The Physics Major

Published by the Department of Physics and Astronomy, Sonoma State College. No. 2, October 1975

NUMBER OF PHYSICS GRADUATES GROWING RAPIDLY

The number of physics majors has more than tripled at Sonoma State in the past four years, while the number of graduates has grown even more.

This year saw the largest number of graduates to date, as can be seen by the following table:

Year	BS	BA-A	BA-B	BA-C	Total
1967	1*				1
1969	3*				3
1970	1*				1
1971	5			1	6
1972	3			1	4
1973			1	3	4
1974	5	3	~~3~~ 2	~~8~~ 6	16
1975	6	4	1	7	18
	~~24~~	~~7~~	~~8~~ 4	~~17~~ 18	~~53~~

*The degree offered from 1967-70 was actually called a B.A. It was essentially identical to the B.S. of recent years.

It is obvious that the popularity of the physics major has increased since the introduction of the B.A. program in 1971. One of the most innovative programs in the nation, the B.A. has appeal for a greater variety of people than the B.S.

For those who have not looked in the catalog lately, the B.A. is offered with three different options.

Option A is purely descriptive, presenting a view of what is happening in physics and astronomy without mathematics. It does not prepare the graduate for any specific job. Thus it is not surprising that all four 1975 graduates had double majors. Two combined physics with psychology, one with management, and the other had a special major in liberal arts and sciences.

Their interests are in paranormal phenomena, theology, business, and law, respectively.

Option B makes use of algebra and trigonometry. Graduates to date have been interested in environmental work, professional schools, and non-technical industry.

Option C is the calculus option. Its students take many of the same courses as the B.S. majors. They have the flexibility, however, to omit those courses which are not relevant to their specific goals.

NEW ASTRONOMY EQUIPMENT ARRIVES

by Steve Alexander

Suppose you want to measure the fluctuations in light intensity of some interesting celestial object, the period of a variable star or an eclipsing binary, maybe even an asteroid or (heavens!) a quasar. To know why you might want to do this you'll have to take an astronomy class; let's just suppose you do.

First, you need a nice fat telescope to gather the light. We've got two, a new 14-in Celestron (Schmidt-Cassegrain) reflector and our older (2 yrs) Celestron 10. Both are large enough for this kind of photometric work. The "14" is even large enough for spectroscopy of brighter objects.

Next, you need an observatory in a quiet dark spot where you can take long vibrationless looks at your object. We've got one, almost. Out in the corner of the football field construction of a concrete block building with a roll-off roof is soon to be undertaken by Plan Operations. The concrete floor and the telescope mounts are already in place.

Finally, you need a system to measure the light. Two systems exist; we've got one and are getting the other. Prof. Spear and student John Gregg are currently preparing the photoelectric photometer (essentially a photo multiplier mounted at the focus of the telescope) that we've had for some time for use on the Celestrons. Purchased and on the way is an optical densitometer, a device for measuring the size and density of a photographic image on film.

So now you're set up for photometry. What else do you want? Pictures of those bautiful nebulae, star clusters, galaxies, planets? Gotcha covered. We've also purchased a Celestron 8-in Schmidt Camera.

Impetus for the acquisition of the new equipment comes from our resident astronomer, (photometry is his specialty) Dr. Spear and from such bulwarks of the Astronomy Dept. as Drs. Tenn, Johnston & Greene.

The pads and piers were built with an NSF Grant obtained in 1973 by Drs. Tenn and Johnston. Planning and design of the observatory was aided in no small part by the diligent efforts of physics seniors Steve Alexander.

(NOTE: All of this equipment will be used in Astronomy 482 this spring)

B.A. students of all three options must choose 12 units in an "area of concentration" outside their major. Fields chosen to date have ranged from French and philosophy to math and chemistry.

The B.S. program, with its long list of rigorous courses in physics and mathematics, remains the choice of those who wish to attend graduate school in physics, astronomy, and closely related fields or to gain the more technical jobs. Its graduates have an excellent record of winning graduate assistantships and fellowships.

