THE PHYSICS MAJOR

NeXT, Suns for the Department

Computing power available to SSU physics and astronomy students and faculty is taking a quantum leap this year with the arrival of two Sun workstations and a NeXT computer. A Sun 360 color workstation, donated to the California State University system by the manufacturer, has been awarded to the Department as a result of a proposal submitted by Professors Lynn Cominsky and Gordon Spear. This system will be used for teaching digital image processing and to support the radio telescope project.

According to Dr. Spear, the system will enable students to gain experience with the standard data analysis and image processing packages in astronomy. Both IRAF (Image Reduction and Analysis–used in ultraviolet, visible, and infrared astronomy) and AIPS (Astronomical Image Processing System–used in radio astronomy) will be available.

The system will display, reduce, and analyze data obtained from the CCD camera system of the SSU Observatory and also from the radio interferometer. Since these are the standard data analysis software systems in astronomy, it will also be possible to directly import and analyze data obtained from other observatories, including such space observatories as the International Ultraviolet Explorer, Infrared Astronomy Satellite, Hubble Space Telescope, and the Extreme Ultraviolet Explorer.

A NeXT computer has been awarded to Drs. Spear and Cominsky by SSU's computer center to develop image processing software for this new workstation. The NeXT is already in Dr. Spear's office; it will be available to physics and astronomy students and faculty in the fall.

Dr. Spear expects to teach the image processing course in a new NeXT laboratory in a few years. The NeXT's megapixel display screen and built-in digital signal processing chip will strengthen the instructional curriculum.

A second Sun computer system will come to the Department this summer as a result of Dr. Cominsky's latest NASA grant. It will be used in her x-ray astronomy research.

Both Sun workstations and the NeXT computer will reside on the third floor of Darwin Hall and will be linked by network to all campus computers, including those in the Observatory.

New Cominsky Research Grant

Dr. Lynn Cominsky has just received word from NASA that her proposal to perform archival research using data from the *HEAO-1* x-ray satellite has been funded for three years, for a total of $116,020. The title of the proposal is "High Time Resolution Studies of Binary X-ray Pulsars," and the work will be done in collaboration with Kent S. Wood at the U. S. Naval Research Laboratory in Washington, D.C. Dr. Cominsky has been collaborating with Wood for over five years, beginning with their discovery of the first eclipses from an x-ray burst source in 1983.

The funds will provide released time from teaching, summer salary, travel money and a part-time job for a student for the next three years. Current student research assistant Francis Moraes will graduate in 1990; students interested in succeeding him should have a background in computer programming and should consider taking Physics 445, Theory of Signal Processing, in the spring.

Rahimi Probes Semiconductors

Miriam Tobin

Dr. Saeid Rahimi is investigating the properties of semiconductors. He is currently working on two spectroscopy experiments in his special area of study, the interface between a metal and a gallium arsenide semiconductor. The first experiment, called PITS (Photo-Induced Transient Spectroscopy), is the study of the effect of impurities on the decay of conductivity induced in a semiconductor by pulses of light. Computer analysis facilitates results for Rahimi and student assistant Alan Gering.

The second experiment, called DLTS (Deep Level Transient Spectroscopy) is similar to PITS, except that the capacitance is measured. Electric pulses are sent directly to the interface, and the decay of capacitance with time is measured for various temperatures of the sample. Rahimi's student assistants in this project are René Woolcott, Jr. and Tim Silver. Both experiments involve computer-controlled measurements

Rahimi recently received grants from Hewlett-Packard and SSU to continue the work.

From Hewlett-Packard, Rahimi received a grant of a $15,000 Low-Frequency Impedance Analyzer, a machine that will facilitate measurements of the electrical parameters at the interface. He had competition for the grant from many other northern California experimenters, including those at research-oriented universities such as Stanford and the University of California at Berkeley.

Sonoma State has also shown its support of the endeavor by giving Rahimi a $4500 grant to pay his student assistants and five units of released time to devote to his research.

The H-P machine measures the impedance, the phase difference between the capacitance and inductance, dissipation and the quality factor, and many other parameters that are frequency related. It is very sophisticated and takes measurements over a wide range of frequencies. It does automatic measurements, applies a bias voltage to the device, has memory, and does comparative measurements. The Analyzer measures many variables simultaneously, and compensates for residual capacitance and impedance.

