The Physics Major

Published by the Department of Physics and Astronomy, Sonoma State College, No. 3, November 1976

SONOMA STATE COLLEGE OBSERVATORY: ASTRONOMY IN ACTION

On Thursday evening, April 22, 1976, Dr. Gordon Speer dedicated the Sonoma State College Observatory to the students of Sonoma State College, the residents of Sonoma County and to all who would study astronomy.

What, in fact, did Dr. Speer dedicate that night? Where is the observatory and what is its purpose? And what sort of programs are carried out there?

The observatory is a concrete block building situated at the south-east corner of the football field. The roof slides off in two sections to reveal the college's main telescopes, a Celestron 10 inch and a Celestron 14 inch. Also housed in the Observatory are the ancillary equipment with which the business of astronomy is pursued: an eight inch Celestron guide scope, a photometer, a spectrograph, an astrograph or telephoto lens, several cameras, and other aids for achieving the best possible use of the telescopes. A sidereal clock soon to be installed will enable users to tell time by the stars. A feature that offers comfort for the hardy astronomers is the carpet covering the floor.

The telescopes are used for student and faculty research and for taking photographs of celestial objects. The observatory also provides field experience for students in Dr. Speer's astronomical laboratory classes and will enable students in the spring astrophotography class to obtain pictures of objects so far away they can only be recorded on film. The observatory has been host to visitors interested in astronomy; many have come to gain assistance in learning the intricacies of photometry or to see how the observatory is constructed.

During the past summer the Observatory was opened to the public several times. On these occasions a total of 400 to 500 people from the campus and from the community came to peer through the telescopes and marvel at double stars, open and globular star clusters, planetary and other nebulae, the planets and the moon. During public viewing events, constellation study and identification is also undertaken.

The Observatory was built by the staff of Sonoma State College with the assistance of plans from a similar building at Chabot Science Center in Oakland. The telescopes are mounted on piers sunk three feet into the ground.

At the dedication ceremonies, Dr. Marjorie Wagner, then president of the college, greeted the guests. Dr. Robert Kraft, astronomer at Lick Observatory and president of the American Astronomical Society, gave a perspective on the expected course of astronomical studies. Professional and amateur astronomers and others from throughout northern California attended the event arranged by Dr. Joe Tenn.

Public viewing nights are scheduled for November 20 and December 4. The Observatory will also be open November 18, the Division's Science Night. Everyone is welcome to come to see the facilities and the telescopes whose duty it is to bring the heavens into reach.

KEITH BENGUIAT (B.A., physics, 1975) is an associate engineer in reactor plant engineering in the nuclear power division of Ingalls Shipbuilding Co. in Pascagoula, Mississippi. Keith writes, "The flexibility and the constant interest of staff (at Sonoma State) made education an experience, not a process." He is eager to help others from here find employment with him.

NEW LASERS PURCHASED

The Department of Physics and Astronomy is replacing one of its old, worn out and "obsolete" helium-neon lasers. In the process, intensity will be improved by three orders of magnitude, and wavelength selection will be essentially "infinitely" better. The new laser is in fact two. One, a 5W, Lexel Corporation, argon-ion laser drives, or "pumps", as they say in laserese, the second, a Spectraphysics dye laser using rhodamine GG dye.

The ion laser is capable of emitting at 8 specific lines ranging from the deep blue to the green with maximum powers varying from roughly 100 milliwatts to 2+ watts depending on the line. The laser may be adjusted so that all lines lase simultaneously with a nominal 5W maximum total power, or any one line may be separately selected.

The wavelength of the dye laser may be continuously varied from the green into the deep red and reaches peak power of the order of a watt in the yellow-red region. The linewidth is less than 1 Å. It uses an impressive dye circulation system where a thin, ribbon jet of dye is irradiated by the ion laser beam.

John Dunning said as he watched it being tuned from green, through yellow and into red at powers two to three orders of magnitude greater than our helium-neon lasers, "Now there's a monochromator, a real winner!"

When you contrast this list of specifications with those of our typical helium-neon lasers -- a few milliwatts at one wavelength in the red, 6328 Å -- you begin to get some idea of the magnitude of improvement in our capabilities.

The lasers and associated optics will be supported on a large vibration isolation table system which is also being purchased. All this will be housed in a remodeled portion of Darwin 343.