All 53 grads were sent a questionnaire this summer by department advisor Joe Tenn. More than a fourth have replied as this is written. Information and quotations from these questionnaires will be found elsewhere in this newsletter. It is hoped that next year's newsletter will contain information about the others.

JOHN PROUD received his B.A. (calculus option) in 1973. He stayed on campus for a year to earn a secondary teaching credential. During this period he started the popular course on celestial navigation which is now taught by Dr. Spear. John is currently in Hawaii, teaching mathematics and astronomy at Seabury Hall, a prep school.

JOHNSTON TO MIT FOR YEAR

A familiar face is missing from the department this year. Dr. George Johnston has taken a year's leave to work full time on his research in theoretical plasma physics. His work, at the Research Laboratory of Electronics, Massachusetts Institute of Technology, deals with some of the plasma instability problems which must be solved if magnetically contained thermonuclear fusion devices are to work.

DR. BARNEBEY WRITING TEXT

A text on Statistical Physics is presently being written by Dr. Tom Barnebey of the Physics and Astronomy Dept. The book is based on a course Physics 450, which Tom has taught twice, and which he is planning to teach again in the Spring. The text will introduce junior and senior physics students to statistical concepts, and to their applications in theoretical physics. Rough, preliminary versions of some of the chapters will be distributed as lecture notes in Physics 450 during the Spring Semester, and constructive criticisms will be solicited from the students.

Statistical physics provides an essential theoretical link between the fundamental laws of nature, which physicists describe in terms of interactions between small numbers of particles, and the phenomena observed in the real world, which always involve particles in vast numbers. Remarkably, this important and widely applicable subject may be developed from very few basic principles, and Tom hopes to make this fact clear in the book.

Another project in which Tom has an interest combines statistical physics with particle theory, the subject of Tom's Ph.D. thesis. The question under investigation is: Can the quantum mechanical laws obeyed by all elementary particles be explained by a statistical model of particle interactions? An experiment to test this idea may be possible, and any students interested in participating should contact Tom Barnebey in Darwin 331.

SPS CHAPTER FORMED

This year is the first year of life for the California State College, Sonoma Chapter of the Society of Physics Students. If SPS is to become a really worthwhile organization it needs a larger membership. SPS is a member organization of the American Institute of Physics. Members of SPS receive Physics Today, the publication sent to all members of AIP Member Socities. They may subscribe at special "member" rates to AIP journals including: Applied Physics Letters, Journal of Applied Physics, Journal of Mathematical Physics, The Physics of Fluids, The Review of Scientific Instruments. All services of the AIP, including placement service, are available to members of the Society of Physics Students.

Chapter meetings can provide an opportunity for discussions on the relations of science to other fields, e.g. political science, art, music, etc. The only limitation is your imagination. Students interested in joining should attend an SPS meeting, or contact Rick DeFreez, Peter Parker, or Peter Conwell, or see Dr. Tenn, Chapter advisor.

NEW COURSES THIS SPRING

Several courses which have not been offered recently will be offered this spring. These include two laboratories, Physics 333 Precision Machining for Experimental Physics and Astronomy 482 Observational Astronomy.

The machining course, very popular the last time it was offered, will be taught by an expert machinist from outside the department. It is acceptable as one of the two advanced lab courses required for the B.S. and is also a popular elective for B.A. students.

Astronomy 482 is a new advanced course to be taught by Dr. Gordon Spear. It is aimed primarily at B.S. physics majors but is open to others who have the necessary background in physics and astronomy. Much new equipment, described elsewhere in this newsletter, will be used for experiments in photometry, photography, and spectroscopy. Interested students should see Dr. Spear.

Dr. Tom Barnebey intends to offer an advanced theoretical course in Field Theory. Students who have completed one semester each of upper division mechanics, electricity and magnetism, and quantum mechanics should register for Physics 396.

