



# THE PHYSICS MAJOR

## OUTSTANDING PROFESSOR NAMED

Dr. Richard Karas was honored as Sonoma State College's 1977-78 outstanding professor last spring. A member of the SSC faculty since 1974, Dr. Karas became eligible for one of two outstanding professor awards granted by trustees of the 19 California State University and Colleges (CSUC). (He did not win.)

Outstanding professor awards were begun in 1963 to recognize excellence in teaching. Candidates are judged on the basis of contributions to their students, academic disciplines and campus communities. A \$1,000 award is granted through the Joseph M. Schenck Foundation to the two CSUC winners each year.

While he feels "greatly honored" by the SSC award, the Santa Rosa resident states he views himself as "representative of the typical faculty person at Sonoma. People here work very hard, and are dedicated to teaching."

Dr. Karas, who holds a Ph.D. in atmospheric and space sciences from the University of California, Berkeley, adds hard work and dedication is "especially true in physics and astronomy at SSC."

"We don't believe physics is the new priesthood with rites of admission to be closed off to all except the select few. While we have been very successful in preparing people for professional work, we also work to make physics and astronomy accessible to all students."

Reflecting on his own teaching philosophy, Dr. Karas says his top priority is offering students "a high quality education. Everything else comes after that."

I don't believe in passive learning. You can't just lecture to students and then expect them to learn unless they actively participate.

My view is that a teacher should get students to think along with him as he goes through topics he thinks are valuable for them to learn. It's also important to relate the study to what the students are doing in other classes and outside school."

## JOHNSTON RETURNS FROM M.I.T., ENERGY COMMISSION

George L. Johnston, Associate Professor of Physics, has returned to Sonoma after a three year leave of absence. During the first two years he was a Research Associate in the Research Laboratory of Electronics of Massachusetts Institute of Technology. During the last year he was Special Advisor to a Commissioner of the California Energy Commission.

George's research at M.I.T. involved theoretical studies of microwave heating of magnetoplasma for controlled thermonuclear fusion. He is continuing research in theoretical plasma physics in collaboration with colleagues at University of California and Lawrence Berkeley Laboratory. He recently initiated a study of four-wave interactions in plasma applied to type III solar radio bursts. He plans to resume research on certain problems of mathematical physics which he initiated earlier. He is presently developing student research participation in these areas.

While he was at M.I.T., George conducted an informal study of the undergraduate programs in physics and electrical engineering and computer science. (He worked closely with a number of BECS faculty and students.) He hopes to make use of appropriate elements of this experience in the development of the program of the Department of Physics and Astronomy.

George's position at the Energy Commission involved a broad range of activities. These included promoting the implementation of two alternative energy technologies, namely fuel cells and solar photovoltaics, and studying the policy implications of nuclear power. He brings the benefit of his experience in Sacramento to Physics 301, the Relation of Physics to Society, which he is teaching this semester. He hopes to encourage an increase in energy studies in the Department. He considers an increased emphasis on sustainable energy supply systems particularly important. He believes that wind machines can make a significant contribution to California's energy supply in the near term and that, relative to other sustainable energy systems, they have received little attention and support.

by  
 Jim Mills  
 Stephanie Snedden

THE FIRST TEN GRADUATES

Most people would not consider sleeping seven days in a windowless, cinder-block building, and working seven nights from dusk to dawn gathered around a telescope and teletype, a pleasure. Two Sonoma State Physics & Astronomy students (Jim Mills, Stephanie Snedden) had the opportunity this summer to accompany Dr. Gordon Spear to Mt. Laguna Observatory to take part in variable star research. They considered it a true pleasure.

The purpose of the trip was to obtain photoelectric and spectroscopic data on three lightly studied variable stars. The first four nights were spent gathering photoelectric data in hopes of measuring light variations of the stars. The equipment used was a 16" Newtonian telescope on which a photoelectronic system was attached. This system is capable of detecting extremely small variations in luminosity. In addition, three nights were spent obtaining spectra for two of the variables and numerous spectra of standard comparison stars. The spectra were obtained photographically on glass plates, to be saved for future analysis.

The observatory is located at the 6100' peak of Mt. Laguna and is approximately an hour's drive to the east of San Diego. The facilities are owned and operated by San Diego State University. San Diego often invites astronomers from other schools to come and use the equipment, which is a great help to the professional astronomer and students who have need of good facilities. There is a great deal of equipment to be used both by the student and professional on the mountain and at the university. The telescopes include a 24" Newtonian and two 16" Newtonians, one of which is used for research and the other for public star gazing. Each telescope is housed in its own dome with additional facilities located under the telescope platform.

Even though the collection of data took seven long nights, there was still plenty of work to be done before returning. Forty-eight continuous hours were spent on preliminary analysis of the spectral data, after which six hours were spent obtaining beautiful sunburns on one of San Diego's public beaches.

Work on the data is still far from complete, although data reduction is proceeding at a steady rate. The observers hope to have some results for the Astronomical Society of the Pacific meeting to be held at SSU in June 1979.

We (Jim and Stephanie) feel that SSU is one of the few schools where undergraduates can participate in serious scientific study usually only available to graduates and the professional scientist, and would like to thank Gordon Spear and the rest of the physics & astronomy department for making it possible.

BARNEBEY PROVIDES SOUND SOLUTIONS

Those looking for Tom Barnebey this year need look no farther than Rohnert Park. Dr. Barnebey has opened a business, Sound Solutions Acoustical Consulting Services.

The former teacher of courses in the physics of music and environmental acoustics now puts theory into practice, providing such services as OSHA compliance surveys and designs, architectural acoustics, environmental acoustics, and surveys for community noise assessment and remediation.

After four and one-half years of teaching here, Tom has not completely severed his ties with the campus. He recently accepted an appointment as a visiting lecturer, which means he will be advising a few special studies students--for \$1 a year.