The primary immediate use of the laser will be in the States of Matter lab, Physics 472, where it will become a prime focus for the course. Students will become familiar with its performance characteristics and then use it in experiments on Rayleigh and Brillouin light scattering. Raman and high resolution absorption spectroscopy, laser doppler velocimetry (LDV) and LIDAR, and applied holography. These are only some of the feasible experiments and applications that have come to mind, and we're sure that the list will increase rapidly. Students who have acquired experience in using the laser will, of course, have the opportunity to use it in special studies projects. As time goes on it will certainly find use in other courses, especially some to be introduced for B.A. majors.

ROBERTO RAMIREZ (B.S., physics, 1972) earned a master's degree and teaching credential at UCLA and is now teaching mathematics at Healdsburg High School.

TENN WINS ESSAY AWARD

Dr. Joe Tenn received an honorable mention in last year's Hughes Essay Contest, sponsored by the Griffith Observer, a popular magazine about astronomy published in Los Angeles.

The article, titled "The Search for Solar Neutrinos", was published in the August issue of the magazine. One of the illustrations was a cartoon drawn by senior student Scott Anderson

SPECIAL STUDIES PROJECTS

Each semester a large number of students work on individual study projects for which they are awarded credit in Physics 495 or Astronomy 495 Special Studies.

For example, several students have done projects in electronics with Dr. Poland. These have ranged from working on the radio telescope on the roof of Darwin to constructing an ovulometer.

Many students have worked on astronomy projects with Drs. Spear, Greene, and Tenn. Some of these are described elsewhere in this newsletter. Others have involved such efforts as building a blink comparator, writing a computer program to tell the observer which interesting celestial objects are up and where they can be found on a given evening (currently underway by Marguerite "Tinka" Ross), or learning to analyze stellar spectra (Paul Avellar is working on this).

Some rather sophisticated work in fast fourier spectroscopy was done last spring by Steve Alexander and Scott Anderson, working with Dr. Bass.

Members of the faculty are usually looking for students to work on interesting projects. If you have some spare time and would like to do something outside the usual curriculum, you might ask them for suggestions. Of course you can come up with your own idea and then seek a faculty advisor.

ANDREW MCLEAN (B.A., physics and special major: liberal arts and sciences, 1975) is a manufacturer's representative in Redwood City. He finds the background he obtained in physics is "very valuable" in his position selling industrial and consumer electronics equipment.

IN SEARCH OF YESTERDAY

A desire to search for possible extraterrestrial influences on the course of ancient cultures coupled with a longstanding interest in those same ancient cultures prompted Dr. Sam Greene to set forth on an odyssey of investigation and exploration through some of the most exotic-sounding cities and countries of the Middle and Far East in the Spring of 1976. This odyssey took him from England to Japan with many stops along the way in his effort to track down the origins of the tales of extraterrestrial intervention that have flooded society.

Dr. Greene has taught courses in cosmology and extraterrestrial intelligence for many years, and it was his reading in preparation for and background of these courses that piqued his interest in seeking first hand knowledge of these fascinating myths. Did Dr. Greene find any solid evidence of the presence of beings from other worlds in his meanderings through ancient civilizations? While Dr. Greene freely discussed his itinerary and the main sights of his journey, he preferred to reserve his conclusions about this for his talk during the "What Physicists Do" series, October 26.

Dr. Greene began his odyssey at Stonehenge during a rainy, freezing winter. Although he found this manifestation of ancient man's sagacity in astronomy interesting, Dr. Greene found the site to be smaller than he expected. Next on the schedule of this modern seeker was the Mediterranean, scene of the wanderings of Homer's hero. Dr. Greene first visited Crete where he toured the ruins of the fabled city of Knossos. In Greece, this modern odysseus inspected Delphi whence the oracle spoke and Mycenae whose golden treasured had been unearthed by Henry Schliemann. In Athens Dr. Greene visited the museum which contains many fabulous artifacts created by early Greeks.

From Greece Odysseus made his way to Syria, where, in the Syrian National Museum in Damascus, he found relics of the old Syrian civilization dating back to 3000 and 4000 B.C. In Jordan the traveler visited the hard-to-reach rose city of Petra. Old Jerusalem was impressive but small. The Israeli National Museum contained large numbers of Jewish artifacts which provided insights into Biblical civilization.

