



# THE PHYSICS MAJOR

## SSU Establishes Applied Physics Program

Sonoma State University has approved a new program: the Bachelor of Science (B.S.) in physics with a concentration in applied physics.

Students in the program will be able to specialize in electronics, quantum optics, applied nuclear and x-ray methods, or semiconductor physics.

They will also be required to complete a senior design project.

According to SSU physicists, the program will be of special interest to students who plan to work in industry upon graduation.

For some years Sonoma State has led the 19-campus California State University system in the percentage of students majoring in physics.

The new program is expected to attract even more students to the highly successful program.

A major development was the initiation of a semiconductor laboratory this year. Dr. Saeid Rahimi, a semiconductor specialist, joined SSU last year and has already established a new lecture and laboratory course that is more advanced than what is usually available to undergraduate students.

The course shows students how to apply the quantum mechanics, electromagnetism, and solid state theory they have learned to some very practical problems, according to Rahimi.

"In terms of concept and application, the course is very modern. The experiments we do in lab reflect discoveries of the last 20 years. We are measuring the characteristics of the materials upon which the entire semiconductor industry is based," Rahimi reports.

The problems in the course all deal with currently important materials— silicon, gallium arsenide, and germanium.

(continued on back page)

## Geoff Wilson Sweeps Awards

For Geoffrey A. Wilson, senior physics major at Sonoma State University, March was quite a month.

He was awarded a research assistantship which will pay his way through graduate school in the department of applied physics at Stanford University.

He was one of a small number of outstanding students from throughout the country selected to participate in the American Physical Society Industrial Summer Internship Program. The award will provide an opportunity to do research in his specialty, solid state physics, this summer at the IBM San Jose Research Lab.

And he scored among the top 1% in the prestigious Putnam Competition, a nationwide mathematics contest. As the highest scorer from SSU, Wilson received \$1250 from a prize fund donated by county supervisor Helen Putnam and SSU mathematics professors.

The Petaluma native is no stranger to awards. He won the Putnam money last year as well. As a freshman he achieved a perfect score on the national first year chemistry exam. And he recently finished in the top one percent of the nation on all three parts of the Graduate Record Exam.

"Geoff is the latest in a series of outstanding students we have had in the department", notes his advisor, physics and astronomy professor Joseph S. Tenn.

"One of our students, Rick DePreez, was a winner the first year of the American Physical Society internships. He repeated the following year, and is now completing his Ph. D. in applied physics at the Oregon Graduate Center."

Recent SSU physics graduates are now successful

(continued on back page)



## Semiconductor Lab Established

by Jane Bunting

If Dr. Saeid Rahimi has his way, Sonoma State University will broaden its role in the community through the offering of more programs designed to encourage and motivate student interest in local opportunities.

Many of these opportunities are in high technology. SSU's young computer science program is already the third largest major on campus, and now the department of physics and astronomy is moving into applied physics.

"Local industry and the community should know that what we do here can be of great importance to them as well as to their sons and daughters attending Sonoma State," stated Rahimi, a semiconductor specialist who joined the physics and astronomy department at SSU last year.

Rahimi, aided by his students, has built a new laboratory at Sonoma State where characteristics of such semiconductors as silicon and germanium are studied.

"My intention here was to introduce students to the idea of semiconductors, an area of great impact, especially in this highly technological region," Rahimi added.

Semiconductors control the electronic processes within a microprocessor, and they are vital elements in the manufacture of computers, among other things. Silicon, one of the more popularly known semiconductors, has been utilized extensively in the building of the high tech industry in "Silicon Valley."

Student dedication to Rahimi's semiconductor lab is evident in the many non-required hours students spend testing such things as the interaction and effects of light, electrical current, and heat on the semiconductor elements.

Rahimi notes that while traditional physics is easier to follow and less costly to teach than this form of applied physics, it is not as beneficial for students in terms of the job market.

"We need to teach students physics they can use right here in the community, at Hewlett-Packard, Fairchild, and Optical Coating," he stated.

Rahimi believes that for SSU's new emphasis on applied physics to have maximum impact, it will need additional financial support from the community.

"We are equipped now with a training lab that has the potential to become a research lab. With this type of facility on campus, we would be in a position to repay the entire community, with more physics graduates ready to work locally," emphasized Rahimi, who envisions SSU assuming the role of a center for education in semiconductor research and applied physics as a whole.

"U.C. Berkeley is saturated, Stanford is full. Sonoma State could easily handle the overflow of physics students from the Bay Area as well as from the surrounding community. We are laying the foundations toward this direction now," he stressed.