In 1967 Sonoma State College awarded its first bachelor's degree in physics. Patricia Marriott had transferred into the then-new physics program as a senior and was one of only three physics majors at the time.

Pat is a software development engineer at Hewlett Packard's General Systems Division in Santa Clara now, but she still remembers Professors Greene and Poland and her physics classes here. She has also worked at IBM and earned a master's degree in computer science at the University of California, Berkeley since leaving Sonoma State.

The department has grown since then, but it has managed to remain in contact with most of its graduates. More than two-thirds have returned questionnaires regarding their experiences. The responses are overwhelmingly positive according to department advisor, Joe Tenn, who has sent out the questionnaires on several occasions.

It happens that nine of the first ten graduates have kept in touch. Let us take a look at this group of "old grads".

The second, third, and fourth physics graduates all received their degrees in 1969, and all are now involved with computers. Ken Larson, who graduated in both physics and mathematics, stayed on a year to earn a master's degree in math at Sonoma, before entering the graduate program in computer science at the University of California, Irvine, where he was awarded a Ph.D. in 1977. Now an assistant professor of mathematics at Southern Oregon State College, Ken has also taught at Western Washington State College and conducted research at UCI and the Institute for Advanced Computation.

Regarding his study of physics at SSC, Ken writes "It has given me good practical insight into solving problems and allowed me to deal easily with applications of math."

Gary Zupan recently went to work for NCR in San Diego as a programmer/analyst. Formerly a programmer for San Diego State University, Gary writes, "The ability and training to think logically is very useful."

Bill Parr, when last heard from two years ago, was employed as a systems analyst for Sonoma County.

The lone 1970 graduate was Robert Steele. Another physics and math graduate, Bob went from SSC to UC, Santa Barbara, where he earned a Ph.D. in physics a year ago. Bob is now doing post-doctoral research in atmospheric and space physics at the University of Colorado.

Paul Goodwin, a Ph.D. in geophysics at the University of Alaska and the president of a sizeable geophysical consulting corporation, is the subject of an article elsewhere in these pages.

James Hill, who came to Sonoma State after many years in the air force, has been teaching physics at Los Gatos Union High School since completing his teaching credential at SSC shortly after graduation.

Niles Severy is a resident geophysicist with Dames and Moore, a worldwide consulting firm. Niles earned a master's degree in geology at the University of Colorado after completing his B.A. in physics and math at Sonoma State. He has been studying the safety of nuclear power plant sites and has presented papers at conferences in the U.S. and Turkey.

That's nine of the department's first ten graduates. If anyone knows the whereabouts of Ed Davis, please ask him to get in touch with the department so that we can complete this story.

At Sonoma State University, physics majors comprised 1.24% of the undergraduate students in the fall of 1977.

This may not seem like a lot, but it is more than three times the percentage in the California State University and Colleges (CSUC) system as a whole, and it is far above the percentage at any other CSUC institution. There were actually more physics majors at Sonoma State than at CSU, Long Beach, although the southern California institution had more than 25,000 undergraduates compared to SSU's 4500.

Second place was held by CSU, Hayward, where 0.85% of the students seeking bachelor's degrees were physics majors. Humboldt State University was the only other CSUC institution above 0.50%.

The department counted 71 physics majors, including double majors, in the fall of 1978. Clearly, physics majors are not lonely at Sonoma State.

When asked why physics is so much more attractive to students at Sonoma State than at its sister schools, department advisor Joe Tenn mentioned the flexible B.A. program, the close interaction between instructors and students, and the fact that the department stresses research and the use of sophisticated instruments by undergraduates.

"There are no graduate students in this department," Dr. Tenn pointed out. "Every resource the department has is here for undergraduates to use. There is much emphasis on individual projects, and most of the faculty conduct their research jointly with students."

Physics is not the only science in which Sonoma State is unusually popular. The 1977 figures showed the university second in the 19-campus system (after Humboldt State) in the percentage of geology majors and third (after CSU, Hayward and CSC, Bakersfield) in chemistry.

#### WHAT PHYSICISTS DO

Once again this fall, the "What Physicists Do" series offers Sonoma State physics students a weekly glimpse into the lives and work of a wide range of modern physicists and astronomers.

The series, now in its sixteenth season, features lectures, films, and demonstrations on topics as varied as "Computers and Robots", "The Brightness of Quasars", "Remote Air Pollution Measurements Using Lasers", and "An Energy Saving Light Bulb". The meetings take place each Monday afternoon at 4:00 in Darwin 108.

Of special interest this fall were lectures given by two Sonoma State physics graduates.

Robert P. Lucas, a 1976 graduate in both physics and chemistry, is now president of Solar Energy Engineering. Offering the first lecture of the season, Lucas spoke on the design, engineering, and manufacture of active solar heating systems. The presentation offered insights into the problems of balancing theoretical possibilities of solar design with practical limitations and consumer needs and expectations.

Later in the series, Lynn Hubbard discussed daily photochemical cycles and how they are affected by pollution. Hubbard is now a doctoral candidate at the University of California, Riverside and performs much of her work at the National Center for Atmospheric Research (NCAR) in Boulder, Colorado. Upon graduation from Sonoma State in 1975, she won a prestigious fellowship for summer research at NCAR and graduate study at the institution of her choice.

Dr. Iris Bloomer of the SSU department of Physics and Astronomy is slated to present one of the final lectures of the season on November 20. The lecture, titled, "The Influence of Matter on Geometry", will provide an introduction to the general theory of relativity.

On November 27, Dr. Frank S. Crawford of the University of California Lawrence Berkeley Laboratory will discuss the development of and measurements made with a telescope system which restores diffraction-limited performance to astronomical telescopes by correcting, in real time, the phase errors introduced by the turbulent atmosphere. The lecture is titled, "Looking at the Stars with a Rubber Mirror".