Rahimi is planning to write another grant proposal to H-P, in hopes of acquiring the Vectra computer and other accessories that go with the Analyzer. These extras are needed if the project is to become self-sufficient with computer-controlled measurements. Currently measurements must be entered into a computer before they can be analyzed. The proposed equipment would produce immediate analysis.

Rahimi is also planning to write a major proposal to the National Science Foundation based on the research he is currently doing. He says the the experimentation has produced no huge breakthroughs, but, "The study may help us understand better what is happening in the junction between metal and semi-conductors."

AAPT Meets at SSU

Sonoma State University hosted the Fall 1988 meeting of the northern California section of the American Association of Physics Teachers. Approximately 150 high school and college physics teachers attended the all-day meeting. After a keynote address on solar system exploration by NASA's Dr. David Morrison, the teachers heard a variety of interesting talks.

Dr. John Dunning described his "hot hair" experiment in the applied nuclear physics and chemistry course, while Dr. Lynn Cominsky spoke on virtual design projects in the microprocessor applications course.

Dr. Saeid Rahimi gave tours of the solid state laboratory, Dr. Dunning showed off the nuclear lab, and Steve Anderson showed visitors the laser lab.

In January the national AAPT met in San Francisco in conjunction with the American Association for the Advancement of Science (AAAS) and the American Physical Society (APS). Some ten thousand scientists attended the triple meeting. Dr. Tenn spoke on "What Physics Graduates Do." More than 90% of the Department's graduates have provided some information on their post-graduation activities.

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Alumnote

KEVIN ABLETT (BS, 6/83) is a software engineer with Island Graphics in Santa Rosa. He was formerly an engineer at Optical Coating Laboratory, Inc., Santa Rosa.

New X-Ray Machine Coming

John Dunning

Our $114,000 proposal for a new x-ray machine has been funded by the National Science Foundation. With this money we are proud to purchase an IBM computer-controlled x-ray diffraction system to be installed adjacent to Geology's recently renovated sample preparation room. This system will allow students to align the system simply and then obtain quality powder diffraction spectra. The background-subtracted peak areas can be printed out and dealt with manually, as we do now. On the other hand, automated search match procedures are available using the entire JCPDS powder diffraction file which will be stored on the hard disk inside the computer.

X-ray diffraction is widely used to characterize crystalline compounds in all fields of scientific endeavor. With the new equipment, complex spectra can be compared to one another, and changes due to sample preparation can be easily identified.

No longer will we be effectively limited to simple cubic structures for laboratory exercises. The lattice constants program will enable more complex structures to be readily characterized by students. Sophisticated use of computer-coupled analysis will be fun and educational.

Some alumni may remember problems with the sample falling out of the holder as it tilted toward the vertical. The new sample holder will be completely horizontal and stationary. Both the detector and the x-ray tube will rotate to maintain the "2θ" geometry.

Faculty interest in this machine is very high in Chemistry, Geology, and Physics and Astronomy. All three departments contributed ideas to this proposal. Duncan Poland is already planning new physics experiments. The author of this article is ecstatic.

This machine puts us on a par with the Stanford University Geology Department, where a similar machine is used to offer quality instruction to their students.

With the old x-ray machine devoted to x-ray fluorescence, it will be possible to use the molybdenum tube routinely. This x-ray tube produces higher energy radiation which is optimal for detecting metals such as lead, copper, nickel and cobalt. Don Marshall in Chemistry is already cooking up a lead sampling experiment and has been contemplating the easier scheduling that dedicated use will bring.

The matching funds from the university should be available in July. Then the bidding process begins. Rigaku, the expected vendor, will hand craft our machine for us. Installation should take place approximately four months after the purchase order is issued. Then the fun really begins. Do stop in to see our new equipment when you next visit us.

Students Selected for Summer Programs

Two Sonoma State University physics majors have been selected to participate in summer research programs. Joseph Beasley will be at the Langmuir Laboratory for Atmospheric Research at the New Mexico Institute of Mining & Technology, while Katherine Rhode will work at the Maria Mitchell Observatory.