Enrollment in physics courses at SSU is already at an all-time high, and with the inclusion of the new applied physics program and the semiconductor lab on campus, Rahimi sees it growing further.

"There are many areas in this field of semiconductors that need to be explored, and we need to continually teach what is new. The newest properties of gallium arsenide, for instance, need to be researched, their applications studied," he added.

Rahimi went on to say that in order to conduct the type of research necessary, the lab must be

equipped with additional testing equipment, and technicians and machinists must be hired on a full-time basis as well. And while he appreciates the help already received in the form of equipment and funding from local industry, Rahimi stressed that much more is needed.

"Without the support of both staff and materials, the semiconductor lab, the electron microscope, and the vacuum chamber that we now have cannot be fully utilized," he emphasized.

In April Rahimi presented a paper on his own semiconductor research at an international conference in Warm Springs, Oregon, where more than one hundred scientists gathered to discuss gallium arsenide and its applications to the world of high technology.

A native of Iran, Rahimi earned his master's degree in physics at Pahlavi University and his Ph.D. at Pennsylvania State University. After a year of research at the Oregon Graduate Center he joined the SSU faculty in 1982. His work on semiconductors has been published in several journals, most recently Solid State Electronics.

## Astronomers Go South in Summer

Each summer Sonoma State University Observatory Director Gordon Spear and a few of his students go south for a week or two of observations at the Mount Laguna Observatory of San Diego State University.

What are the attractions? A 40-inch telescope and a 16-inch one, and the auxiliary equipment needed for Dr. Spear's specialty—photoelectric photometry.

Last summer Tom McMahon and Jim Pisano joined Dr. Spear for the trip. The trio sought short period variability in two Be stars.

"There is no question that they varied. What is important is whether they varied periodically," Spear reported.

The data analysis continues. Tom McMahon can often be seen hunched over the Tektronix graphics terminal on the third floor of Darwin Hall, looking for that important periodicity.

In the meantime the students in Dr. Spear's advanced astronomy laboratory course are learning to do photometry (and also spectroscopy and photography) with more modest equipment. Soon some of them will also be involved in research.

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## Physics Majors Win Scholarships

Three physics majors were among the winners of University Scholarships for the academic year 1983-84.

Each year SSU's University Scholarship program awards approximately a hundred scholarships for academic merit. Funds are contributed by a number of generous individuals, corporations, and foundations.

Seniors David Lapp and Geoffrey Wilson both won Forrest and Ida Benson Memorial Scholarships. Funds left by the Bensons provide twenty scholarships yearly to residents of the North Bay Area.

Junior Chris Ray won the Joe S. Tenn scholarship. This scholarship, given in the professor's honor by his brother and sister-in-law, is awarded each year to a physics major. Ray is a double major, in physics and applied mathematics.

In addition to the current majors, one of the department's graduates was a winner. Miriam Carolin was awarded the Ana Rosa Call Scholarship, contributed by Mr. and Mrs. John T. Stafford in memory of the pioneer Sonoma coast resident. Now a graduate student in history, Miriam intends to specialize in the history of modern astronomy.

## Don Martin Takes Kitt Peak Position

On June 4 Don Martin will begin working with one of the big telescopes at Kitt Peak National Observatory.

The position at the major observatory near Tucson, Arizona, will be a great opportunity for Don, an amateur astronomer since the age of six.

He has followed a roundabout path toward an astronomical career. Don's first degree was a Bachelor of Arts in German and history, awarded by the University of California, Berkeley in 1969.

In the following years he taught at a private school in Scotland, worked in traffic engineering in San Leandro, and traveled extensively in Europe and Africa.

It was after a year of teaching at a continuation school in Lake County that Martin came to SSU in 1980.

"At the continuation school I started an astronomy program, and this reawakened an old interest," Don said.

He came to Sonoma State because of its highly-regarded astronomy program. He soon distinguished himself as an outstanding student in the introductory laboratory courses and as a knowledgeable observatory assistant at Public Viewing Nights.

It should be no surprise that his favorite course at SSU was Dr. Gordon Spear's advanced observational astronomy.

"It helped me get through the tough interview at Kitt Peak," he noted.

Don has worked on photometry and photography of minor planets and Seyfert galaxies at the SSU Observatory. He made an impressive photograph of Comet Iras-Araki-Alcock.

He is known for his writing.

"Don Martin is one of the best writers I have ever had in my classes," reports Dr. Joe Tenn.

His article, "Adrian Maanen: How a Good Scientist Went Wrong," won an honorable mention in the Griffith Observor essay contest in 1982. The following year he took 5th place in the McDonald Observatory News essay contest with "Mystery of the Martian Canals."