The final lecture in the series will be presented by Dr. Erwin L. Hahn of the University of California, Berkeley on December 4. Dr. Hahn will speak on the topic of "Entropy--Ebb and Flow of Chaos", experiments which bring order out of chaos.

The Spring series will also be on Monday afternoons at 4:00 in Darwin 108, from February 12 to May 14 excluding February 19 and April 9, when classes will not be in session.

Students attending the meetings can earn one unit of physics credit by writing a paper or presenting a lecture. Anyone interested in offering a lecture or presentation as part of the Spring series should contact Dr. Joe Tenn, the series' founder and director.

Coffee is served at 3:30 before each lecture.

#### STUDENT PROFILE: RONALD BLEAU

Two years ago, Ronald Bleau was among the first group of students to take Gordon Spear's new course in Astrophotography. A photographer since childhood, Ron had extensive darkroom experience which complemented the astronomical background of some of his classmates.

Not long afterward, Ron designed and constructed a 4x5-inch wide field astrocamera using less than \$25 worth of materials. He is responsible for a substantial number of the beautiful astronomical photographs which line the walls of Darwin Hall.

"I enjoy the psychological aspects of recording little dots of light on a piece of gelatin and making up stories about them," he says with his usual smile.

Ron came to Sonoma State to study psychology. He had worked on electronic display systems in the service and had been employed in aviation electronics. He had become deeply interested in the integration of visual information by the time he transferred here from Orange Coast College. He is also interested in visual displays, symbols, and environmental psychology.

Ron created the psychology department's course in psychological photography and has taught it three times.

Since that first course in astrophotography, Ron has taken a number of other courses in astronomy, and also some calculus and physics. In January, 1979, he will receive his B.A. with majors in both psychology and physics.

Last spring Ron took up flying. By the end of the summer he had logged one hundred hours, including a flight to Massachusetts and back, made with two friends in a single-engine plane.

"My whole emphasis," he states, "is visual information. I anticipate advances in microelectronics enabling individuals to acquire more information about their environments."

Ron wholeheartedly supports the concept of living in space. He intends to return to avionics and hopes someday to participate in the design and construction of space colonies.

STUDENT PROFILE: DAWN MCKINLEY

Dawn McKinley has long been interested in astronomy. By the time she graduated from Napa's Vintage High School last June, she had read most of the astronomy books in the library. She had also attended a number of lectures in the "What Physicists Do" series and Public Viewing Nights at the SSU Observatory.

Always a good student, especially in mathematics and science, she was one of fifteen students to enter Sonoma State this year with the coveted Sonoma Scholars at Entrance scholarship. She intends to earn a B.S. in Physics with an Astronomy minor.

Not surprisingly, she is taking two astronomy courses in her first semester here--Introductory Astronomy and the Introductory Astronomy Laboratory, both with Dr. Gordon Spear. Her most exciting time was when she stayed at the Observatory until 3:30 one morning, timing lunar occultations of stars in the Hyades with Miriam Carolin, Stephanie Snedden, and Dr. Spear.

When asked how she likes it here, Dawn replied, "I think the people at Sonoma State care more about students than those at other universities. I like the small class size and individual attention, and the opportunity to use the telescopes and computer."

A computer from her family home in Napa, Dawn spends her spare time disco dancing, hiking, and reading about astronomy.

THE CLASS OF 1978

Eleven students earned bachelor's degrees in physics at Sonoma State University in 1978. Like their predecessors, they are a successful lot.

Four were awarded the Bachelor of Science degree. Two of these are now working with computers, and two are in graduate school. Scott Anderson, who graduated in January with distinction, is in business in Cotati. He and two partners (Tim Fioto and Fred Weishaupt, both former students in the department) have formed Sonoma Softworks. They provide software and consultation to individuals and small businesses with microcomputers.

Dennis Goodrow, who also graduated with distinction in January, is happily employed as a scientific programmer at Research and Development Associates in Marina del Rey. He makes considerable use of his education, solving problems for a group of physicists. He writes that his co-workers are impressed with the amount of physics he learned at Sonoma State and that the programming course he took with Dr. Spear was quite comprehensive. He suggests that the department keep stressing computer programming.

The graduate school of business at the University of California, Berkeley, recently ranked sixth in the nation, is the new home of Ross Goodwin, who was awarded a B.S. with majors in physics and applied mathematics at SSU last June. Ross intends to become an executive with an electronics company after completing his M.B.A.

Bruce Odekirk decided to go on for a Ph.D. in physics after completing his B.S. He was offered assistantships at four graduate schools, and chose to accept a position as a research fellow in the department of applied physics and electronic science at the Oregon Graduate Center. The Portland institution offers close interaction between students and faculty in a small department somewhat similar to Sonoma State. Bruce started research in July, after making the move with an assist from fellow student Al Naudin. He writes that he is doing very well there.

Alan DeMers and Albert Plambeck earned B.A. degrees with the calculus option. Alan, who completed an interesting special studies project with a microcomputer in his last semester here, accepted a teaching assistantship in the physics department at the University of California, Santa Barbara. He is enrolled in the Master of Science in Instrumentation program recently described in *Physics Today* (Sept. 1978, p. 9). Bert, who graduated with a double major in physics and music, is currently traveling and relaxing before continuing his studies, probably in music. He is a pianist as well as a student of astrophysics.

The B.A. with the algebra option was the choice of Douglas Morris and Shelley Randall. Doug never left us; he is continuing to take courses in the department, strengthening his physics background before entering the job market.

Shelley is teaching chemistry and electronics at Cardinal Newman High School in Santa Rosa. She enjoys it very much and looks forward to returning to Sonoma State on a part-time basis to complete a second degree in chemistry (she is almost there) and a teaching credential.

