Applications International Corporation (SAIC) in San Diego.

David E. Miller ('96, physics and mathematics) is a graduate student in experimental particle physics at Purdue

University, where he received his M.S. in 2000. He is now based at the Lawrence Livermore National Laboratory while conducting research at Fermilab in pursuit of his Ph.D.

Rodney Lee ('97) teaches chemistry, physics and math at Regis High School in Stayton, OR. Formerly 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.

James Snyder ('97) is a research engineer in the Applied Physical Sciences Laboratory at SRI International in Menlo Park. Formerly he was a program manager at Deposition Sciences Inc. in Santa Rosa.

Steven Becerra ('98) is CEO of Mockworld, a developer of Real-Time 3D First-Person Shooter and Multiuser Games. He also operates the online games portal Shockwave3D.com.

Laura Withnell ('00) is an asphalt quality control technician in Battleground, WA.

Brooke Haag ('01) is doing research in heavy ion physics at the Relativistic Heavy Ion Collider, working on a Ph.D. in nuclear physics at the University of California, Davis, where she received her M.S. in 2004. She is also teaching a physics course at Woodland Community College.

Leif Noble ('01) is a business banker for Wells Fargo in Santa Rosa while pursuing an MBA in sustainable enterprise at New College of California.

SSUO Obtains New Equipment

By Gordon Spear, Observatory Director

Much has happened at Sonoma State University Observatory (SSUO) this past year. Three significant upgrades have enabled us to offer substantial new research opportunities many of these new capabilities have been made possible through grants and private contributions. Many thanks to Dean Saeid Rahimi for his support!

First, we have now successfully replaced the original mount for the historic C14 telescope on the east pier of the observatory. The new Mathis mount was installed near the beginning of the fall 2004 semester, and should yield pointing to around an arcminute. Using computer controlled pointing, it is now a snap to show interesting faint objects to folks at Public Viewing Nights (PVNs). In honor of this stunning performance, our historic C14 has been renamed the "Mathis Telescope."

The second significant upgrade has been the acquisition of a modern spectrograph system with CCD detector, to be used on the Mathis Telescope. This system has a resolution of nearly 2 Angstroms. Using the built-in autoguider, we expect to obtain quality spectra for objects as faint as 9th magnitude. Research projects involving the strength and variability of emission lines, radial velocity measurements, and spectral synthesis studies are now possible.

Finally (after more than 10 years of effort), we have obtained high speed internet access at the observatory. This means that students can send data obtained at the observatory directly to campus servers or other computers. The days of sneaker-net are finally gone! This also means that students can check in real-time for those finder charts they forgot to bring with them for an observing session, and it is now possible to display real-time results at remote locations and computers. It will also be possible to control the Mathis Telescope from remote locations. Unfortunately we have not yet figured out how to automate opening the observatory roof. But I do expect there may be a web-cam very soon at good ol' SSUO. Anyone out there interested in some telescope time?



SSU Observatory

Unanticipated Knowledge From Research

by Ryan Quitzow-James

This past semester, I had the opportunity to work on a theoretical research project at SSU under the direction of Dr. Hongtao Shi. I received credit for my work by taking Physics 497 — Undergraduate Research in Physics. The initial aim of the research was to develop a deeper understanding of the concepts behind ferromagnets. The work involved taught me much about theoretical research.

Dr. Shi's first task was to teach me the concepts behind ferromagnets. Ferromagnets have a wide variety of uses in industry, ranging from magnetic recording media like harddrives to microelectromagnetic devices.

The main aim of the research was to simulate the behavior of ferromagnets, by writing a computer program which could mimic the distinctive behavior of ferromagnets. While I had a strong conceptual and mathematical grasp of the physics of the research, I had little of the programming skill necessary to tackle this problem.

Initially, I resisted the idea of creating an actual program. I attempted to simulate the ferromagnets by hand. The behavior of each ferromagnet layer can be described by certain energy equations, which I attempted to solve analytically. This proved extremely challenging and even with the help of mighty Mathematica I could only solve a few special cases. After much energy and effort, I figured out how to simulate the behavior of a ferromagnet. However, the time involved in the process was staggering, and the process had to be repeated for each case! Finally, I decided to attack the seemingly insurmountable barrier of programming.

I enlisted the help of my uncle Eric Braun, an expert computer programmer, for this task. My uncle spearheaded the programming, while I developed the logic. The resulting program was quite impressive, and was able to find solutions almost instantly. This illustrated to me the advantages of using computer programs in theoretical physics. The power of a computer allows you to attack problems numerically rather than analytically, bringing to light different aspects of physics equations. Investigating problems numerically can even yield new concepts that could not be found analytically. Although initially daunting, the task of developing a computer program saved much time in the long run.