Both prize-winning articles were first written as term papers for Tenn's courses, discovering the galaxies and frontiers in astronomy, respectively.

Don completed his B.A. in physics in August 1983. Since then he has been working at the Reprographics Center on campus, taking more courses in electronics, history of science, and German, and teaching.

He taught the introductory astronomy lab course in the fall and is currently teaching sections of Physics 116 and 209B laboratories.

At Kitt Peak Don Martin will be doing stellar spectroscopy with the 60-inch McMath solar telescope. It is only recently that the big telescope, built for solar studies, has been used at night as well.

"The McMath is an incredible telescope," he reported after his recent visit. "The dispersion is about one-fourth of an Angstrom per millimeter with seventh magnitude stars."

"I will be doing aperiodic data collection on various bright stars over a period of several years."

The three electronics courses he took at SSU from Professors Karas and Poland will not be wasted.

"They want me to do some microprocessor applications, interfacing a reticon detector with a Varian computer," he added.

Don commented on his stay at Sonoma State: "I have been pleased with my experience at SSU. All of the professors have been helpful. I think the 'hands-on' approach in the labs has been very useful in learning how to use equipment."

"I am looking forward to learning a lot of astronomy and instrumentation at Kitt Peak," he concluded.

## The B.S. in 4 years: It Can Be Done

The Bachelor of Science degree program in physics is one of the most demanding majors at Sonoma State. It takes careful planning to complete the 50 units of physics, 15 of math, 10 of chemistry, and 39 of additional general education courses within four years.

Since many students transfer from other colleges and many work while studying, it is not surprising that most take more than four years to complete the B.S.

Yet this year the department expects three to receive the B.S. just four years after finishing high school.

Tim Finnegan, Kim Powers, and Tomas Vera are expected to receive their B.S. degrees on June 1, 1984.

Finnegan, a graduate of Serra High School in Burlingame, found Dr. John Dunning's applied nuclear physics and chemistry class a high spot of his studies.

In the fall he will begin graduate studies in nuclear engineering at the University of Wisconsin. He feels well prepared to earn a doctorate in the field. According to Tim, "The quality of the education at SSU in the physics and astronomy department is great."

Powers came to SSU from Kelseyville High School in Lake County. Interested in instrumentation and optics—he especially enjoyed Dr. Sam Greene's course in lasers and holography—Kim has accepted a teaching assistantship in the physics department of the University of Arizona.

Vera plans to seek employment in electronics after graduation. Since coming to SSU from Piner High School in Santa Rosa, he has developed his interest through several electronics courses. He has also enjoyed playing trombone in the SSU Wind Ensemble.

## Prominent Scientists Speak at SSU

"The Age of the Universe," by astronomer Allan Sandage, was the high point of the "What Physicists Do" lecture series this year.

The rare public lecture by one of the world's leading astronomers drew visitors from as far away as Eureka, Ukiah, Kelseyville, Sacramento, and Oakland. More than 110 persons sat or stood under threatening skies for the outdoor lecture at a hastily-rounded-up chalkboard when a last-minute power blackout made Darwin 108 unusable.

When the power finally returned, the amiable Sandage showed his slides with commentary that amounted to a second lecture.

The visit of the Mount Wilson and Las Campanas Observatories astronomer was one of 26 lectures presented this year by a wide variety of physical scientists and engineers.

During the fall semester, Dr. William A. Little of Stanford University gave an exciting description of the invention of a micro-miniature refrigerator, a device he now manufactures and sells.

Dr. Narinder Kapany, president of Kaptron, Inc., spoke on thirty years in fiber optics, a rapidly-growing field he helped found.

And one of the department's graduates, Bill Cabrall (BA, 1976) described the work he does at Martin Marietta on space shuttle secondary payloads.

This spring, the 27th semester of SSU's oldest public lecture series, saw a comparison of the evolution of climate on Earth, Venus, and Mars by NASA astronomer James Pollack. One of the authors of the famous "nuclear winter" article, Pollack warned that human activities could drastically alter the earth's climate.

Paul LaFevre, an engineer at Optical Coating Laboratory, Inc. and SSU physics student, explained the physics of anti-glare coatings on video display terminals.

Nancy Kerr Del Grande, a Lawrence Livermore National Laboratory physicist, gave a fascinating description of the use of black body radiation theory to measure ground temperatures to within 0.2°C from airplanes. The method promises to be an important tool for geothermal prospecting.

Other highlights of the series included the presentation of semiconductor research at the Lawrence Berkeley Laboratory's new Center for Advanced Materials by program leader Eugene Haller and an exciting talk on "Superconductivity, Pendula, and Chaos" by Stanford professor M. R. Beasley.