While in Egypt, Dr. Greene made it a point to visit the pyramids. He toured the great pyramid which he did not consider to be anything other than a mysterious and mighty work of antiquity. To round out his knowledge of ancient Egyptian burial practices, Dr. Greene visited many of the other 60 pyramids in the land of the Nile. One that was especially interesting was the stepped pyramid of Sakhara, reminiscent of the Mayan temples in Central America. Also included during the wanderer's sojourn in Egypt were excursions to Thebes, Karnac where the temple's pillars dwarfed him, and Abu Simel where the temple of Ramses II had been raised above the waters of Lake Aswan. In Cairo, Odysseus marveled at the sculptures of ancient Egypt exhibited at the National Museum and found ample evidence that the art of sculpture had originated in Egypt.

In Tehran, Dr. Greene visited the cities of Isphahan and Sheraz, the apogee of Islamic culture and the site of the most beautiful mosques in the Middle East. Persepolis, destroyed by Alexander the Great in 400 B.C. and the possible landing field for extraterrestrials, drew Dr. Greene into the interior of Iran.

India and its neighbors were the source of many insights for an understanding of the progress of civilization in its trek through the Middle East. New Delhi contains an ancient iron pillar which is reputed to be rust proof. Indian Buddhism was established in Ashoka in 400 B.C. The storied lands of Kashmir and Ladakh, opened recently after being sealed for 25 years because of their nearness to the Chinese border, are the last outpost of Tibetan culture and the repository of some early temples of Hindu worship. Among the sights visited by the wayfarer during his travels in India was the Taj Mahal. Kahagaraho, a village halfway between the Taj Mahal and Benares, contains remnants of early Hindu culture. Benares, itself, the center of Hindu culture from 2000 B.C. contains the temple where Buddha preached after his conversion. In Nepal, a mixture of Hindu and Buddhism, animal sacrifices are still offered weekly.

At the Bishop Museum in Hawaii, Odysseus ended his search by noting the relics from Polynesia which may tie into the artifacts he saw earlier during his trip. These objects may also reveal evidences of extraterrestrial influence.

Dr. Greene feels that his trip was a rousing success and enhanced his understanding of the world. During this trip Dr. Greene traced the flow of culture from its presumed origin in the Middle East all the way to Japan. He is convinced that the early culture of Central and South America was profoundly influenced by the previously flourishing culture in the Middle East. When Odysseus sets out again he will head for Mexico, other Central American lands and South America.

Did extraterrestrial beings land on the earth and influence or change the course of humen civilization? If you would hear Dr. Greene's conclusions, take Astronomy 303, Extraterrestrial Intelligence and Interstellar Travel, next spring.

MICHAEL MCBRIDE (B.A., physics and management, 1975) is a student at the American Graduate School of International Management in Arizona, where he is working on a master's degree in International management. He writes that his background in physics is especially helpful in the frequent discussions of nuclear power there.

BASIL SWABY (B.S., physics, 1974) is well on his way to completing work for a master's degree in physics at San Francisco State University. Still employed by the department of public safety at Sonoma State, Basil is frequently seen around the campus. He writes, "The contact made with individuals whose energy, experience, ingenuity, and patience gave me the desire for self-improvement and to be part of something I now consider quite valuable, i.e. the science of physics" was the most beneficial aspect of his education here.

TWO PHYSICS MINORS TO HARVARD

Two 1976 graduates of Sonoma State College have just entered graduate schools at Harvard University. Both minored in physics and both won fellowships.

Nancy Goodban came within five units of completing a B.A. in physics in addition to her degree in psychology. She was awarded a fellowship to the extremely selective program in clinical psychology.

Tom Taylor, who earned his B.S. in chemistry but was also well known in the department of physics and astronomy, was awarded a substantial fellowship by Harvard's department of chemical physics.

Two other physics minors last year were Jim Laramee and Myrtle Milhite, who accepted teaching assistantships at Purdue University and the University of California, Davis, respectively, both in chemistry.

STATES OF MATTER LAB

This fall the department is offering for the second time an advanced laboratory titled "States of Matter." Dr. Isaac Bass conducts the lab which deals with such experiments as Nuclear Magnetic Resonance (NMR), Fast Fourier Transform (FFT), Spectroscopy, and diffraction of light by photons.