Joe Beasley will join a research project in which investigators attempt to gain a deeper understanding of the electrical charge buildup process in thunderclouds. He will participate in the "Super Benjamin Franklin" experiment atop Magdelena Mountain, 20 miles west of Socorro, New Mexico. Balloons with steel wires attached will be sent aloft in an attempt to test three proposed charge buildup mechanisms.

The New Mexico Tech team hopes that a better understanding of the charge buildup process may lead to a means of lessening such buildups so as to reduce the prevalence of lightning and thunder. One motivation is the need for the nearby Very Large Array radio telescope to be able to detect feeble signals sent from the Voyager 2 spacecraft as it flies past Neptune this August. Thunderstorms often interfere with VLA reception, so the ability to neutralize a thundercloud would be helpful!

Kathy Rhode will spend the summer on Nantucket Island off Cape Cod, where she will be one of six students in the summer research program. She will conduct research and will also manage the public programs and press relations. The Maria Mitchell Observatory, a memorial to the famed 19th century astronomer, is operated each summer for research.

Alumnotes

GEORGE AMORINO (BS, 1/86) received his M.S. in biomedical engineering from California State University, Sacramento in August 1988. While a graduate student, he was also a research assistant at UC Davis Medical Center in nuclear medicine.

SCOTT C. ANDERSON (BS, 1/78) is founder and president of Anderson Studios, a software firm in Sonoma County. His program, *Fantavision*, is distributed nationally by Broderbund Software. He is currently working on a game of stellar conquest.

Radio Telescope Making Progress

Joan Ghiglieri

The SSU radio telescope is ready to go "on the air." After months of hard work and testing, the various hardware components of the system–receiver, feed, dish, and accessories–have been given the green light by the engineers and group working on the project.

For those of you unfamiliar with the project, here's the lowdown: The SSU radio telescope project purchased two television satellite dishes and modified them in a couple of ways so that they would function as altitude-azimuth mounts. An alt-azimuth mount moves up and down and parallel to the horizon. If we know the altitude (angle above the horizontal) and azimuth (angle eastward from north) of a celestial object, we can steer the telescope and point it at the object we wish to observe.

The second modification was to completely redesign the feed so that it would function as a spectral line type rather than the continuum type television buffs desire. The feed will be attached to the end of a boom mounted at the focal point of the dish. The purpose of the feed is to collect the incoming radio waves reflecting off the dish and convert them into electrical signals. These currents are then sent to the control room (the little shack on the roof of Darwin we like to call the penthouse) where they are amplified a million or more times in the receiver.

Both the feed and the receiver were designed and built by engineers at Hewlett-Packard with some student assistance. We have chosen to operate our system at the 1.4 GHz frequency for two reasons: (1) It is a frequency allocated by international agreement for the sole use of radio astronomy and hence the "noise" problem of communications and radar systems interfering with observations is greatly reduced. (2) The 21-cm spectral line of neutral atomic hydrogen is emitted at that frequency. We are all very excited about the possibility of studying hydrogen emission in radio sources from interstellar clouds to nearby galaxies. Remember, it was radio astronomers' observations of the 21-cm line that revealed the spiral nature of our galaxy. So who knows what the SSU group will observe? The sky is our limit! (Well, up to 1 Jansky anyway.)

First things first, however, which brings us to the next phase in the project–hooking up the dish, feed, receiver, and computer, and making preliminary observations of every earthling's favorite star, the sun. *(Editor's Note: The sun was successfully detected at a "first light" ceremony 16 May 1989).*

When we return in the fall, observations will continue, and the second dish will be put into operation to form an interferometer. With one of the new Sun work stations allocated part-time to the radio telescope project we will be capable of image processing. Newcomers are invited to join the group!

Let us close by giving a rousing round of applause to those people whose effort and commitment to excellence has made this year's progress on the radio telescope project an unqualified success: to the engineers at Hewlett-Packard, Stan Bischof, Bruce Erickson, and Clyde Underwood for their time and technical support; to the faculty advisors, Dr. Lynn Cominsky and Dr. Gordon Spear, for their guidance and know-how; to Steve Anderson, our invaluable resident techie; and finally to the students, Joe Beasley, Joan Ghiglieri, Susan Knaus, Rich Mayer, Steve Wallace, and René Woolcott, Jr.