The descriptive B.A. in physics is not intended to produce physicists, so it is not surprising that this year's graduates are entering other fields. Perhaps typical is Richard Hertz who combined a strong minor in political science with his B.A. in physics. Heavily involved in the use of computers in political campaigns, Richard is now a graduate student in politics at Sonoma State.

Another is Roy Harthorn who has set up his own business as a design consultant for alternative energy systems in Chico. Roy designs and builds small scale hydroelectric plants. He is also enrolled in a master's program in the department of industry and technology at California State University, Chico.

That leaves one. Where are you, Rob Doern?

STUDENT PROFILE: BARBARA CHRONISTER

If you happen one Saturday or Sunday to end up on the wrong side of the X-ray machine at Community Hospital, take a good look at the technician. Her name is Barbara Chronister and she is a senior physics student at Sonoma State. A resident of Novato, Barbara was born in Vancouver, Washington, but because her father was in the service, she has called a variety of places home. At one time or another Barbara has lived in Mannheim, Wurtzburg and Lampertheim, West Germany, as well as Yokohama, Japan.

Barbara graduated from high school in Novato and continued to wander between Santa Rosa, Sausalito, San Rafael and Northridge in the San Fernando Valley. She found her goal finally in a two-year X-ray technician program and has worked in that field since 1974. Last year she decided to return to school, but found it impossible to handle the load of both a full-time job and school, so she moved back in with her parents and began to work weekends at Community Hospital in Santa Rosa.

Goals for Barbara are still in the formative stage. She plans to receive her B.A. in physics at the end of the Fall '79 semester. If, however, she decides to go to graduate school, she will work toward receiving her B.S. in two years. She is looking seriously at the M.S. programs in environmental health at both U.C. Berkeley and Davis.

When she manages to find some spare time, Barbara may sometimes be seen peering at and photographing rocks, flowers or mushrooms through a macro-lense. She says it's preferable to broken bones any day.

On three occasions recently, the SSU Department of Physics and Astronomy was honored by mention in national publications.

In January, Dr. Joe S. Tenn presented a paper at the national meeting of the American Association of Physics Teachers. Titled, "Six Years' Experience with a Flexible B.A. Program in Physics", it described the rapid growth in the number of physics majors at Sonoma State since the introduction of the B.A. program in 1971. An abstract of the paper appeared in the AAPT Announcer in December, 1977.

For the second year the department published an Observatory Report in the Bulletin of the American Astronomical Society, (Vol. 10, No. 1, p. 313). Of the 65 Observatory Reports published in 1978, 21 were submitted by institutions devoted exclusively to research, 34 were from universities dedicated primarily to research and education at the Ph.D. level, four were from master's degree-granting institutions (Vanderbilt, Wesleyan, Victoria, and San Diego State) and only four were from undergraduate institutions (Swarthmore, Williams, Villanova, and Sonoma State). In addition, one was submitted by the Five Colleges Observatory, a consortium of four undergraduate colleges (Amherst, Hampshire, Mount Holyoke, and Smith) and one Ph.D.-granting university (University of Massachusetts-Amherst). The remaining one was from an observatory operated by a public school system.

Further recognition came in the spring with the publication of an article, "College Astronomy for Everyone", in the March-April 1978 issue of Mercury, the journal of the Astronomical Society of the Pacific. The article, by Dr. Tenn, described Sonoma State's extensive program in undergraduate astronomy, including both nonmathematical courses for the nonscience student curious about the universe and advanced courses in observational astronomy and astrophysics for the B.S. physics majors.

#### PUBLIC VIEWING NIGHTS POPULAR

Since its dedication by the President of the American Astronomical Society on April 22, 1976, the sliding roof observatory at the south end of the SSU football field has been open for public viewing monthly, except when clouds have forced cancellation.

Students who use the observatory regularly for projects involving stars and galaxies enjoy showing the moon, planets, star clusters, and nebulae to visitors of all ages. Paul Avellar, Miriam Carolin, John Dotta, Brett Morgan, and Stephanie Snedden are the ones most frequently found at the telescopes, while a professor, usually Gordon Spear or Joe Tenn, answers questions. The most difficult questions tend to come from ten-year-olds.

Crowds have grown from an average of 100-150 per night two years ago to 300 or more in recent months. The schedule for the rest of the academic year is as follows:

#### Friday Evenings

December 8, 1978	7:00 - 10:00	Jupiter, Orion nebula
January 26, 1979	7:00 - 10:00	Orion nebula, Jupiter
February 19, 1979	7:00 - 10:00	Jupiter, star clusters, Orion nebula
March 8, 1979	7:00 - 10:00	Mercury, Saturn, Moon
April 6, 1979	7:30 - 10:30	Moon, Saturn
May 18, 1979	9:00 - 11:00	Saturn, stars, galaxies
June 1, 1979	9:00 - 11:00	Moon, stars

Everyone is welcome at public viewing nights. There is no charge. Visitors may park inside the gate at the entrance to the football field. In case of last minute doubts about the weather, phone the observatory at (707) 664-2267. Call (707) 664-2119 during business hours if you have other questions.

#### IRIS BLOOMER JOINS DEPARTMENT

There is a newcomer in the department this year. Dr. Iris Bloomer is teaching Environmental Physics and two introductory laboratory courses this fall and is scheduled to teach Descriptive Relativity and Quantum Physics and the two labs in the spring.

A native of Philadelphia, Dr. Bloomer received her M.A. in physics from Temple University in 1973 after four years of undergraduate work. She then journeyed to England to earn her Ph.D. in 1976 from the University of London. That same year she travelled overland by car from London to Iran, making the entire trip in two weeks. She arrived in Berkeley in August 1977 as a Research Fellow in General Relativity.