The series will conclude May 14 when Gerson Goldhaber of the Lawrence Berkeley Laboratory describes his discovery of the physical property called charm. Goldhaber won the California Scientist of the Year award for finding the "charmed quark."

He already knows the way to the campus. Last semester Goldhaber accompanied his wife, Judy, when she spoke in the series on science writing.

The next "What Physicists Do" series will be under the direction of Drs. Sam Greene, Gordon Spear, and Saëid Rahimi. Dr. Joe Tenn, who founded the series in spring 1971 and who has directed it for all but one and one-half semesters of its existence, will be on sabbatical leave for the 1984-85 academic year.

## Student Profile: David Lapp

"It was right after I took a class in earth science at Santa Rosa Jr. College that I got very interested in physics. I have been interested in science as far back as I can remember."

Those are the words of David Lapp, senior physics major at Sonoma State University and future high school teacher.

Lapp is also an excellent experimental physicist, a former military policeman, and a serious student of the bible.

Although there has been much publicity recently about the great need for high school science teachers, SSU's physics and astronomy department hasn't produced a teacher in more than a decade.

(The last graduate to get a credential is now working in private industry, teaching computer use to manufacturers. Of the Department's 139 graduates, only Jim Hill (BS, 1971), now teaching physics at Los Gatos Union High School, and Healdsburg High School mathematics teacher Roberto Ramirez (BS, 1972) are known to be teaching at the present time.)

Asked about his choice of profession, Lapp said, "It wasn't until my Sonoma State experience that I realized the benefit of good motivational teaching techniques."

"John Dunning had the greatest effect on me. He seemed so interested in what he was teaching, whether it was elementary or complex. He is always patient and compassionate."

"I want to apply that to my further education and learn to develop those motivational techniques so that I can motivate others."

"I have a broad interest in many subjects in science. I don't want to get into a job field that would restrict me," he added.

David Lapp's route to SSU included a three-year stint as a military policeman in the Army. It was during this period that he met his wife, Mary.

"The way I met her was that I gave her a speeding ticket," he remarked with a smile. He added that she forgave him eventually.

Mary graduated from SSU as a management major in 1983 and is now working as a manager for a local company.

The whole Lapp family has attended Sonoma State: five-year-old Angie has been a regular at the campus child care center for two years.

David Lapp has especially enjoyed his courses in applied physics—nuclear physics, lasers and holography, and Dr. Gordon Spear's tough programming for scientists course.

This summer Lapp will work with Dr. Sam Greene on the latter's laser research project.

"David is a careful experimenter. He is meticulous; he understands mathematical physics," declared Dr. Greene. "He is quiet and unassuming."

But physics is far from being David Lapp's only interest. He is deeply interested in theology, specifically the question of how the Church has lost its zeal since the first century.

"This summer I hope to master Greek well enough to read the New Testament in the original," he noted. And in the fall he will enter the credential program at SSU.

Soon there will be one more well-qualified high school physics teacher in the community.



## New Equipment Acquired

### Laser Lab: Electronic Revolution

by David Jensen

(reprinted from the Sonoma State Star)

Like rocket ships that fly to the moon, lasers have left the realm of science fiction and entered our everyday lives. In printing, surgery, manufacturing, telecommunications, entertainment, and perhaps, combat, the laser has found new uses.

Sonoma State's physics and astronomy department now offers students an exceptional opportunity to enter the world of laser technology.

The Department presently has twelve lasers, including a five-watt argon laser and a one-watt dye laser, with a pulsed dye laser being constructed. The smaller lasers are used to study optics, larger ones to construct holograms.

According to professor Sam Greene, "Students get to manipulated expensive equipment not usually available at the undergraduate level. They get their hands on the inner workings of the lasers."

Students are given a box of parts and asked to build a laser. With a little supervision it's not too hard—at least that's what the professor says.

Ordinary light is composed of a rainbow of colors. Lasers, however, emit only monochromatic light (composed of one wavelength or color).

The laser has proven to be a valuable tool for chemical analysis. Sonoma State recently received a grant from the Petroleum Research Fund to perform laser analysis on sulfur compounds. Common pollutants in oil and coal, these compounds escape in the smoke and react to form "acid rain."

Physics and astronomy department technician Steve Anderson has brought a wealth of knowledge and personal experience to the laser program. Before coming to Sonoma State he helped develop lasers for eye surgery, newspaper printing, scientific analysis of compounds, and cell separation and analysis for genetic engineering.

He is also a founding member of two educational groups, Laser Affiliates and Laser Arts Society for Education and Research. In addition to teaching, both groups stage public performances of laser and holography shows, or, as Anderson prefers to call them, "kinetic visual art."