Three non-calculus courses are expecially suitable for upper division B.A. majors, although B.S. students and others are welcome. They are Astronomy 396 Discovering the Galaxies, Physics 342 Popular Optics, and Physics 405 Physics of Structures.

The two-unit special topic course in astronomy, to be taught by Dr. Joe Tenn, will deal with discoveries in astronomy in the early part of this century. In 1900 most astronomers thought that the solar system was located at the center of the Milky Way Galaxy and that the Galaxy was the universe. By 1930 it was known that we were situated on the outer edge of one of millions of galaxies, and that all of these galaxies were moving apart. Students will read and discuss the 1920 "Great Debate" on the scale of the universe, as well as letters, articles, and newspaper articles from the period.

Dick Gordon will take over Popular Optics, which features lasers, holograms, lenses, mirrors, cameras, and telescopes, among other **interesting** optical devices. Like the two courses above, its only prerequisite is one course in physics or astronomy.

Physics 405 Physics of Experimental Structures and Devices will be offered by Doug Greene this spring. He plans a number of field trips in which students will visit unusual structures and talk with their builders. Students will also be encouraged to build their own experimental devices, such as solar energy systems.

DR. SAM GREENE TO TAKE SABBATICAL

Next SPS meeting will be October 17 at 12:00 p.m. in Darwin 343.

PAUL GOODWIN earned his B.S. in physics with distinction in 1971. Since then he has been at the Geophysical Institute of the University of Alaska. He earned his master's degree in 1974,and expects to complete his Ph.D. in theoretical atmospheric physics and auroral physics in May 1976.

Currently he is working half time in the college of arts and sciences of the University of Alaska, teaching philosophy (of science) and physics.

Paul has been a visiting scientist at the National Center for Atmospheric Research in Colorado for three summers. He also finds time to lecture on cross cultural education in sciences.

Of his education here Paul writes, "The education that I recieved in physics while at CSCS was, in my opinion, the best obtainable."

Dr. Sam Greene of the Physics and Astronomy Department will be taking a sabbatical leave this spring in order to do research and investigation in two areas of study that are undergoing a popularity boom among people from varied educational backgrounds.

Dr. Greene, who has done work in Cosmology, Elementary Particles, Statistical Mechanics, Parapsychology and the Physics of Consciousness, will be devoting part of his sabbatical time to doing research in Cosmology in Amsterdam and Vienna. He specifically intends to explore the possibilities that may exist for time travel through the use of black holes. The rest of his time will be spent in visiting the ancient ruins of the Middle East to look for evidence of extraterrestrial influences on those past civilizations.

Dr. Greene hopes to share the information he gathers on his sabbatical in a number of ways when he returns to Sonoma next September. He intends to include the results of his investigations in courses on Cosmology and Extraterrestrial Intelligence. He also plans to present a series of lectures or publish a paper on the results of his cosmological research.

GRADUATE RECORD EXAM IMPORTANT

Students planning to enter graduate school in physics, astronomy, or related fields will probably need to take the Graduate Record Exam (GRE). Many graduate departments require scores on the aptitude or the advanced test in physics. Those which do not require the tests often recommend that they be taken, particularly by applicants from smaller colleges.

A high score on one of these tests can be helpful in gaining admission and financial assistance at one of the more select graduate schools. Even a low score can be helpful, in that it may direct the student to apply to a graduate program with a more open admissions policy.

One advantage of the more select shools is that they usually offer assistantships to nearly all the students admitted. Teaching assistants generally do better in their graduate work than non-assistants. They finish no later.

The GRE is a high-speed, multiple-choice, machine graded exam. It is offered several times a year by the Educational Testing Service (ETS). The aptitude test is given on a Saturday morning, the advanced tests that afternoon.

A large number of graduate departments require that all application materials be submitted by some time in February. In order for your score to be available by January 29, 1976 you will have to take the Dec. 13, 1975 exam. If the graduate departments to which you are applying have later closing dates, you may be able to take the Jan. 10. 1976 exam.