High School Grant Helps Fund Radio Telescope

Dr. Lynn Cominsky, together with Analy High School physics teacher Jay Goldberg and student Sarah Hurley, have been awarded a California State University High School Research Collaborative grant for the summer of 1989. They will spend approximately 8 weeks together studying radio and X-ray astronomy and using the SSU radio telescope and new Sun computer. After the summer, Goldberg will use his enhanced knowledge of astronomical research to prepare a set of lesson plans for his physics classes, and Hurley will give a presentation to her classmates. Both Goldberg and Hurley will be paid for their participation, while Cominsky will receive $1200 which she will donate for supplies for the radio telescope.

Student Essay Wins Prize

Senior management major Annabel Ayres won fourth prize in the 1988 *Griffith Observer* essay contest. She received $150, and her article, "Particle Physics and Cosmology: Getting to the 'GUTs' of the Matter," appeared in the magazine in April 1989. The article was originally written as a term paper for Dr. Joseph Tenn's Descriptive Astronomy class. It was the seventh paper written in the SSU Physics and Astronomy Department to win a prize in the annual contest. Dr. Tenn has won four, and his students, Don Martin, Reiko Hibbett Crane, and Annabel Ayres, have each won one.

A Good Year for SPS

The SSU chapter of the Society of Physics Students (SPS) had an exciting and informative year filled with lectures, field trips, movies, and parties. The lectures spanned many areas of interest from Dr. Joe Tenn's annual lecture on preparing for graduate school and Dr. Lynn Cominsky's talk on her current research to Hewlett-Packard engineer Bruce Erickson's lecture on radio interferometry. We also heard SSU graduates like George Amorino, who gave a talk on his master's thesis work in biomedical engineering, and Mary Silber, who described her doctoral work at UC Berkeley on pattern formation in liquids.

It has recently come to the attention of many physics students that there is a large similarity between the physics faculty here at SSU and the characters in the Winnie the Pooh stories. The SPS felt that this was something that had to be looked into, so we showed *Winnie the Pooh and the Blustery Day* at one of our meetings. This is just one the public services that the SPS is involved in.

We had two field trips this year. One was to the Exploratorium, following the gracious invitation of Dr. Paul Doherty of the teachers institute there. Dr. Doherty gave a lecture in the "What Physicists Do" series last semester on building science exhibits for the public. The second field trip was to the Lawrence Hall of Science and the Space Sciences Laboratory in Berkeley. This field trip ended with another exciting party hosted by Dr. Cominsky.

The SPS has held other parties this year. We started with a party at Dr. Tenn's house last semester, and have also had small parties (barbecues) at the volleyball courts for some of our meetings. The last major event of the year was a beach party at Salmon Creek.

There is a large amount of enthusiasm in the SPS now, so if you're not already a part of it, you really owe it to yourself to be. We hope to see you next year!

(Editor's note: The SPS was led this year by President Francis Moraes, Vice President Tim Silver, and Secretary Amanda Tunison.)

SSU Faculty and Students Present Research at Meetings

Dr. Joseph Tenn spoke on "William H. Wright: the Man Who Declined the Bruce Medal" at the 100th annual meeting of the Astronomical Society of the Pacific in Victoria in June 1988.

Dr. Lynn Cominsky presented "Multimission Observations of 4U 1538-52" at the American Astronomical Society meeting in Boston in January.

Two students presented papers at the annual meeting of the Association of North Bay Scientists, held at College of Marin April 29. Joan Ghiglieri spoke on "The Sonoma State University Radio Interferometer," and Francis Moraes described "Geometric Modelling of X-ray Pulsations."

Alumnotes

PHILIPPE ARGOUARCH (BS, 6/88) is an accelerator system operator at the Stanford Linear Accelerator Center.

ROBERT BILODEAU (BA, 6/83) is a claims specialist, litigation specialist, and assistant coordinator for Santa Clara County for State Farm Insurance Co. He is pursuing a degree with theChartered Property Casualty Underwriter Program.