Her doctoral thesis was published under the title, "Modifications to General Relativity Due to Torsion in Space Time". An article titled, "A Maximally Symmetric Space with Torsion" was accepted last January for publication in the journal, General Relativity and Gravitation. "My interest," says Iris, "is in Relativity. Relativity, according to Einstein, is full of singularities. The phenomenon of black holes, the beginning of the universe, the prediction that the universe will collapse are all examples of singularities. Can Einsteinian relativity be modified by introducing torsion? Implicit in Einsteinian relativity is the geometrical concept of curvature. Torsion, on the other hand, is generated by spin. What is the effect of torsion on singularities? Do we still have singularities if we introduce torsion into space time? It is possible, I believe, in certain circumstances to avoid singularities."

What does Iris do in lighter moments? She loves music ("any kind you can dance to"), good food (especially French and Iranian) and ballet.

Want to learn more? Then come to the "What Physicists Do" lecture series on Monday, November 20. The title of the talk will be, "The Influence of Matter on Geometry". Dr. Bloomer will present an introduction to the general theory of relativity.

#### ASP TO MEET AT SSU

The Astronomical Society of the Pacific (A.S.P.) will hold its 90th annual meeting at Sonoma State University June 13-15, 1979.

Since its founding in San Francisco in 1889, the A.S.P. has grown to include more than 5000 astronomy enthusiasts worldwide. Its aim, expressed by its founder, Edward Holden of the Lick Observatory, is "...to be popular in the best sense of the word. We wish to count in our membership every person who takes a genuine interest in Astronomy, whether he has made special studies in this direction or not..."

Annual meetings include something for every category of member: research papers for the professional, amateur contributions for those with telescopes in their backyards, and public lectures, often by world-famous astronomers such as Margaret Burbidge or Alan Sandage, for anyone with an interest in understanding the universe.

Students and faculty from Sonoma State have presented papers at two recent meetings, and several intend to present research results at the local one. Arrangements for the meeting are being made by Professors Gordon Spear and Joe Tenn. They will be seeking students to run slide projectors and provide other assistance.

High school teachers from throughout the United States have come to Sonoma State University the past two summers to take short courses titled, "Geothermal Energy and the Environment".

Dr. Richard Karas of the department of physics and astronomy has joined with professors Chris Kjeldsen of the biology department and Terry Wright of geology to present the course. Field trips to the nearby Geysers, the largest producing geothermal field in the world, have been highlights of the course. The physics portion of the course has included x-ray fluorescence measurements to determine the abundance of various air pollutants in the steam fields.

It appears likely that the course will be repeated in the summer of 1979, with a new group of teachers as students, and with Dr. Karas as the director.

#### SPECIAL STUDIES PROJECTS ARE POPULAR

This fall a Sonoma State physics student is designing and testing a spectrograph that will one day become part of the instrumentation of the University's observatory.

Another SSU physics student is researching the safety of radioactive smoke detectors.

Yet another student is studying orbital dynamics and intends to make observations of asteroids and then calculate the orbits of these objects.

These are but three of 18 SSU students now engaged in independent study projects under the auspices of the Department of Physics and Astronomy. All are enrolled in Physics 495 or Astronomy 495, the special studies classes open to physics majors and other interested SSU students.

To enroll in a 495 class a student needs only a proposed project, a suggested mode of evaluation and the approval of a member of the faculty. Often, a faculty member can suggest a special studies project in a student's area of general interest.

The professor now acting as advisor to the largest number of special study students in the department is Dr. Gordon Spear. The following seven students are working with Dr. Spear to complete a variety of projects.

Two students, Jim Mills and Stephanie Snedden, recently accompanied Dr. Spear on a visit to the Mount Laguna Observatory in Southern California. Their project is described elsewhere in these pages.

Paul Avellar is working on a two-phase study of orbital dynamics. First he will study methods of computing the orbits of astronomical objects, primarily asteroids. Then, he will compute the orbits of selected objects based upon observations of their positions.

Avellar is also working on a special studies project with Dr. Joe Tenn. He is identifying lines in the spectrum of Arcturus and will use the results to make a display for the lobby of Darwin Hall.

A scale model linear induction motor known as a "mass driver" is being constructed by Brett Morgan. It has been suggested that giant "mass drivers" may provide an economical means of launching shipments of mineral ore from mines on the moon's surface to orbiting space refineries. They would thus play a key role in the colonization of space.

Morgan is also designing and testing a grating spectroscope. This instrument, when complete, will become part of the equipment at Sonoma State Observatory. The SSU observatory has been weak in the area of spectroscopy and Morgan's spectrograph will be a valuable addition.

Ron Bleau is conducting research in photographic sensitometry. He is developing procedures to measure the characteristic light curves of various types of film used in astrophotography here at SSU. If the photometric response of a film is known, the brightness of an object can be determined from the density of the exposed and processed film.

Steve Hinch is developing computer programs for a procedure for reducing photometric data. Hinch's method will first be applied to data gathered here at Sonoma State. A group of students is monitoring the variations in brightness of the nuclei of a number of Seyfert galaxies. Regularly, throughout the year, members of the group will measure the thicknesses of photographic images of these galaxies with a microdensitometer. The algorithmic reduction procedure will then be applied to the microdensitometer measurements.

John Dotta is conducting a comparison of two photographic developers, D-76 and D-19. He hopes to determine their photosensitive qualities and suggest their best application in astrophotography.

Anthony Pearson, a special studies student working with Dr. John Dunning, is also studying the composition and response of photographic films.

A news story written by SSU Public Affairs Director Carl Jensen inspired Robert Bilodeau to study the safety of radioactive smoke detectors. Bilodeau is working with Dr. Joe Tenn.

Working with Dr. Duncan Poland, David Kelson is using a spectrum analyzer and simulated recording studio conditions to study the acoustics of recording studios.

Elissa Rubin, under the supervision of Dr. Isaac Bass, is performing work in the field of holography.