Note that in many cases you will have to apply to a department for an assistantship and to a registrar or graduate school for admission. The latter may have a late deadline, but the department is likely to hand out the dollars in February or March.

The Dec. 13 date is a bit inconvenient. It is the weekend before final exams start at Sonoma State, and the nearest place to take the GRE is 50 miles away. The exam will be given at the U. of S.F., at S.F. State Univ., and at U.C. Berkeley. THE DEADLINE FOR THE RECEIPT OF YOUR APPLICATION TO TAKE THE EXAM IS NOV. 12. Your application must reach the ETS in Berkeley by that date. The fee is $10.50 per exam. For an extra $4. late fee you can submit your application up to one week later.

If all of the departments to which you are applying can wait for your score until Feb. 12, 1976, you are in luck. Not only can you take the exam on Jan. 10, in the middle of semester break, but you can take it right here on the Sonoma State campus. THE DEADLINE FOR THE RECEIPT OF YOUR APPLICATION TO TAKE THIS EXAM IS DEC. 9. Again, you can apply up to one week late for a $4. late fee.

Applications may be obtained at the Testing Services Office in the Field House, or you can write to Educational Testing Service, Box 1502, Berkeley, Ca 94701.

DUNNING WORKS ON COAL RESEARCH

Can our vast reserves of coal be converted into "unnatural gas" which can then be shipped through the nation's network of pipelines and burned as a clean fuel? Dr. John Dunning worked on this problem this summer with scientists in the Columbia University chemical engineering department. Efforts have been made to develop a coal gasification proeessor that would operate at 80 to 90% efficiency.

Dr. Dunning remains very interested in teaching students the techniques necessary to detect and measure pollutants in the environment. This fall his students in Physics 355 Environmental Physics Laboratory are doing x-ray fluorescence and mass spectrometry, while in the spring his Physics 482 Applied Nuclear Physics and Chemistry Laboratory class will work on neutron activation analysis and other nuclear methods.

ROBERT PORTER earned his B.S. in Physics in 1971. He has remained with the department as a half-time electronics technician. In addition he has taught occasional courses in electronics and the physics of music, has earned an M.A. in psychology, and has pursued research on the effects of electromagnetic fields on people.

SOLAR ENERGY FUNDED AT CSCS
by John Nelson

"Solar refrigeration? But I thought the sun was hot!"

The above quote was a remark often heard by us (from non-physics students, of course) after telling people about the project we worked on this summer.

Doug Hayes submitted a successful proposal to the NSF for funding to build a solar powered refrigeration system. Doug, Roy Harthorn, Mike Ingertson, David Kageyama and I spent the summer working on it.

Our major effort and the main objective stated in the grant proposal was to develop a workable optical transmission system as a means of transfering energy from the collector to the refrigeration unit itself. Recent developments seemed to make fiber optics ideal as a transmission medium, but unfortunately a six-figure price tag for the amount we needed deterred us from using it. After other considerations we decided to build a thermal transmission system using heat pipes.

The Servel absorption refrigerator we used, which is normally propane powered, is an old idea in refrigeration, and many were built in the 1930's and 1940's. Hopefully, its conversion to solar power could easily be achieved by the backyard mechanic with readily available materials.

Overall, it was a very worthwhile summer for all of us. We not only had a chance to learn some applied science, but we also gained experience in dealing with business and bureaucracies. All should be encouraged by the availability of funds from the NSF for such student originated projects.

DONALD NEMEC received his B.A. (descriptive option) in June 1975. He also earned a B.A. in psychology. He is now enrolled in the Ph. D. program of the Humanistic Psychology Institute, San Francisco. He intends to pursue research in paranormal phenomena.

According to Don, "The Sonoma State Physics Dept. is far ahead of most state school physics depts., because it is open minded enough to offer courses in areas beyond the normal trend of physics."

It sure beat working in the vineyards.

Everyone is invited to share our experiences at the "What Physicists Do" lecture on October 14 at 4:00 p.m.