TERESA BIPPERT-PLYMATE (BA, 6/84, physics and art) is studying astronomy at the University of Arizona and working as a detector technician at the Steward Observatory.

ALLYSON BISHOP (BS, 6/86) is a graduate student in medical biophysics and a research assistant with the Department of Nuclear Medicine at UCLA. She was awarded a fellowship upon graduation from SSU.

KEITH BRISTER (BS, 6/82) is a National Research Council Associate at the Cornell High Energy Synchrotron Source. He received a Ph.D. in applied physics at Cornell University in 1989.

BENJAMIN BURRESS (BA, 6/85) returned from two years of teaching high school mathematics and physics as a Peace Corps Volunteer in Cameroon to take some more astronomy courses at SSU. He left in April to take a job operating the 36-inch infrared telescope on NASA's Kuiper Airborne Observatory and immediately flew to New Zealand for observations of Supernova 1987a.

WILLIAM F. CABRALL (BA, 6/76) is a principal engineer with the Boeing Aerospace Company in Seattle. He earned an M.B.A. in finance at the University of Denver in 1985.

Senior Design Projects 1988-1989

Robotics and image processing are senior design projects being built this year by physics majors concentrating in applied physics.

Daniel Wilcox is building the motor control circuitry and writing software in the FORTH language on a 6502 microprocessor to implement robotic functions. He is building the digital interface circuitry to interface a DC motor to the Apple II. His robot will be commandable from the Apple's keyboard, and it will be able to move backward and forward and left and right.

Michael McClendon has built a complex electronic diffuser in order to perform photographic enhancement using unsharp masking. This is a process in which the contrast between faint and bright areas in an image is enhanced while retaining the fine details present at both brightness extremes. An unsharp mask is made from the original image by flashing a diffused xenon strobe light through the image onto film. The mask and the original image are then combined to produce a new image which can be printed with greater contrast. Mike has developed adjustable high voltage electronic circuitry to run the xenon strobe. The light is then diffused within the structure of the box before it reaches the film for the mask. McClendon is also building a transmission densitometer with a logarithmic amplifier for evaluating negatives and a reflection linear densitometer for evaluating prints. His devices can be used for studying characteristics of film in order to determine suitability for use in astronomical observations.

Both projects are under the direction of Dr. Lynn Cominsky.

H-P Comes Through

In the past six months the SSU Department of Physics and Astronomy has obtained about $12,500 worth of surplus equipment from the three Hewlett-Packard divisions in Sonoma County. The restoration of the H-P "school stock" program after a hiatus of a few years is a welcome boost for the Department. In past years much useful equipment, including the multichannel analyzer used in the x-ray laboratory, was obtained from H-P in Palo Alto.

Why Physics?

Miriam Tobin

A recent impromptu poll taken on the the third floor of Darwin Hall resulted in some interesting, if not wholly anticipated, answers. This inquiring mind wanted to know what motivated students and professors to pursue the study of physics.

Some answers were predictable. Dr. Sam Greene told me that he's been "interested in the basic nature of the universe since my early memories."

Senior Jim Garrett emphasized, "I wanted to know the basic workings of the universe."

Dr. Duncan Poland has always been curious about nearly everything. "I wanted to get down to the fundamental process," he says, with a faraway expression in his eyes.

Some physics majors are pursuing their scientific interests for other varied reasons.

Senior Jeff Sandberg says, "I became interested in astronomy and decided I liked this physics stuff."

Susan Knaus, pursuing a second degree, states, "I enjoyed doing physics homework more than chemistry and calculus homework, so I became a physics major."

Keith Waxman, a senior, was the most dogmatic in his reasoning. He told me, with all seriousness, "Since the likelihood of my getting a baseball career is slight, I decided to go into astronomy. But since there aren't too many jobs in astronomy, I settled for physics, in which there are a lot of opportunities."

Dr. Lynn Cominsky shares my reason for studying physics. We were both avid science fiction fans as children, and realized that what we knew as fiction was rapidly becoming science fact. She decided that getting paid for doing something that she thoroughly enjoys is all right with her. I just love writing about it.