Many students were introduced to Anderson's kinetic art at the recent dance recital, "Different Visions, Common Ground." With the help of Don Eggers, Steve united the strength and beauty of the laser with the dancing of Victoria Strowbridge.

Anderson explains, "Dancers and lasers seem to fuse together. They're both so graceful, so light, yet so strong. It's a natural combination."

Anderson has collected equipment which will expand SSU's ability to make holograms.

A hologram is a three-dimensional picture. Holograms are able to store information in less space than any other method presently available.

In the near future, textbooks will have holographic illustrations. Major works of art have been reproduced on holograms.

Sonoma State students are producing their own holograms. If space can be found to set up the additional equipment already on hand, SSU's holographic production capability will double.

According to Greene, "Right now there is a revolution in electronics. Electronic components are being replaced by optics. Sonoma State is in a good position to take advantage of what's going on around us."

The SSU physics and astronomy department has received some new equipment during the past year.

Five new Hewlett-Packard oscilloscopes have been donated—four by the H-P Foundation, one by the Santa Rosa H-P plant, and one by H-P engineer and part-time SSU instructor Grant Doering.

A \$21,000 investment in People grant, awarded by the State of California, has paid for more oscilloscopes, function generators, other equipment for the microprocessor lab, and technician training. Dr. Richard Karas wrote the grant proposal.

"This brings us within reach of a full up-to-date electronics and microprocessor applications laboratory," Karas stated.

A new set of microprocessors, microcomputers, and associated peripherals and software, together with a remodeling and expansion of the microprocessor lab, is expected in time for the opening of the Fall 1984 semester.

Another much-appreciated donation to the department has been a continuing supply of liquid nitrogen, provided by a local industrial firm.

## Alumnotes

Roland Begin (BS, physics, 1980) is working as a research associate at Colorado State University's computer center while finishing up work for his master's degree in physics. He writes that he is getting "deeper and deeper, day by day, into the world of supercomputers," as he works with the Cyber 205.

Dr. Paul A. Goodwin (BS, physics, 1971) is currently self-employed as a consultant specializing in the area of artificial intelligence. He also teaches a graduate course in neuropsychology at Alaska Pacific University in Anchorage. Paul received his Ph.D. in geophysics from the University of Alaska in 1979.

Keith Brister (BS, physics, 1982) transferred to Cornell University from the University of California, Berkeley. A graduate student in the Applied Physics Department at Cornell, Keith is working on materials, "mostly III - V compounds," at the very high pressures obtained with the diamond anvil cell. He writes that what he learned in Dr. Dunning's x-ray fluorescence and nuclear physics labs is now "of great use."

Robert Hammond (BA, physics, 1980) is currently enrolled in the multiple subject credential program at Sonoma State University. He has presented short courses in optics, electricity, and astronomy at two Santa Rosa elementary schools.

R. Jefferson Porter (BA, physics, 1983) writes that he is presently the Test Engineer for United Energy Corporation, Foster City, California. He evaluates solar cell performance in the company's research and development lab.

Brett Morgan (BA, physics, 1982) is working for Lad Computers in Santa Rosa. Brett and Dyan McKenna were married last year.

Steve Williamson (BA, physics, 1974) is working for Data 3 Systems in Santa Rosa, teaching usage of the company's software to large manufacturing companies.

## Temporary Faculty Enrich Department

by Marlene Phillely

The SSU physics and astronomy department has often been fortunate enough to attract outstanding temporary lecturers to supplement the regular faculty. The part-timers have brought diversity to the Department and have enhanced student contact with local industry.

The spring 1984 semester brings three engineers from Hewlett-Packard, an industrial metals specialist from Optical Coating Laboratory, Inc., and a diversified astronomy entrepreneur and lecturer to the faculty. They join long-time lecturer and acoustical consultant Tom Barnebey and SSU graduate and soon-to-be Kitt Peak spectroscopist Don Martin.

The engineers from H-P's Santa Rosa research and development division are teaching laboratory sections in introductory physics and electronics.

Grant Doering, an active contributor to the Department for three semesters now, is a design engineer with a bachelor's degree in electrical engineering from Iowa State University.

Doering is currently designing software for a Motorola 68000 microprocessor in H-P's signal analysis division. He has worked in design of spectrum analyzer CRT and intermediate frequency circuits. These are circuits used in high speed communications systems. The programming is done in C and assembly language.

The other Hewlett-Packard engineers, Kenneth Wildnauer and Marek Mierzewski, are new to SSU this spring. They received their undergraduate education in applied physics in the same class at Cornell University.