PHYSICS 354- ENVIRONMENTAL PROBLEMS IN PHYSICS
by Dr. Richard Karas

This course should really be called "Energy and the Environment," since its main concern is the environmental effects of energy production and consumption. I like to begin with a working introduction to the first and second laws of thermodynamics and their application to heat engines. An understanding of these allows the study of nuclear (fission and fusion), fossil fueled and geothermal electricity production as well as alternative energy sources (wind, solar power). Gasoline, diesel and steam engines also appear here. With all these devices consuming resouces at an ever-increasing rate, it's useful to learn how the life expectancy of each energy source is estimated. A fairly simple model gives good answers, and the model is covered in class, with sample problems to try at home.

The second half of the class is spent looking at the effects of energy production. In particular, I try to cover atmospheric processes affecting the dispersal of air pollutants, and the problems associated with radioactive wastes, thermal pollution (both in water and air), and if time permits, noise pollution. Brief descriptions of measurement techniques are also included, where possible.

Come join the class next year. If you'll pardon the pun - "pollution is a gas."

SEE YOUR ADVISOR; GET ADVISED

Have you seen your advisor lately? If you are a physics major, your advisor is Dr. Joe Tenn. Dr. Tenn recently moved up out of his dungeon and into Trailer 3A. His phone number there is 664-2594.

It is lonely out there in the trailers, and your advisor would like to see you. He has your file, the most up-to date list of requirements for graduation, information on new courses to be offered, and a variety of other materials.

For example, he has a tremendous file of posters, brochures, and letters from graduate schools in physics, astronomy, applied science, atmospheric physics, geophysics, biophysics, and other fields, all anxious for students. Many offer assistantships and fellowships.

Information regarding employment opportunities, national fellowships, and the graduate record exam can also be found in the air conditioned trailer.

Remember, to avoid cavities in your graduation application, see your advisor twice a year.

STEVE WILLIAMSON earned a B.A. (calculus option) at Sonoma State in 1973. From here he went to UCLA, where he earned a Master of Arts in Teaching degree in physics, and also a secondary teaching credential.

Steve is now back in this area, teaching physics part time at the College of San Mateo and leading a Psychology 200 discussion section at Sonoma State.

DEPARTMENT SPONSORS WHAT PHYSICISTS DO SERIES

For the tenth consecutive semester the department of physics and astronomy is presenting a weekly series of lectures and demonstrations for its majors and others.

When the time comes to decide what you want to be when you grow up, you will be better informed of the many fields open to you if you have regularly attended the series.

Presented each Tuesday at 4 p.m. in Darwin 108, the lectures do not require much background in physics, yet are usually of interest to seniors and faculty as well as new physics majors.

Headlining the list of speakers this semester are Dr. Halton Arp of the Hale Observatories and Dr. Bruce Bolt of the University of California, Berkeley.

Dr. Arp, a regular user of the 200-inch telescope at Mt. Palomar, has been at the center of the controversy over quasars. While most astronomers and cosmologists believe them to be the most distant objects known, Dr. Arp has obtained pictures which appear to show some quasars connected to relatively nearby galaxies. On Nov. 25, Sonoma State students will have the opportunity to view these famous pictures and decide for themselves.

Dr. Bolt, a prominent geophysicist and an expert on seismology, served as president of the Seismological Society of America in 1974-75. He has been a visiting lecturer in the United Kingdom, Japan, Australia, and the People's Republic of China. He will speak Oct. 28 on predicting earthquakes and what to do about them.

Other speakers this semester will discuss solar refrigeration, cosmology, physics and consciousness, new discoveries in particle physics, air pollution, and the earth's magnetosphere. See the brilliant orange posters for details.

BALLOONING IN GREENLAND
by Pete Conwell

This summer Dr. Richard Karas and I joined the University of California, Berkeley and University of Denver's space physics groups in an expedition to Sondrestrom, Greenland. We measured the x-rays caused by the de-acceleration of high energy electrons as they collide with air molecules in the upper atmosphere with sixty foot high helium filled balloons. It is these x-rays and electrons which we believe are responsible for the Aurora Borealis.