Not all of the students earning Physics 495 credit are physics majors. Dr. John Dunning is currently acting as advisor to two students who are studying x-ray fluorescence. Laurel Allen, a physics major, is examining the x-ray fluorescence of engine oil to determine the wear on motors. Alan Bramletter is an anthropology major. He is using x-ray fluorescence to study pottery samples and hopes to develop a technique which will enable him to isolate the sources of various pottery fragments. Mimi Favot and David Peterson are Environmental Studies majors working on special studies projects with Dr. Sam Greene. Mimi Favot is studying the physics and electronics of harnessing the energy in all forms of moving water. David Peterson is studying the physics of harnessing wind power.

At least three SSU physics professors are developing future special study projects for interested students.

The SSU physics and astronomy department will soon receive a new germanium gamma ray detector. When it arrives, Dr. John Dunning will be looking for students to calibrate the detector and to write an analysis program.

Special studies students could also assist Dr. George Johnston with a research project in plasma physics. The study will focus on a four wave instability in plasma and the results may provide an explanation for type-three solar radio bursts.

In addition, Dr. Richard Karas intends to travel to Greenland again next summer to resume his research, with University of California, Berkeley colleagues, on the aurora and the earth's magnetic field. He is likely to have projects for students working on instrumentation and data analysis and may once again be able to take a student with him.

Three times a week Keith Soreng goes out to the campus observatory at midday to photograph the sun. As a project for Astronomy 231 Introductory Observational Astronomy, he is learning the solar coordinate system and preparing to determine the sun's rotation rate from the motion of sunspots.

Keith likes astronomy--he is currently taking his third and fourth courses in the subject--but his primary objective is to complete a B.S. in physics. Now in his third year at Sonoma State, he is well on his way.

Someday he hopes to be an automotive engineer, designing and perhaps building his own cars or components. Currently, he buys and restores wrecked cars as a means of earning money. He also participates in drag races and slalom events in his bright red Volkswagen.

Last summer, in addition to his automotive work, he spent some time on campus, working on a spectrograph to be set up as part of the forthcoming science display area in the lobby of Darwin Hall. When finished, it will display the spectrum of the sun "live". It will be fed a beam of sunlight from the heliostat being built by Eric Reiter.

Keith commutes from his family home at Hamilton Field. He entered the university directly after graduating from high school in Palos Verdes.

#### SOCIETY OF PHYSICS STUDENTS MEETING SUCCESSFUL

The West Coast meeting of the Society of Physics Students (SPS) hosted by the SSC chapter on Saturday, April 15, 1978, was a great success.

Physics students and instructors from 13 colleges and universities attended. The total number of persons who attended is not known, but 122 registered. These included students and faculty from Eastern Oregon State College in La Grande, and from CSU, Long Beach, as well as a number from northern California institutions. The national director of SPS came from New York.

All were impressed by the four invited lectures by prominent scientists and by the short research papers presented by 12 students, five of them from Sonoma State.

Local speakers included Eric Reiter, who described the 17-foot wind turbine he constructed, and Mike Loken, who explained making holograms with a five-watt laser. Loken's talk was co-authored by art student Elissa Rubin and described work they did under the supervision of Dr. Isaac Bass.

Three SSC students described research they are performing in astronomy, a field in which Sonoma State is one of the most active undergraduate schools in the nation. Miriam Carolin spoke on the unusual star FG Sagittae. She described spectroscopic analysis she did with Dr. Joe Tenn and photographic photometry she is currently performing under the direction of Dr. Gordon Spear.

Paul Avellar described how he photographs and tracks asteroids with telescope, blink comparator, and computer. His work is also supervised by Dr. Spear.

A paper on photoelectric photometry of an eclipsing binary star was presented by Stephanie Snedden, Paul Avellar, Miriam Carolin, Jim Mills, and Tinka Ross. Stephanie described the research she and her collaborators are doing with Dr. Spear.

The visitors toured SSC's nuclear and laser laboratories and the computer center before enjoying a banquet in the residence halls dining room. As the last invited speaker finished his lecture on his discovery of the most distant galaxies known, the sky suddenly cleared, enabling a number of the visitors to go out to the college observatory for beautiful views of Jupiter, Saturn, and the moon.

The meeting was planned and presented by a group of hard-working students which included Paul Avellar, Roland Begin, Alex Busek, Miriam Carolin, Shelley Randall, Stephanie Snedden, and Frank Van Gieson. They and their chapter advisor, Dr. Tenn, were pleased by the success of the meeting. The national director called it one of the best he has attended.

#### PAUL GOODWIN NAMED CORPORATE HEAD

Paul A. Goodwin, a graduate of Santa Rosa Junior College and Sonoma State University, has been named president of the Earth Sciences Consulting and Technology Corp., ESCA-Tech, headquartered in Anchorage, Alaska.

Following graduation from SRJC in 1968, Goodwin did his upper division work at Sonoma State and graduated with a B.S. degree with "Distinction" in physics in 1971. He received his M.S. and Ph.D. in physics from the University of Alaska, in Fairbanks.

Looking back at his education at Sonoma State, Goodwin said, "For me, the education I received at Sonoma is becoming more valuable as time goes on."

"This is due to the fact that my SSU education did not concentrate or emphasize mechanistic abilities in physics and math so much as it emphasized a functional understanding and appreciation of the areas," he noted.

Prior to his appointment as president of ESCA-Tech, Goodwin, one of three of SSU's first ten physics graduates to have earned Ph.D.'s, was president and chief executive officer of the Fairbanks Native Association, Inc.; and research assistant, lecturer, instructor, and consultant to the University of Alaska.

A recipient of a variety of research fellowships and a visiting scientist to the National Center for Atmospheric Research, Goodwin has also presented and published a number of professional papers.

He also is a nominee for a presidential appointment to the National Advisory Council on Indian Education.