In the NMR experiment, students get to make extremely sensitive magnetic measurements using Dr. Bass' custom-built resonance detector in the Darwin dungeon. A formidable amalgam of tubing and circuitry, his detector is also set up to measure the relaxation times of metastable He^3 atoms in the gaseous state. Dr. Bass hopes to fit a cryogenic unit to his detector soon, and future students will get a crack at NMR studies of liquid He^3.

The FFT Spectroscopy experiment uses a sophisticated and clever computer program to analyze data from a Michelson interferometer. The computer program is based on the fact that the spectrum of a source is the Fourier transform of its interferogram. This method yields much more detailed information about a source than conventional spectroscopy does.

Diffraction off phonons (quantized sound waves) is a fascinating experiment. It involves a quartz transducer that produces vibrations in water. Due to the minute pressure differentials created, a laser beam gets diffracted as it passes through the water.

Other experiments set up in the past include Electron Spin Resonance, Polarization in an isotropic medium, and Rayleigh Scattering. The lab has a flexible structure and on occasion will incorporate a new or unusual experiment.

In many cases, the lab will provide the student with his first full-blown research project. If you're interested in the many wierd and glorious states of matter, this class will be a revelation.

FACULTY PUBLISH IN AMERICAN JOURNAL OF PHYSICS

The American Journal of Physics, published by the American Association of Physics Teachers, is devoted to the instructional and cultural aspects of physical science. This year it has published two articles written by members of the department.

Dr. Tom Barnebey's article "Note on 'Normal Modes of a Compound String'" was in the May 1976 issue. It presents an interesting solution of a classical mechanics problem.

"On the Stark Effect of the Plane Rotator" is the title of an article in the August issue by Dr. George Johnston, currently on leave from the department, and Dr. Garrison Sposito, who formerly taught here. It deals with a quantum mechanics problem that came up in Physics 460 a couple of years ago.

Dr. Barnebey has also written several reviews for Mathematical Reviews.

GRADUATES START OWN BUSINESSES

Two 1976 Sonoma State graduates have decided to use their knowledge of physics to go into business for themselves.

Don Greenberg has completed courses for a B.A. in physics and has decided to explore the possibilities of electronics.

"The problem with being a graduate in physics," he said, "is that you either pump gas or play with a linear accelerator, and there's nothing in between. But electronics you can do by yourself or with a few others, and with only a few thousand dollars you can equip yourself with a decent electronics lab." Deciding that physics should be fun, Don found that electronics offered the "Mr. Wizard Glamor" he was looking for, in an area where it is almost impossible to run out of ideas.

One of his planned projects is the building of a new type of biofeedback machine which, Don claims, will outdo all other machines. Most biofeedback machines display electrical impulses from the brain which, he states, produce data of questionable value to the user. His machine will look at changes in the electrical characteristics of the whole body in a way that will provide a high correlation between changes in the user's emotional state and changes in the displayed output of the machine.

Don also plans to work in musical electronics. A guitar player since the age of nine, Don enjoys "toys" which he can plug into his guitar to produce different effects, but doesn't want to pay $100 for something he can build for $5. By electronically altering the harmonic content and frequency of sound, a variety of other sounds can be produced. He will be making a number of these devices which may or may not be on sale to the public.

Robert Lucas, a June B.A. graduate in Physics and Chemistry, is now president of his own company, Solar Energy Engineering. He has developed a one-piece copper flat-plate collecting unit for the heating of water for homes and swimming pools. Funded by grants from federal and state agencies as well as individuals, his research includes applications of solar energy for space heating and electrical generating systems.

He first realized the possibilities of the sun's power when he built a solar fruit dryer as a physics project last spring, but his interest in solar heating came about with the desire for a swimming pool heater where he lives. Checking the prices, he felt that he could build a unit with an automated system to sell at a reasonable price. Here, the combination of a physics and chemistry background proved to be invaluable.

The fusing process of this collecting plate is chemical, but the realization of the need for the process came through his knowledge of physics. This 'thermal adhesive process' is a breakthrough in all-copper collector units because the low man-hour requirement reduces costs. It is expected that a collector will take five minutes to complete.

The State of California has offered him plans for assembly line modification to enable him to hire the handicapped, and he expects to have a full plant in operation by the first part of the year.

Reflecting on his education, Bob says, "The wide variety of thinking gives you a chance to look at things from different angles."