Our real concern was where these electrons come from, why they occur when they do, and why they appear only in certain geographical regions here on the earth. It is clear from previous research that part of the answer lies in understanding the process by which the solar wind (photons, protons, electrons, and other subatomic particles streaming from the sun) interacts with the earth's magnetic field to form the magnetosphere. A simplified picture of this process is not unlike the streamlines formed by the air flowing around a spinning baseball if one imagines the flowing air as being the solar wind and the baseball as the earth.

Sometimes in the course of experimental research physicists accidently are in the right place at the right time to witness nature do "its thing". We were very fortunate to have this happen to us. When one of our balloons was up, the sun emitted a solar flare. Large fluxes of very high energy photons and highly relativistic protons reached our detectors. Very few measurements of this kind have been recorded at these latitudes.

Fortunately the process of deciphering the data recorded on this flare will be simplified greatly by a data reduction system designed and built this summer by Joe Fraser and Milt Enderlin. The information will first be coded onto paper tape, then fed into our computer for analysis.

In the days ahead Rich, Joe, Milt, and I will certainly be busy talking to the computer, digging into old research articles and preparing for Greenland '76.

(NOTE: Pete will give an illustrated lecture on his summer adventures in the "What Physicists Do" series December 2)

DR. SPEAR ENGAGED IN ASTRONOMICAL RESEARCH

Dr. Gordon Spear spent the summer at the NASA Lyndon B. Johnson Space center in Houston working on stellar spectral analysis in conjunction with a project undertaken by Skylab.

Skylab astronauts obtained spectra of many early-type (hot) stars in the far ultraviolet wavelengths 1200 to 4000 A. At the same time the 84-inch telescope at Kitt Peak National Observatory was used to obtain ground-based spectra of the same stars in the visible region to nearly 5000 A.

During thesummer Dr. Spear made a preliminary survey of the ground-based data - identifying the lines and establishing equivalent line widths for comparison with theoretical calculations of line strengths for single stars.

The plan is to compare the Kitt Peak observations with the Skylab data to provide a form of "ground-truth" and to extend the wavelength coverage of certain objects. Many of the ground-based spectra are of peculiar objects or are variable in either spectral characteristics or over-all energy output. Ground-based observations will he used to attempt to explain certain features in the ultraviolet spectra.

Some of Dr. Spear's tracings are of spectroscopic binaries. Line widths will be measured to detect the presence of the unseen companions. Information is being sought to determine some of the physical characteristics of the companions and to observe any differences between them and the main components of the systems.

Two of the spectra obtained last summer are of shell stars. These shells, which concentrate about the equatorial regions of the stars, are not planetary nebula nor were they produced by the same mechanism which produces planetaries. Much data exists to be studied and analyzed in an effort to determine the origin of the shells, the differences in chemical abundances of the shells and of the stars, and to identify shell features.

ROBERT STEELE was the department's fifth graduate, earning the old B.A. degree (equivalent to today's B.S.) in 1970. A double major in math and physics, he stayed for a year of graduate work in math, then entered the University of California, Santa Barbara, where he earned his M.A. in physics and is now well on his way to a Ph.D. He is working in molecular spectroscopy.

Bob writes, "Sonoma State gave me a solid foundation of basic physical concepts."

LYNN HUBBARD WINS NATIONAL FELLOWSHIP

Each year the National Center for Atmospheric Research grants eight fellowships for graduate work in atmospheric science. They may be used at any university in the nation. Four of the eight are usually renewals for a second year.

Of the 1975 winners, the only one from California was Lynn Hubbard of this department. Along with the other NCAR Fellows, she spent the summer doing research at NCAR in Boulder, Colorado.

Lynn has just begun her graduate work in the physics department at the University of California, Riverside. She turned down offers of assistantships at three other universities.