#### STUDENT PROFILE: ED MORRIS

At age 17, Ed Morris is a sophomore, with many of his junior level courses completed. In addition to the usual courses in mathematics, physics, and chemistry, he is studying two languages -- German and Sanskrit. Ed started Sanskrit at the University of Washington as a high school student in Seattle, and is continuing here under the direction of Dr. Roshni Rustomji of India Studies. He intends to read the Bhagavad-Gita in the original someday.

Once a reader of science fiction, Ed has a lingering interest in space research. For the immediate future however, his goals include a B.S. in physics followed by graduate school in physics or engineering.

Not one to spend all of his time on science, Ed plays racquetball and studies poetry. He is a "semi-avid" bicyclist and is considering buying a moped. He also plays the piano and is proficient at karate.

Ed says that his most memorable experience in a class occurred last spring when Dr. Barnebey presented Maxwell's equations and showed how they predict the existence of electromagnetic radiation.

How well do you know your instructors? Perhaps you would like to learn a little more about them. Here is a brief guide to the physics and astronomy faculty:

ISAAC BASS, Associate Professor

Born in California and raised in Texas, Isaac earned his B.S. in chemistry and mathematics at the University of California, Berkeley. From there he went to Columbia University, where he performed experiments in atomic physics for his doctorate. He spent five years at Stanford as a research physicist in low temperature physics before coming to Sonoma State in 1970. Here he has developed several laboratory courses, including Physics 316 and Gas Lasers and Holography. He is currently dreaming up new uses for the argon laser and its partner, the tunable dye laser. He served as department chairman from 1974-77. Isaac, Susan, and their two young sons live on an apple orchard in Sebastopol.

JOHN R. DUNNING, JR., Professor

A native of New York, John received his B.S. and M.S. at Yale before earning his Ph.D. in experimental high energy physics at Harvard. He stayed on at Harvard for three years of teaching and research. He came to Sonoma State College in 1968 and promptly switched from high energy physics to nuclear and environmental physics. He is interested in teaching students to detect trace quantities of pollutants and to make analyses with sophisticated equipment. John, whose favorite phrases are "hands-on equipment" and "state-of-the-art", can take credit for establishing three of the laboratories in the department: the mass spectrometer, for which he won a \$25,000 grant; the nuclear lab, heavily used for such techniques as neutron activation analysis each spring; and the x-ray lab, which is shared with the chemistry and geology departments. He has conducted research in geothermal energy and in coal gasification, and has spent some summers learning new nuclear techniques at the Los Alamos and Oak Ridge National Laboratories. Among his many accomplishments is the creation of an extremely popular Descriptive Physics course which has an environmental emphasis. Off campus, John flies a plane and folk dances. He lives in the country near Sebastopol.

SAMUEL L. GREENE, JR., Professor

Sam, who was once a Texan, did his undergraduate work at the Polytechnic Institute of Brooklyn and earned his Ph.D. in theoretical physics at Syracuse University. He came to California to work at the Lawrence Radiation Lab in the early 1960's. In 1966, he became one of the first members of the faculty of the physics department at Sonoma State. He immediately started building the astronomy program. The most versatile member of the department, he has taught at least 22 different astronomy and physics courses, and has initiated many of them. He is interested in just about everything, from theoretical astrophysics, particle physics, and cosmology, to paranormal phenomena and extraterrestrial life. He is willing to entertain and carefully consider any idea on almost any topic. He is currently developing the course Quantum Physics, Mind, and ESP. His summers are usually spent in mountain climbing, river running, or traveling around the world looking for evidence that the earth may have been visited by extraterrestrials.

GEORGE L. JOHNSTON, Associate Professor

After earning his B.S. in physics at Caltech, George entered Harvard Law School. He received his law degree and then went to work in the aerospace industry in his native southern California. After

a few years, he returned to school, this time in theoretical plasma physics at UCLA, where he earned his Ph.D. in 1967. He has been on the faculty here since 1969, and has specialized in upper division theoretical courses such as Electricity and Magnetism, Quantum Physics, and Mathematical Physics. He introduced Physics 301, The Relation of Physics to Society, and has taught it a number of times, critically examining the arms race and problems connected with disarmament, energy, and the environment from the unique perspective of a physicist-lawyer. He has also taught astronomy, including the upper division course in space and planetary physics. He is interested in the development of fusion, and conducted research in this field while on leave from 1975-78. His wife, Pat, teaches classics at Brandeis University. She is currently spending the year at the University of Southern California, so the Johnstons are only 400 miles apart!

RICHARD H. KARAS, Associate Professor

The chairman of the department is another Californian. He started his education at UCLA but earned all of his degrees at UC Berkeley. His doctorate was in atmospheric and space sciences

and was achieved with balloon-borne experiments to probe the earth's magnetosphere and the causes of the aurora. He has done research in Canada, Alaska, and Greenland, and spent a year as a post-doctoral researcher in Norway before returning to Berkeley. There he taught three years in the DIGS (Division of Interdisciplinary and General Studies) program and continued his research on the aurora. He also revamped some of the undergraduate laboratories in the Berkeley physics department and wrote lab manuals for them. He came to SSC in 1974 and quickly achieved great popularity in the Physics 210 General Physics course. He is proud that his students scored exceptionally high on the Medical College Aptitude Test. Rich teaches most of the electronics in the department and has taught the environmental physics course and the history of physical science. He is currently developing the new lecture and laboratory course, Digital Electronics. Rich and Sandy have built a house on Sonoma Mountain which overlooks the campus. In his spare time, Rich is a river runner and a hiker. He recently sold his glider and bought a sailboat.