NILES SEVERY (BA, physics and math, 1971) is employed as a geophysicist by Dames & Moore, a worldwide consulting firm. He has made recommendations regarding the safety of proposed nuclear power plant sites in several states, Turkey, and Pakistan. He has presented a number of papers at international conferences on his work. Based in Virginia, he was back for a brief visit to the campus last summer. Niles earned a M.S. in geology at the University of Colorado after he graduated from Sonoma State.

DEPARTMENT OFFERS VARIED "SELECTED TOPICS" COURSES

Two of the most interesting courses offered in the Department of Physics and Astronomy are the "396" courses. Physics 396 "Selected Topics in Physics" and Astronomy 396 "Selected Topics in Astronomy" include a wide range of courses on topics that would not normally be covered by the standard curriculum.

This semester there are two sections of Physics 396. One deals with group theory and the other is a study of nuclear fusion.

The course on nuclear fusion covers the scientific principle of what fusion is and how it can occur. It deals with the evaluation of fusion as a probable source of power for the future. It takes a look at most of the probable future developments, improvements and the social impact of a power source that takes its fuel from water. Dr. Dick Gordon is the instructor.

The other 396 course offered this fall is a course on Group Theory. It is taught by three instructors, Drs. Tom Barnebey of Physics and Astronomy, Les Brooks of Chemistry and Rick Luttman of the Math Department. The course is a study of groups and symmetry as they occur in the world. Examples of groups were taken from all disciplines, from sub-atomic physics to the symmetry of dance.

Last semester a Physics 396 and an Astronomy 396 course were offered. The Physics 396 was on solar energy and alternate energy sources. It touched on almost all of the methods proposed for producing energy. Solar energy was the main topic and was looked at as both a source of power to generate large amounts of electricity and as a method of heating a home and its hot water. The instructor was Dr. Mike Samis.

The Astronomy 396 course was taught by Dr. Joe Tenn and was called "Discovering the Galaxies". This historical course dealt with the revolutionary discoveries made in astronomy during the early part of the twentieth century. In 1900 many astronomers believed that we were located at the center of the Galaxy, and that the Galaxy was the universe. We now know that our solar system is on the outskirts of one galaxy, that there are many, many other galaxies, and that all of these galaxies are moving apart. The course traces how man's horizons of the universe expanded as a result of new observations. In the future this will be a regular catalogue course, Astronomy 356.

Another Physics 396 course was taught several semesters ago by Dr. Sam Greene on paranormal phenomena. This course offered a scientific look at psychic phenomena. The background and history of many forms of psychic phenomena were examined and evaluated. Hopefully this course will be repeated sometime in the next school year.

Next semester Dr. Barnebey will be offering a Physics 396 course on environment acoustics. It sounds like an interesting course, especially for those who have enjoyed his Physics of Music course.

Many 396 courses are open to students with only basic background in physics and math, while others, such as the course in Field Theory offered by Dr. Barnebey last spring, are actually at the graduate level.

ADVISING ADVISABLE

Have you seen your advisor lately? If you haven't, you may be missing out on some information important to you. Do you know which courses will be offered next semester? Next fall? Do you know which courses you need to complete the B.A. or B.S.? Have you thought about what you will do when you grow up?

Dr. Joe Tenn, your advisor if you are a physics major, has information on courses, degree requirements, general education requirements, and a tremendous file of information about graduate schools, fellowships, and assistantships. He even has some information about jobs.

Visit him in Trailer 3-A at least once a semester.

FELLOWSHIPS AVAILABLE

If you are graduating this year and you intend to enter graduate school next year, you should begin considering application for various types of financial aid soon. The deadlines for applying for numerous fellowships are rapidly approaching.

Several fellowships, such as those awarded by the National Science Foundation and by the California Student Aid Commission, have deadlines as early as December 1. Others require that the Graduate Record Examination (GRE) be taken in December.

Whether or not you try for a fellowship, you will probably want to apply directly to various graduate departments for assistantships. Some of these require early action, or an early GRE test date.

In recent years, graduates of this department have done quite well in competition for these awards. In 1975 Lynn Hubbard won a fellowship from the University Corporation for Atmospheric Research. Four of these are granted each year. They provide support for two years of graduate work in atmospheric science anywhere in the country as well as two summers of research at the National Center for Atmospheric Research in Boulder. Lynn is working on a Ph.D. in physical chemistry at UC Riverside. She turned down assistantship offers from three universities to accept the prestigious fellowship.