Lynn intends to work on the transport of pollutants in the atmosphere. She credits Dr. Richard Karas with getting her involved with atmospheric work.

R. GARY WONG received his B.A. (algebra option) in June 1975. He is back on campus this fall, taking more courses preparatory to applying to college of optometry.

Gary writes that what he found best about Sonoma State was "The freedom to expand in areas of interest to me through the independent studies program, associating with instructors who really like what they are doing and get their students to share this."

Detailed analysis of several of the ground-based spectra are waiting to be made.

Dr. Gordon Spear and his colleagues in Houston are planning additional projects of astronomical research. The group is applying for time on the 4 meter telescope at Cerro Tololo Observatory in Chile. They hope to detect main sequence stars in the Large and Small Magellanic Clouds. Such stars have never been observed. Dr. Spear would like to discover their relative frequency and their chemical composition, and compare them with main sequences stars in our own galaxy to determine similarities and differences in metal abundances. An electrographic detector, which obtains better resolution and more meaningful colors, will be used.

A second research project involves the photometry of variable stars or clusters. For this Dr. Spear will write a proposal for the study of B-emission stars, using the 24-inch telescope of the San Diego State University Observatory. Dr. Spear would like to have a student write the proposal with him and accompany him to the observatory to assist in making the observations. Anyone interested in either project may contact him in his office, Darwin 332A.

HENRY HOPPE received his B.A. (~~algebra~~ calculus option) in January 1974. He is happily employed by the Marin French Cheese Company in Petaluma in a position which does not involve physics. He writes of his studies here, "The most beneficial aspect was the training to approach a problem or situation in a logical and systematic manner."

FRED ARIOLI earned his B.S. in June 1975. He has just entered graduate school in geophysics at the University of California, Berkeley.

Fred found the "small classes, professors usually available for help, informal atmosphere, excellent library of references" to be the most beneficial aspects of studying physics at Sonoma State.

GREG SEEGER received his B.S. with distinction in 1974. After working as a micro-processor programmer in Southern California, he recently returned to this area to teach junior and senior high school science at the Rincon Valley Christian School in Santa Rosa.

BARBARA GREENE received her B.A. in physics and mathematics in January 1975. She has worked at the Lawrence Berkeley Laboratory, and is currently teaching an extension course on campus on the physics of experimental structures and devices. She has been admitted to the new doctoral program of the Energy and Resources Group of the University of California, Berkeley.

FELLOWSHIPS AVAILABLE

Students interested in applying for national fellowships for graduate study beginning in 1976 should contact Dr. Tenn as soon as possible. He has information regarding NSF, NCAR, Danforth, and other fellowships.

DICK GORDON JOINS DEPARTMENT

The newest man about the department is Richard H. Gordon, who is substituting this year for Dr. George Johnston who is on leave.

A native New Yorker, Dick received his undergraduate degree from Harvard University. He is presently working toward his doctoral degree at UC Berkeley and hopes to complete his dissertation this fall.

Dick's main interest is in theoretical astrophysics, and he makes an interesting distinction between astrophysics and astronomy: "Astronomy is looking through telescopes, and astrophysics is physics!"

Richard's thesis topic concerns the acceleration of clouds near QSO's by radiation pressure. He is the author of an article, "Acceleration of Isolated Atoms by Radiative Pressure", which appeared in Astrophysics and Space Science.

Dick would like to continue teaching after he receives his Ph.D. He would be interested in assisting students with their own short-term theoretical projects with special emphasis on astrophysical subjects. His office is located in Darwin 328.

Richard enjoys ice skating, hiking and backpacking. He also plays the violin and the viola.

What do physicists do late at night? Here is one physicist who might be found late at night playing quartets with friends.

DAVID NIELSEN earned his B.S. in June 1974. He then moved to Las Vegas where he is employed as a physicist at the National Environmental Research Center of the U. S. Environmental Protection Agency. He is working on the devlopment and testing of remote sensing methods for specific chemical and physical pollutants.