Alumnotes

WALTER CARTER (BA, 6/87) is a student in mathematics at California State University, Chico and a summer park ranger at Mt. Lassen National Park.

CHRISTOPHER C. COOK (BS, 6/88) is working on photonics at the MIT Lincoln Laboratory in Lexington, Mass.

STEPHAN R. CRANDALL (BA, 6/82) is a senior software engineer with Versatec, Inc. in Santa Clara.

What Physicists Do

Susan Knaus

Each week the Sonoma State University Department of Physics and Astronomy presents the solution to the age-old question of what to do on a Monday evening. The thirty-seventh semester of the "What Physicists Do" public lecture series, under the direction of Dr. Lynn Cominsky, continues the international, eclectic, topical format which has been responsible for the regular attendance from all over the greater Bay Area.

Over coffee and often home-baked cookies, speak with or eavesdrop on the day's guest lecturer to find out who becomes a physicist. One young San Francisco boy's interest in earthquakes led him to become consultant Dr. Robert Nason of New Quake Research. A farm lad sending his sketches of events seen through his home-built telescope was hired to do technician work for an observatory and became Dr. Clyde Tombaugh, the discoverer of the planet Pluto. A young woman who professes to have had little chemistry became Dr. Shirley Chiang of the IBM Almaden Research Center, using the scanning tunneling microscope to image surface atoms of solids. A boy who rode his pony to his eight-student school in Montana became a physicist at his brother's advice and crewed on the Spacelab 2 Shuttle doing solar research as astronomer-astronaut Dr. Loren Acton.

Next, in SSU's intimate lecture hall, enjoy the slide and film presentation of the "What Physicists Do" lecture series proper. Hear first-hand the latest on Superstring and Force Unification theory from Dr. Elizabeth Rauscher of Tecnic Research Labs or on soundproofing indoors and out from Dr. Tom Barnebey, president of Sound Solutions Acoustical Consulting Services and sometimes SSU lecturer. Consider new job hunting strategies or course work selections based on information gleaned from Dr. Peter Michelson's Stanford University work on the search for gravity waves, or from Dr. William Bialek's UC Berkeley work in experimental neurobiology. Dr. Don Cottrell of San Diego State University started a new line of research when presented with the problem of what to do with his new Macintosh computer. The publishing world is grinding away on papers put out by Dr. Cottrell's group on computer-constructed holograms and image recognition.

Finally, Monday evening can be further extended to dinner with faculty and the day's guest lecturer. Perhaps appetizers while discussing the auroras of other planets with Dr. Randy Gladstone of UC Berkeley? A main course augmented with conversation of chaos theory with MacArthur Fellow Dr. Rob Shaw? Dessert enriched with Dr. Imke de Pater of UC Berkeley's remarks on the red and white clouds on Jupiter? And, finally, coffee dolloped with Dr. Luisa Hansen's words about her work for Lawrence Livermore National Labs on fusion reactors and on the latest speculations in cold fusion theory.

Scholarships Available

SSU's first annual fund drive, directed by Dr. James Meyer, brought more than $500,000 to the university, much of it for scholarships. Physics students Debra Khattab, Nickolas Melville, Iad Mirshad, Francis Moraes, Shawn Wanamaker, and Keith Waxman were awarded university scholarships for 1988-89. With more money coming in every year from generous alumni and other community supporters of the university, the picture looks particularly rosy for good students who could use a little financial help. All of the scholarships are based on academic performance; you don't have to be poverty-stricken to be eligible. There will soon be two scholarships reserved for physics majors, so worthy students should not hesitate to apply. Deadline is in mid-March each year. Call (707) 664-2778 for information.

Alumnotes

PHILIP CULLEN (BA, 1/89) is a research associate at the Space Sciences Laboratory of the University of California at Berkeley.

RICHARD K. DEFREEZ (BS, 1/80) is a senior scientist at the Oregon Graduate Center, where he earned his Ph.D. in applied physics in 1985. He now conducts research on high powered semiconductor lasers for space communications and remote sensing of chemical species. He and his colleagues were cited by the Optical Society of America for one of the "principal advances in optics" of 1986: focused ion beam micromachining of optical surfaces.