Ten of the department's graduates have received assistantship offers in recent years, several of them to two or more graduate schools. Three have nearly completed Ph.D.'s: Paul Goodwin in geophysics at the University of Alaska, Ken Larsen in computer science at UC Irvine, and Bob Steele in physics at UC Santa Barbara.

The important thing is to start looking early. See your friendly advisor, Dr. Joe Tenn, for information regarding graduate programs, fellowship applications and the GRE. Do it soon!

DAVID SHOAF (B.A., physics and psychology, 1975) is employed as a computer programmer by American Computing Centers in Salt Lake City. He is currently testing a new structured language for on-line processing applications.

ENVIRONMENTAL ACOUSTICS TO BE OFFERED

A course in Environmental Acoustics shall be offered by the Department of Physics and Astronomy for the first time in the Spring, 1977. The course shall be taught by Dr. Tom Barnebey as a Special Topics, Physics 396.

The fundamentals of sound production and propagation shall be covered and many applications to such areas as room acoustics, acoustical considerations in neighborhood and city planning, and noise pollution shall be discussed. Sound level measurement techniques shall also be included, together with certain aspects of developing and enforcing noise regulation laws.

Little mathematics shall be used, and the course is open to all students who have completed a physical science course equivalent to Physics 100 or Astronomy 100.

QUANTUM MECHANICS--
WHAT DOES IT REALLY MEAN?

A one unit seminar course on the interpretations of Quantum Mechanics is to be offered by Dr. Tom Barnebey of the Department of Physics and Astronomy during the Spring semester, 1977. The class shall meet once a week to discuss the writings of prominent physicists who have speculated about the origins of the laws of quantum mechanics. Students in the course are expected to actively participate by preparing summaries of various viewpoints for presentation to the class.

The seminar course is open to all students who have completed Physics 314.

RESEARCH, STUDY PROJECTS IN PHYSICS OF MUSIC

Many students enrolled in Physics of Music (Physics 300) gain practical experience with the subject through Individual Study Projects. The following are examples of projects which have been done: Dulcimers of various types have been built and analyzed; a musical scale based upon the atomic transitions of hydrogen was explored; the acoustic properties of a room were studied; speaker cabinets have been built, etc.

An informal acoustics lab is maintained for the use of Physics 300 students working on projects. The equipment available includes such things as a monochord, a high quality sound system, microphones, tape recorder, oscilloscope, etc.

This semester several Physics of Music students have joined Dr. Tom Barnebey in assembling equipment to analyze and plot the frequency response curves of musical instruments and other acoustic devices. The completed system shall be used for experimental research on the behavior of trumpets. The equipment shall also be available to other students in the Physics of Music class for use in connection with study projects.

Some aspects of the trumpet research shall be reported during Tom's "What Physicists Do" talk, scheduled for November 30.

EILEEN PHILIPS (B.S., physics, 1974) is employed as a production engineer at National Controls, Inc. in Santa Rosa. In a previous position, she helped test an infrared detector that went to Mars on the Viking spacecraft.

"WHAT PHYSICISTS DO" SERIES CONTINUES

Every Tuesday at 4 p.m. the Department of Physics and Astronomy presents a free public lecture on some topic in the physical sciences. Probably the oldest such series on campus, the "What Physicists Do" series is currently in its twelfth semester.

Dr. Joe Tenn, who founded the series and has directed it for ten and one-half of those twelve semesters, is already starting to plan the spring series. One of the main purposes of the series, according to Dr. Tenn, is to give physics majors a picture of the many types of employment and study undertaken by people with backgrounds in physics.

Among the lectures this semester have been an exciting account of the discovery of element number 126 by one of its discoverers, Dr. Thomas Cahill of UC Davis, and first-hand descriptions of work in two of the "new astronomies" -- gravitational wave astronomy by Dr. Steven Boughn of Stanford, and extreme ultraviolet astronomy by Dr. Michael Lampton of UC Berkeley. Many are looking forward to Nov. 9 when Dr. P. Buford Price of UC Berkeley describes his team's discovery of what may be the first evidence for the existence of a magnetic monopole. Dr. George Johnston, a member of the department who has been on leave conducting research in plasma physics at MIT the past two years, will return on Nov. 23 to answer the question, "Is there a tokamak in your future?"