Wildnauer works in the signal analysis division at H-P. His work is in analog circuit design for a new family of spectrum analyzers.

Ken completed his M.S. in electrical engineering at Cornell. He found the problem-solving, applications-oriented character of his applied physics undergraduate program to be an excellent preparation for advanced work.

Marek Mierzewski (pronounced Mark) went to Stanford for a master's degree in solid state electronics after graduation from Cornell. He also praises his undergraduate education in applied physics. In fact, he finds that his training in theoretical and applied physics is ideal for his work with gallium arsenide semiconductors. He is currently working on 40 GHz Schottky-barrier MESFET transistor design. Previously he spent five years working with silicon semiconductors.

Also new to the department this spring is Norman Sperling, proprietor of a mail-order astronomical supplies business called Everything in the Universe. A regular lecturer at the Morrison Planetarium of the California Academy of Sciences and a board member of several amateur astronomy organizations, Sperling is teaching descriptive astronomy.

The Michigan State University graduate was assistant editor of *Sky and Telescope* magazine for several years, and once directed a planetarium in Princeton, New Jersey. (Asked why he left that post, he asserted that the population of New Jersey is the densest in the country.) Sperling was one of the designers of the popular Edmond Astroscan telescope and of the Bowl of Night Starfinder.

Bill Archuleta, a supervisor of the engineering metal shop at OCLI, is once again teaching precision machining for experimental physics. Bill is an advisor to the California Technical Education Consortium.

## Physics Major Popular at SSU

The percentage of undergraduates majoring in physics at Sonoma State University continues to be the highest by far in the California State University system.

In fall 1982, the most recent semester for which complete data are available, 1.98% of Sonoma State's undergraduates were majoring in physics. Second highest in the system was California State College, San Bernardino, where the 27 majors made up 0.76% of the total undergrad enrollment.

Systemwide, only 0.43% of the students seeking bachelor's degrees were majoring in physics.

SSU's 79 majors were actually outnumbered by those on five of the nineteen campuses—CSU, Northridge; San Jose State; Cal Poly, San Luis Obispo; San Diego State; and Cal Poly, Pomona—but those campuses have far larger total enrollments.

"There are several reasons we have so many physics majors," according to the physics and astronomy department advisor, Dr. Joseph Tenn. "One is that we have long been a strong and active department. We have recruited students, encouraged them, and maintained contact with them after graduation. Our successful graduates in the community are the best recommendation for our program.

SSU's undergraduate astronomy program, one of only a handful in the nation to publish an annual report in the *Bulletin of the American Astronomical Society*, has attracted many fine students to the campus.

Another reason for the department's popularity is the flexibility of its B.A. program.

"The B.A. program is of particular value to those seeking careers in fields other than pure physics. It allows the student the flexibility to prepare for a position in engineering, technical sales, or computer applications," Tenn notes.

Approximately one-fourth of the Department's graduates are working in engineering, mostly in optics, electronics, and aerospace.

The number of physics majors at SSU currently stands at 85. Certainly, physics majors are not lonely at Sonoma State.

## Student Profile: Martha Schopp

by Ernest Medeiros

When Martha Schopp entered Sonoma State University, it was as a foreign language major. It was a natural choice, as she had previously studied some Spanish, French, Russian, and Latin.

In the course of meeting her general education requirements she took Descriptive Astronomy from Dr. Joe Tenn. Inspiration struck! Shortly afterward she changed her major to physics.

The change probably came as a pleasant surprise to Martha's father, a professor of astronomy at San Diego State University.

Observational astronomy and astrophotography are now Martha's primary areas of interest. She plans to enter a graduate program in astronomy after completing her bachelor's degree in physics.

That will come later. Currently taking first semester calculus-based physics from Dr. Rahimi, she says, "At this point, just making it through the physics program is challenge enough."

Besides a demanding load of courses, Martha works weekends and some evenings at a Santa Rosa department store. Yet she still finds time for sailing and motorcycle riding. She enjoys classical music and jazz, and she makes outstanding sauteed rainbow trout!

## Sanchez Chosen for SLAC Summer Program

Each year the Stanford Linear Accelerator Center chooses a small number of students from throughout the nation for its Summer Science Program.

For the fifth time in six years, one of those chosen is a Sonoma State University physics major.

Lou Sanchez-Chopitea will join seventeen other outstanding students for a program of morning lectures and afternoon research at the two-mile long accelerator.

Born in New York, Sanchez spent half his childhood there and half in Argentina. After finishing high school in Argentina he studied physics at the University of Buenos Aires.

Lou's arrival at SSU in September 1982 was not an auspicious one. He arrived on crutches, squinting because of the loss of his glasses.