LYDIA FOWLER (BA, 6/86) is a certified flight instructor with Dragonfly Aviation in Santa Rosa. She is also continuing her research in astronomy with Dr. Gordon Spear.

ROY W. HARTHORN (BA, 1/78) is the chief of building and zoning for the city of Santa Barbara. He is also working on a master's degree in public administration at CSU, Northridge.

X-Ray Astronomy Is Fun

Francis Moraes

This semester brings us near the completion of work for the two-year NASA grant Dr. Lynn Cominsky received in 1987. The result will be papers on two binary x-ray pulsars, 4U 1538-52 and 4U 0115+63. I am Lynn's student assistant and I present here, for your enjoyment, highlights of the past year.

Lynn has the paper on 4U 1538-52 nearly completed. It will present an impressive array of data from four separate satellites (*Einstein, HEAO-1, EXOSAT,* and *UHURU*) spanning a twelve year baseline (1972-1984). Originally, our data spanned a six year baseline, but it occurred to Dr. Cominsky one day that she might have worked on some data from 4U 1538-52 when she was at Harvard. After she rummaged through her attic for a few hours, the treasure was found: satellite data from *UHURU* dating back to 1972. In a matter of hours Lynn doubled our baseline.

The paper will, in general, confirm the results of the last work done on this pulsar by a Japanese group, but it will also present some new analyses. In particular we have set an upper limit on the "spin-up" (the speed at which the orbital period of the pulsar is changing) and we have modeled the pulsar using a simple geometric model suggested by some of Lynn's colleagues in Holland at the European Space Agency.

During the fall semester Lynn worked feverishly on several proposals to do research. The most interesting of these was a proposal submitted to NASA to develop a computer data analysis system in order to study five x-ray sources. All this work paid off when NASA accepted her proposal, including a Sun workstation which we will get this summer.

In January Lynn and I went to the Extreme Ultra-Violet Astronomy Colloquium in Berkeley. Lynn seemed clear as to what all of the speakers were talking about, but I was, at best, slightly confused, though I did find myself perking up whenever someone mentioned a pulsar or an accretion disk. It was a good introduction to the science community, and the food was great.

This summer will see us finish work on the current grant and start on the new one. We'll let you know if we get any Nobel Prizes.

Alumnote

RICHARD HERTZ (BA, 6/78) heads Richard Hertz Consulting, a public opinion, polling, and market research firm in Bodega Bay.

Profs Speak in the Community

Sonoma State University physics and astronomy faculty have given a number of talks in the community this year.

The Sonoma County Astronomical Society (SCAS) was impressed by Dr. Gordon Spear's demonstration of the new SSU Charge Coupled Device (CCD) data acquisition system. The SCAS also heard Dr. Lynn Cominsky on "Radio Astronomy at SSU" and history major Eric Edwards on "Ancient Astronomical Measurements." Eric described how he and Francis Moraes reenacted ancient measurements as a special studies project with Dr. Spear last year.

Dr. Cominsky presented "X-ray Visions of the Universe" to the San Mateo Astronomy Society, the California State University, Fresno open house (where she also spoke on "Arms Control and Disarmament"), and at the Lawrence Academy in Santa Clara (as part of the Women in Mathematics program). She also spoke at El Cerrito High School this spring.

Dr. Joseph Tenn spoke on career opportunities in astronomy and physics at career days at Healdsburg High School and Casa Grande High School in Petaluma this spring. Dr. Duncan Poland did the same at Brook Haven Junior High School in Sebastopol.

Drs. Cominsky and Spear were interviewed on Santa Rosa radio station KSRO before the launch of the Magellan spacecraft to Venus.

Tenn Portrays Astronomers

Dr. Joseph Tenn is studying the astronomical developments of the last century as seen through the works of the greatest astronomers.

The occasion is the centennial of the Astronomical Society of the Pacific (ASP). Founded in San Francisco in 1889, the ASP unites professional and amateur astronomers, teachers, and others interested in the universe.

The ASP has awarded the Catherine Wolfe Bruce gold medal to the outstanding astronomers of the world 82 times. At the centennial meeting, to be held in Berkeley in June, Dr. Tenn will give an invited talk on the Bruce medalists and will present a photographic exhibit of the medalists.