In case you have not been taking advantage of all that your department offers, make it a point to join the other students and faculty for coffee at 3:30 and a lecture at 4:00 in Darwin 108 next Tuesday.

KENT NELSEN (B.A., physics, 1974) finds much use for his physics education in his position as equipment technician for the department.

JIM RECTOR (B.A., 1976) is now employed as a communications technician with American Satellite Corporation in San Francisco.

ALTERNATE ENERGY DEVICES

A hydraulic ram pump, solar hot water heater, and other alternative energy devices were constructed by students this spring as part of the physics 405 class. The projects were funded by people living in an alternative community near Cazadero as part of their commitment towards living a lower consumption lifestyle. This combination of students' knowledge and energy and money provided by people with real and immediate needs proved to be a highly satisfying experience for all involved.

Typical student comments on the course were:

"I have never learned or benefitted by any other course I have taken as much".

"This course has for the first time allowed me to apply the theory obtained from my classroom experience."

"This class helped open a section of my life. I liked the realness of it, less talking and more doing."

The people for whom the projects were constructed were equally enthusiastic. The hydraulic ram pump, for example, is the sole source of water for a couple who have no electricity or other means for pumping water up an 80 ft. hill to their home site. The ram uses the power of the moving water at the source to provide the pumping action and has only two moving parts. Total cost of the project was $125 plus a donation of pipe from Standard Oil Co. in Richmond which was arranged by student Kirk Lindgren.

The class is also taking place this fall where 10 solar hot water hearing systems are being constructed. In the spring of 1977 the course will be expanded to 3 units and called The Physics of Alternative Energy Devices (Phys 396). If you are interested in applying your knowledge of physics to real situations and serving people in the surrounding community join us. Doug Greene is the instructor.

VARIABLE STAR RESEARCH AT SONOMA STATE

The first research program at the Sonoma State College Observatory was initiated this summer by John Gregg and Miriam Carolin under the direction of the Observatory director, Dr. Spear. The program is designed to survey some of the brighter of the class of objects known as dwarf novae. These objects appear to undergo nova-type outbursts, brightening from 2 to 5 magnitudes (from 6 to 100-fold increase in light output) on time scales between 10 and several hundred days. The outbursts can last from several hours to several days and appear to result from the fact that the objects are really binary stars in a stage of evolution in which one component transfers mass to its companion. The outbursts result when the transferred material falls onto the surface of the companion. The observing program requires that photographs of the objects be taken on a regular basis to study the frequency of occurance of outbursts for different stars.

A second research program involves photoelectric observations of the long period eclipsing binary VV Cephei. Several students including Paul Avellar, Stephanie Snedden, Jim Mills and Miriam Carolin are obtaining photoelectric observations in the UBV system an average of twice a week. The binary system consists of a B-type mainsequence star and an M-type supergiant with a 20 year orbital period. The present observations are especially significant as the B star will begin to move behind the "edge" of the supergiant about 4 November and will be completely obscured by about 1 December. Sonoma State is cooperating with several other observatories across the country in an effort to obtain detailed coverage of the event. The observations will be analyzed to yield information about the sizes of the stars and the physical structure of the atmosphere of the supergiant.

WILLIAM CABRALL (B.A., physics, 1976) recently started work as a Satellite Operations Associate Engineer, Planner/Analyst at Lockheed. Bill found the "small classes, easy access to professors, no T.A.'s" most beneficial in his education at Sonoma State.

PHYSICS STUDENT WINS ASSISTANTSHIP

Peter Conwell, a 1976 graduate of Sonoma State College, accepted a teaching assistantship at the University of Utah where he has begun graduate studies in physics.

He chose Utah over the two other graduate schools which had offered him assistantships because of its excellent program in computational physics.

The use of computers to solve problems in physics is one of several fields in which he became proficient as an undergraduate.

"I found at Sonoma State a free atmosphere where I could satisfy my own curiosities and be myself," he notes.

"I was able to become personal friends with professors, and I found the atmosphere very conducive to learning physics."

Interested in teaching, Conwell voluntarily taught problem sessions in introductory classes both before and after completing his B.S. in January.

Last spring he also served as a part-time instructor in physics, teaching one laboratory section.

For the last two years, he worked with Dr. Richard Karas on a research project concerning the aurora borealis and the earth's magnetic field. He accompanied Dr. Karas to Greenland to work on this project in the summer of 1975.