He is also a part-time student at the University of Nevada, Las Vegas, pursuing a Master's degree in physics with an emphasis in biophysics.

Of Sonoma State, Dave writes, "I have found my physics background to be more than adequate and very valuable both in my career and in my graduate studies."

KEN LARSEN received bachelor's degrees in both physics and mathematics at Sonoma State in 1969. He stayed a year and earned a master's in math, then went to the University of California, Irvine. He is currently doing research there on computer network security and expects to complete his Ph.D. soon. He was an assistant professor of math and computer science at Western Washington State College in 1973-1974.

Ken writes "I have always felt that my years as a physics major were the most significant part of my education." and "In my approach to quantitative problems, my physics background has taught me to deal first with the significant, 'first order' quantities"

SUMMER RESEARCH ON FUSION
by Scott Anderson

Hydrogen fusion offers some tantalizing solutions to the energy problem. The fuels are deuterium and tritium which are easily obtainable from sea water. The conversion into electricity is relatively efficient, with little heat or radioactivity lost to the environment.

Of the many schemes proposed, most deal first with the containment of a hydrogen plasma. The operating temperature of a hot plasma is of the order of a hundred million degrees, thereby ruling out any material container. It is thus fortuitous that a plasma acts as a dielectric, i.e. it is repulsed by a strong magnetic field. It is toward the goal of plasma confinement in a "magnetic bottle" fields are explored.

Under a generous NSF grant, I worked at Washington State University with Dr. J.H. Wagner last summer to explore aspects of plasma containment. Of particular interest to us was a ferromagnetic end piece to reflect plasma losses back through the "neck" of the bottle. Using computer generated solutions of the Maxwell equations, we arrived at a hollow magnetic cone configuration that validated our initial experimental data.

At the time of this writing, Edward Teller has exploded a fusion device the size of a firecracker and a plasma has been contained for five thousandths of a second at 250 million degrees. Hopefully our research can dovetail with that of others to achieve a cheap and efficient source of energy--fusion.

TENN SUMMERS IN SANTA CRUZ

Dr. Joe Tenn had a busy summer. For five weeks he conducted research in astronomy with Lick Observatory astronomers at the University of California, Santa Cruz. Then he traveled to San Diego where he presented a paper at the 146th meeting of the American Astronomical Society.

The paper, co-authored by Sonoma State student Elaine Barsman, was on the changing spectrum of the peculiar variable star FG Sagittae.

Rare earth elements, such as lanthanum, cerium, praesodymium, and neodymium, have been appearing in steadily increasing quantities in the atmosphere of this star in recent years. Their changing abundances provide important information regarding the nuclear reactions which produce these elements in stellar interiors.

Each year Dr. Robert P. Kraft of the Lick Observatory uses the 120-inch telescope to photograph the star's spectrum. Dr. Tenn and Ms. Barsman have analyzed the spectra observed in 1973 and 1974 and are now working on new data taken in 1975.

While at UC Santa Cruz, Dr. Tenn also gave a seminar on teaching physics and astronomy in an undergraduate college. He described how Sonoma State has increased its number of physics majors from 25 to 73 in the past four years.

JON SIMMONDS earned a B.A. (calculus option) in 1974. He is now an ensign in the U.S. Navy undergoing pilot training.

DAVID KELSO earned his B.A. (calculus option) in 1974. The following year he obtained a secondary teaching credential at Sonoma State, and he is now in Australia, teaching high school science and mathematics.

Dave writes, "My physics background makes it very easy for me to have an overview of materials worthwhile and interesting for high school students."

Jon writes, "While an in-depth knowledge of physics is not necessary in our work, my background gives me an advantage in areas where some physics and math is necessary."

This newsletter was a volunteer effort. Unsigned articles were written by Tom Barnebey, Elaine Barsman, Stephanie Snedden, and Joe Tenn. Typing was by Delmy Rosales.