This spring has seen correspondence with medalists and institutions worldwide to collect photographs. Reproduction is being done by campus photographer Brenda J. Fundaro. Dr. Tenn and student assistant Miriam Tobin are researching and writing captions, aided by a $1000 campus grant.

Building Astronomy Instruments for Fun and Profit

Daniel Wilcox

I have been working at UC Berkeley's Space Sciences Lab for the past year, helping develop a solid state infrared detector for the Keck telescope. The Keck will be the world's largest telescope when completed. It will be made up of 36 hexagonal mirrors fitted together to form a single mirror ten meters in diameter.

The infrared detector I am helping to develop and build will observe the universe's energy output at ten microns. Everything tends to emit heat at this wavelength, so making a detector to see only what we want it to see is quite tricky.

We have to cool the detector to 10 K for it to not see itself. We keep it in a dewar that has a vacuum lining, a liquid nitrogen lining, and then a liquid helium center.

I work on the detector electronics. The detector is like a CCD camera in that it is a doped silicon device that detects photons. Every 1.2 microseconds we read out a pixel in each row, then subtract the background noise and convert the analog voltage to a digital representation of the real brightness of each pixel.

Every 77 microseconds we take a picture of the sky. Since we would like to see faint objects, we then take about one million pictures (one minute's worth) and add them together digitally. This makes the stars stand out better from the background.

To accomplish this, we build a single board computer for each row. We had to develop some quite complicated software on the controlling Sun workstation. I write software in a language called Magic/L. It is not FORTRAN, but the basics I learned in Physics 381 sure help me produce readable code.

This project is due for completion in the summer of 1990. We hope by then to begin developing a detector array for the Superconducting Super Collider. So it looks like I will be busy doing research and development for a long time to come.

Cominsky to be Mentor

Miriam Tobin

Dr. Lynn Cominsky will be one of five faculty members in the SSU Mentor Program next year. The Mentor program is designed to encourage entering freshmen from underrepresented minorities to complete their studies.

The mentor's role is a supportive one, giving students counselling, social contact, and advising. Most of the students in the project participate in the Summer Bridge Program, a transitional process for incoming, self-selected Educational Opportunity Program freshmen.

Dr. Cominsky volunteered her time to the project this semester, but in the fall the five faculty mentors will each have three units of released time to work with as many as ten students. Two student mentors will assist. Cominsky values the program because of the encouragement she received as a student.

"I think it's really an important thing to do," she says emphatically.

"The two women scientists that I met early in my life were very important to me deciding to actually stick with science, especially the one who gave me a pat on the back at a time when I was really struggling to learn physics at MIT."

Alumnotes

DAVID LAPP (BA, 6/84) teaches physics at James B. Conant High School in Hoffman Estates, Illinois. Also enrolled in the graduate physics program at DePaul University in Chicago, he earned his teaching credential at SSU in 1986. While in the credential program he taught part-time in the SSU Department of Physics and Astronomy.

DAVID MARSHALL (BA, 6/88) is an electronics technician at the Stanford Linear Accelerator Center.

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MICHAEL MCBRIDE (BA, 5/75, physics and management) is sales manager for AIRCO Coating Technology, Fairfield. He earned an M.A. in international management at the American Graduate School of International Management in 1977.

STEPHEN MESSINGER (BA, 6/86) teaches science and mathematics at Upper Lake High School. He earned his teaching credential at SSU in 1987.

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MARTHA SCHOPP (BA, 6/88) is a partner in Monsoon Construction, a custom home-building firm.

MARY C. SILBER (BS, 6/81) is a graduate student in physics at the University of California at Berkeley. She recently spoke to the Society of Physics Students on "Pattern Formation in Fluids," the topic of her dissertation. She has already accepted a prestigious post-doctoral position at the University of Minnesota.

PIERCE TIMBERLAKE (BA, 6/76, physics and philosophy) is a public relations writer for Fair, Isaac, & Co., San Rafael.

GEOFFREY A. WILSON (BS, 6/84) has transferred from Stanford University to the Oregon Graduate Center, where he is now working on a Ph.D. in applied physics.