Both problems were due to a collision with a truck in Mexico. Lou and his wife, Viviana, had come most of the way on a motorcycle, taking to the air part way to avoid the break in the Pan American Highway in Panama.

They left Argentina immediately after the Falkland Islands War, during which Lou served as an interpreter for CBS News.

"It's great to be here," was Lou's comment on Sonoma State. He likes the smaller classes, increased contact with faculty, and more up-to-date laboratories, compared to his former university.

An expert computer programmer, Lou is currently working at the SSU computer center as a consultant, helping students and faculty with problems in FORTRAN, BASIC, and PASCAL.

Viviana and their baby will stay in Rohnert Park for the summer, but Lou will be home most weekends. He will see one familiar face at SLAC: It was just announced that this year Dr. Joe Tenn will be the director of the Summer Science Program.

## Student Profile: Paula Bennett

by Mary Howland

Four years ago Paula Bennett traded army life for a college career and got one step closer to her childhood dream of becoming a scientist.

She had enlisted in the army in 1972 and signed up for nurse's training because it was the military occupation most closely related to science. After eight years as a soldier, Paula began her college education at Indian Valley Colleges.

Paula has always been interested in science—when she was a child her favorite toys were her microscope, telescope, and chemistry set.

Now, thanks to the "hands-on" approach to education in the SSU physics and astronomy department, Paula has the opportunity to work with a variety of sophisticated equipment. In the introductory quantum physics lab this semester she and her lab partner, Allyson Bishop, have performed the classic Franck-Hertz experiment, completed experiments in x-ray diffraction and x-ray fluorescence, and learned a great deal about spectroscopy.

"I hope to eventually integrate what I am learning about physics with my medical background," Paula explains.

She has already decided to do graduate work at UC Davis after completing her B.S. in physics at Sonoma State.

Paula, her husband, David (an anthropology major at SSU), and their nine-year old son live in Rohnert Park. She works part-time as an intensive care nurse at Novato Community Hospital.

## Student Profile: Milton Hagler

by Phil Cullen

Milton Hagler is a junior from Auburn, California. A transfer student from CSU, Sacramento, he is particularly interested in electronics and computers.

Although he won't take the course in solid state physics until next year, Milton has already done considerable work in the field. He has constructed several pieces of apparatus for Dr. Rahimi's new semiconductor lab.

Upon graduation in 1985 Hagler expects to work in engineering. Eventually, he intends to pursue graduate study in that field.

Asked why he came to SSU, which has no engineering program per se, he replied that physics is the theory behind, and the underlying foundation of, engineering.

Milton expressed the view that the SSU physics and astronomy department is an excellent place to learn physics, remarking on the thoroughness of the program, the large number of classes to choose from, and the close personal attention from the faculty.

"SSU," he says, "has really thorough, solid, basic, well-taught physics."

Sonoma State's reputation for providing a broad liberal arts program was also important in Milt's decision to come to SSU.

Milton is currently living in Rohnert Park. When he isn't in the solid state lab or the machine shop, he likes to get his kicks playing soccer.

## Alumnotes

Dr. Kenneth Larson (BA, physics and mathematics, 1969) returned to his faculty position at Southern Oregon College after spending the 1982-83 academic year establishing the computer science program at Sonoma State University. Ken earned his Ph.D. in Computer and Information Science at the University of California, Irvine, in 1977.

Robert M. Bilodeau (BA, physics, 1983) was recently promoted to regional claims representative at State Farm Insurance Company in Rohnert Park.

Jim Pisano (BS, physics, 1982) is a graduate student in astronomy at the University of Virginia.

David W. Nielsen (BS, physics, 1974) is working as a computer programmer analyst with the Environmental Protection Agency in Las Vegas, Nevada. Of his education at SSU, David writes, "My background has been invaluable in creating scientific programs to evaluate the environmental impact of radioactive isotopes resulting from nuclear tests."

Lance Erickson (BS, physics, 1980) is a graduate student in radio astronomy at the University of Florida. He is "looking at some missing mass puzzles with the Very Large Array."

Frank Van Gieson (BS, physics and applied mathematics, 1979) is an engineer with National Semiconductor Company in Santa Clara. Frank received his M.S. in Materials Science from M.I.T.

Dr. Bruce Odekirk (BS, physics, 1978) is now working on gallium arsenide integrated circuit development at Tektronix in Beaverton, Oregon. Bruce earned his Ph.D. in Applied Physics at the Oregon Graduate Center and then spend a year doing postdoctoral research at Southern Methodist University.