Keck Lab Projects Underway

By Hongtao Shi, Director of Keck Laboratory

The William M. Keck microanalysis laboratory houses several state-of-the-art microscopes and spectrometers. A confocal microscope, which can build up a very clean three-dimensional image of the sample down to submicron resolution, is very attractive for performing biotechnology industry and environmentally-related research. The Keck Lab also contains a high resolution scanning electron microscope (SEM), two atomic force microscopes (AFM), and a powder x-ray diffractometer (XRD). All of them can be used in fields such as physics, chemistry, and engineering science to determine the topography, surface morphology, crystal structure, inter-atomic or inter-molecular spacing to better understand the properties of different materials. Our SEM is equipped with an electron dispersion x-ray spectrometer (EDX), which can be used to perform qualitative and quantitative analyses for elements comprising a material by measuring re-emitted characteristic x-rays from each element. It is non-destructive and therefore can be used to analyze various types of materials in solid, powder, or even liquid. In the last few months, I have been involved in using the SEM/EDX to measure the topography of geological samples from another university and to identify chemical elements in those samples. I have also used the SEM to probe the surfaces of metallic thin films for a local company.



Mark Wollam operates the Scanning Electron Microscope/Energy Dispersive X-ray Elemental Analysis System in the Keck Laboratory, part of the Cerent Engineering Science Complex.

Most of my effort during this past year has been dedicated towards installing several vacuum deposition systems in the Keck Lab, so that students can make thin film samples, which can then be transferred to SEM, AFM, and XRD for characterization. In March, 2005, the Department acquired a sputtering chamber from Agilent Technologies, which is temporarily located in Carignane. Physics major Schell Scivally has been awarded a P&A Department summer research fellowship to work with me to make this system operational. I have also been reconstructing the Keck Lab's Auger electron spectroscope (AES), so that we will have yet another method for surface analysis.

During the Spring semester 2005, I have taught many students how to use these outstanding facilities through the P466 Lab and other student research projects. I am proud of the Keck Lab facilities, as this lab helps our undergraduate and graduate students become involved in projects with strong applicability to the high tech job market and graduate programs in their fields. Any students who are interested in doing research projects in the Keck Lab, please let me know and I will be glad to take you for a tour!

ALUMNI NOTES

Tom Bittancourt ('03) is a metrology specialist at Research Electro-Optics in Boulder, Colorado.

Jeremy Hieb ('03) is a graduate student and research assistant in electrical engineering at the University of California, Santa Cruz.

Tiffany Borders ('04) is 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.

Michael May ('04) is a mechanical engineer working on aerospace projects with General Dynamics OTS in Healdsburg.

The Physics Major No. 30 May 2005

Published by:
Department of Physics and Astronomy
Sonoma State University
Rohnert Park, CA 91928-3609
(707) 664-2119
gayle.walker@sonoma.edu

Edited by: Lynn Cominsky

Written by: Lynn Cominsky, Sean Greenwalt, John Dunning, Logan Hill, Jeanie Mar, Ryan Quitzow-James, Hongtao Shi, Gordon Spear, Joe Tenn, and Kris Tyson.

Layout and design by: Aurore Simonnet

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

NASA E/PO Reunited with Old Allies and Gaining New

By Logan Z. Hill

Over the winter break the NASA E/PO group was excited to see the rest of the physics community pushing through the front lines to establish a new base of operations at Chalk Hill due to the destruction of old Darwin. The company has been most welcome.

Also during the winter break, several agents from the E/PO group met in San Diego for the American Astronomical Society national convention where they hosted educational seminars with educational instructors and gave talks for the AAS.

Prior to that, last fall, the group was busy preparing for the Swift launch (see Swift Launch article), whether making travel plans to see the launch, updating our websites with information, or sending Swift materials to our Educator Ambassadors (EAs). The EAs went through boot camp at SSU in the Summer of 2004 and have now been deployed across the continent.

After several months of deliberations and negotiations, the E/PO group has finally hired Laura Chase, who has proven most valiant in manning the guns against all initial assaults and inquiries against the group. In addition, Laura is a new mother of a young girl, Lucy, or “baby-Tron” as the child is known to some.

The remote tactical observation platform, GORT (GLAST Optical Robotic Telescope), has now become

fully operational with much thanks going out to agent Tim Graves for his immense contribution of energy. Now, whether on-site at Pepperwood or from the safety of one’s very own heated bunker miles away via the internet, images can be acquired of distant locations and objects with stealth and comfort.

New materials have also been developed here at the NASA E/PO industrial compound. The Swift Model book allows one to create their very own satellite, though out of sturdy construction paper and on a far smaller scale, it can be completed within a few hours and is quite resilient to hostile external stimuli. The book was developed in large part by Aurore Simonnet, whose artistic and engineering skills provided the structural integrity needed for the project.

The Gamma-Ray Burst Guide has also come to completion, a manual of fifty-two pages containing four activities, an astronomical glossary, and information on the national science and math standards. It has been well received by the groups EA’s from around the nation.

As of the writing of this article, the group is getting ready for the summer campaign that includes the development of several more educational activities, observing with GORT, Flash-based educational games and “Schell’s GLAST LAT simulator.”



NON-PROFIT
U.S. POSTAGE
PAID
SONOMA STATE
UNIVERSITY

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