DUNCAN E. POLAND, Professor

The senior member of the department is now serving his second three-year term as chairman of the Division of Natural Sciences. For the past year he has also been the university's budget advisor. This makes him an administrator most of the time, but he manages to teach one or two physics courses each semester and to supervise a few students in independent study projects in electronics. The only midwesterner in the department, he earned his bachelor's degree at the University of Michigan and his Ph.D. in physical chemistry at Wisconsin. He was awarded a National Bureau of Standards fellowship for two years of postdoctoral research in Washington, D.C. He came to Sonoma State College in 1965, when the physics department was just being established. A specialist in solid state physics, Duncan is one of the department's electronics experts. He created all of the electronics courses in the catalog and is especially proud of People's Electronics, a course designed for people with no background in science. If you are curious about the strange looking antenna on the roof of Darwin Hall, ask Duncan about it. He has had several generations of independent study students building a radio telescope, and is about ready to have some more students work on it. He lives in Santa Rosa with his wife, Marion, and their two teenagers.



The Director of the Campus Observatory earned his bachelor's and doctoral degrees in astronomy at the University of Pennsylvania, in his native Philadelphia. The research for his Ph.D. was conducted at Mt. John Observatory in New Zealand, where Gordon was one-half the staff of the isolated observatory for nine months. While a graduate student, he taught astronomy, physics, and meteorology at a nearby college. Afterward, he moved to Houston for research at the NASA Johnston Space Center and some teaching at the University of Houston. There he analyzed ultraviolet stellar spectra obtained from various spacecraft and sailed his boat on the Gulf of Mexico. He came to Sonoma State in 1974 but returned to Houston the first two summers to continue his work with the astrophysics group at Johnston Space Center and to resume sailing on the Gulf of Mexico. His boat has traveled more miles across deserts than on water. He combines his vocation and avocation in the popular course in celestial navigation. He teaches all three laboratory courses in astronomy and many of the lecture courses. Interested in every aspect of astronomy, he also established the course on the U.F.O. phenomenon. In this course he often finds students who do not consider themselves scientifically inclined, but he soon has them making statistical analyses of sightings, often with one of his favorite instruments, the computer. Gordon is on campus nearly every night, but his wife, Barbara, does not mind. She is usually in Darwin Hall, helping to direct the Sonoma Film Institute. The Spears live in Rohnert Park.

#### JOE S. TENN, Associate Professor

Another southern Californian, Joe did his undergraduate work at Stanford University. Upon graduation, he joined the Peace Corps and was a member of the first group of volunteers to go to Ethiopia. For two years he taught math and physics to tenth graders in Addis Ababa, where he and the other volunteers were welcomed by Emperor Haile Selassie. From Ethiopia, Joe went to Seattle where he studied low temperature physics at the University of Washington. His dissertation was on the theory of neutron scattering from liquid helium. Joe came to Sonoma State immediately after completing work for his Ph.D. in 1970. Here his interests have gradually shifted so that he now teaches more astronomy than physics. He initiated the courses Frontiers in Astronomy and Discovering the Galaxies, and he has taught the upper division courses in astrophysics three times. He has taken two courses in astrophysics and has spent three summers on research in stellar spectroscopy at the Lick Observatory since coming to SSU. He founded the "What Physicists Do" lecture series and this newsletter. For several years, he has been the advisor for all physics majors. Joe and his wife, Eileen, live in Santa Rosa with their two young children.

#### NAME CHANGE OFFICIAL

In September 1978, Sonoma State College officially became Sonoma State University.

Founded in 1960 as the 16th state college in California, the institution was known as Sonoma State College until 1972 when the California State University and College system changed the names of the 14 larger campuses in the system to California State Universities and the five smaller schools, including Sonoma, to California State Colleges.

California State College, Sonoma was a name that pleased no one, least of all the post office workers in Sonoma who found themselves inundated with mail for the campus twenty miles away.

After four years of effort by everyone at the college, especially the alumni association, the name of Sonoma State College was restored in 1976.

Now the campus has grown to the point where it meets all of the criteria established by the CSUC for university status. These include such items as size of graduate programs, credentials of faculty, and accreditation by national societies.

The new official name, Sonoma State University, should be permanent.

#### MY SUMMER AT SLAC

by  
Mary Silber

Over the summer I worked at the Stanford Linear Accelerator Center. SLAC is billed as the world's most energetic electron accelerator, up to 24 billion electron volts. The accelerator appears two miles long to nonrelativistic humans, although it's a journey of less than a meter to the electrons which travel it at nearly the speed of light.

I was at SLAC as a participant in their "Summer Science Program". This is an affirmative action program which brings thirty undergraduate science students to the accelerator center each summer. The students come from all over the United States and are placed in a variety of research and technical groups based on their interests and backgrounds.

I settled into the Spectrometer Facilities Group whose duty is maintaining a couple of magnetic spectrometers used in analyzing the momenta of particles. These spectrometers are quite huge; they're housed in a building about as large as a commercial aviation hanger.

My supervisor, a high energy physicist (who indeed lives up to the appellation), likes to run experiments as well as climb mountains and coordinate the Spectrometer Facilities Group. He is one of the spokesmen for an experiment completed last May in which a parity violation was observed in electron-proton interactions. This can be oversimplified to mean that the protons of the deuterium target prefer left-spinning electrons to right-spinning ones (spin is a quantum mechanical concept bearing only a mathematical relationship to physical spin). This result is significant because it's predicted by theories which unify the weak and electromagnetic interactions as two aspects of the same force. It so happens that the experimental results are exactly as predicted by the earliest version of this unification theory, the one that's considered the simplest and therefore the most elegant.

A tunable dye laser was used in the parity violation experiment. This is where I come into the story. I spent about half of my ten weeks at SLAC reading about lasers, and the rest of the time I actually worked with a couple of lasers built by my group for their experiment. There was also a lecture series which I attended daily, and on Fridays we usually went on field trips to various research and industrial laboratories in the Bay Area. At the end of the summer there was a two day seminar in which each of the summer science students gave a talk and submitted a paper.

I had a very nice summer playing research scientist. They gave me some computer memory, a white lab coat, an office, a laboratory and a key to the place. I even drank some beer with the regular physicists.

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