## Geoff Wilson (con't. from p. 1)

graduate students at UC Berkeley, Cornell, Texas, Virginia, and Florida. Those of a few years ago have earned doctorates in physics, physical chemistry, geophysics, applied physics, and computer science.

As an undergraduate student Wilson has been conducting research with Dr. Samuel L. Greene, chairman of the department of physics and astronomy at Sonoma State. They are using lasers for studies in molecular spectroscopy.

An indifferent student at Casa Grande High School, Wilson did odd jobs and construction work for three years after graduation. It was a book—Douglas Hofstadter's Pulitzer Prize-winning *Godel, Escher, Bach*—which stimulated him to return to Sonoma County to enroll as a freshman at Sonoma State in 1980.

He has been conducting his own research into the theory and construction of optical transistors, devices which could lead to a new generation of faster computers. At Stanford he will see where this may lead or start on something new. Geoffrey Wilson is on his way.

## Students Present Research at ANBS Meetings

SSU physics and astronomy students have been among the participants in each of the four annual meetings of the Association of North Bay Scientists (ANBS).

Geoffrey Wilson presented a paper on an optical transistor at the 3rd annual ANBS meeting, held at College of the Redwoods on April 30, 1983. The work was the result of research Wilson performed on his own after being inspired by an article in *Scientific American*.

At that same meeting, Lou Sanchez-Chopitea presented "Simple stellar models," a computational project that grew out of work he did in the astrophysics course taught by Dr. Joe Tenn.

At this year's meeting, held at Santa Rosa Junior College, April 28, 1984, no fewer than six of Dr. Richard Karas's students presented papers on projects involving microprocessors.

All six took Dr. Karas's course on microprocessor applications, and several went on to build more advanced devices as senior design projects.

David Fassett, Greg Melancon, and Thomas McBride gave separate talks on their respective portions of a small local area network for microcomputers.

William Stockton described the design of an "intelligent" sun-tracker for the Darwin Hall heliostat.

Virginia Lacker presented an upgrade of the computer interface to the x-ray diffractometer. (The original was built by Michael Helm as a student project and presented at the second ANBS meeting in 1982.)

The remaining paper in the series was "Improved gas chromatograph data acquisition and analysis using a microcomputer," by Mary C. Guerrero.

All of the students who spoke in 1984 are computer science majors. Fassett is also a physics major.

## Applied Physics (con't. from p. 1)

SSU physics students can take a sequence of three electronics courses, culminating in a microprocessor applications course which requires an advanced project. According to Dr. Richard Karas, developer of the course, it allows students to achieve a thorough understanding of what goes on inside a computer.

"Many of our recent graduates have gone into industry, mostly in engineering positions in the fields of optics, electronics, and aerospace," says long-time department advisor Joe Tenn.

Optical Coating Laboratory, Inc., Santa Rosa, is by far the largest employer of SSU physics grads, followed by Lockheed Missiles and Space Co., Sunnyvale.

SSU students gain optics expertise in Dr. Samuel Greene's advanced laboratory course in lasers and holography and in a lecture course on the theory of light. With the new applied physics emphasis will come a new course on the theory of signal processing as well.

Dr. John Dunning, one of the most popular teachers at SSU, is in charge of the applied nuclear laboratory, where students learn detection of trace quantities of elements and the use of radiation for medical applications. For the new program Dunning is introducing an additional course in x-ray applications.

All physics students are already required to become adept at scientific computer programming. Most achieve this proficiency in an intense upper division course taught by Professor Gordon Spear.

Dr. Duncan Poland, teacher of several of the electronics courses, and one of the initiators of the program, notes that "Conversations with students and with people in local technological industries have convinced us of the need for this program. There is increasing demand for graduates with skills in applied physics."

## Society of Physics Students Active

This year was a busy and productive one for the local chapter of the Society of Physics Students. Under the leadership of Tony Salazar, Walter Carter, and Tom Posa, the SPS held a variety of meetings.

There were several guest speakers. Ron Wickersham discussed the design of sound systems for rock concerts. Dr. Saeid Rahimi explained how to do a literature search among the library's technical journals.

Ross Goodwin (BS, physics and applied mathematics, 1978) spoke on employment opportunities for physics graduates at Hewlett-Packard Company. Ross, who earned an M.B.A. at the University of California, Berkeley after graduating from SSU, is employed as a marketing engineer at H-P's Santa Rosa plant.

At the last meeting of the year graduating senior Geoffrey Wilson spoke on his own research on optical transistors.

Membership in the Society of Physics Students is "a great buy at only \$10" according to Tom Posa. Members receive a subscription to *Physics Today* and the SPS newsletter as well as discounts on a number of technical journals and such popular magazines as *Scientific American* and *Astronomy*.