HAROLD D. CHANEY (B.A., physics, 1975) is a project health physicist at Mare Island Naval Shipyard in Vallejo. He finds the courses he took in applied nuclear physics and chemistry at Sonoma State to be most beneficial in his work.

SUMMER FACULTY RESEARCH

During the summer months, many of our professors were involved in physics and astronomy research.

Dr. Isaac Bass, assisted by Scott Anderson, spent part of the summer studying the magnetic properties of He^3. This was part of a long term project to determine the nuclear magnetic relaxation time in gaseous He^3 and ultimately, to liquify the polarized gas and study the properties of the polarized liquid.

Optical pumping was used to achieve polarization, and He^4 was used as a buffer gas to inhibit the main cause of disorientation; collisions with the walls of the container. It was hoped that longer relaxation times could be produced, but the experiment will need to be repeated with purer samples of He^3.

Scott was working under a Cottrell Research Grant. It is hoped that there will be additional money for two people to work for ten weeks this coming summer.

Dick Gordon completed his doctoral dissertation, "Resonance Scattering and the Equilibrium and Stability of Radiatively Accelerated Q.S.O. Clouds". Dr. Gordon could frequently be found in Darwin Hall during the summer. Much of his work was on the writing of a program to design an optical system. From a description of the lenses and materials of the system, the program determines how light passes through the system and where the image is formed. The program will also diagram this, and is available for use by students having access to the Chemistry Department's Tektronix 31 programmable calculator.

Dr. Sam Greene has just returned from a Sabbatical leave during which he did research on the possibility of time travel through the use of black holes. In addition, he spent some time visiting and photographing ancient ruins believed to be extraterrestrial landing sites and will be presenting his findings and slides at 'What Physicists Do', Oct. 26.

Dr. Richard Karas' research was not so fruitful. "My watch broke on the way to the airport and it was all downhill from there", he said. He, and six other people from U.C. Berkeley and Denver, worked at the Sondrestrom Air Base, Sondrestromfjord, Greenland, measuring the X-rays caused by the de-acceleration of high energy electrons as they collide with air molecules in the upper atmosphere. These X-rays are believed responsible for the Aurora Borealis.

Measurements of the X-ray and particle fluxes were made with instruments flown to above 100,000 feet by helium filled balloons. Some of the instrumentation was built here by students Pete Conwell, Milt Enderlin, and Joe Fraser. Last year Pete Conwell accompanied the group on a successful expedition to Greenland. This year, however, Dr. Karas' research group experienced an unprecedented number of failures of apparently defective balloons, batteries, and timers. Consequently, no data was obtained.

Dr. Karas has no auroral research plans for next summer, but does plan to further analyze the data obtained from a solar flare of the previous summer.

Dr. Gordon Spear spent the summer in the Astrophysics Section of the Johnson Space Center in Houston, Texas.

One of his two papers, "Stellar Rotation and the Thermomagnetic Torque", has already been accepted for publication, and will appear in Astrophysics and Space Science in a few months. This paper deals with the laboratory phenomenon of torque that occurs when gas is cooled in a cylinder and then reheated. The desire was to apply this effect to see if it would influence axial rotation of stars. Even though the torque was large, it was found that it was not great enough.

Dr. Spear also investigated the high-dispersion optical spectra of Wolf-Rayet stars. These are high temperature objects which exhibit strong emission lines of carbon, nitrogen and oxygen, instead of the usual hydrogen patterns. Since many of these are binaries, the attempt was made to infer the physical characteristics of companion stars, to see if patterns exist.

His plans for next summer include doing research here at our own observatory with Sonoma State students.

Dr. Joe Tenn spent his third summer at Lick Observatory, working on the analysis of the spectrum of the peculiar variable star FG Sagittae. The highlight of this summer was a three-night observing run at the 120-inch telescope. He and student Miriam Carolin hope to finish the analysis within the next year or so and publish it. They are studying the changing abundances of rare earth metals in the atmosphere of the star from one year to the next.

CLYDE UNDERWOOD (B.A., physics, 1974) works at Space Microwave Laboratories in Santa Rosa as a product engineer. When the president of the company needed another engineer recently, he called the department and asked for "another Clyde Underwood."

DAVID NIELSEN (B.S., physics, 1974) is employed as a physicist by the Environmental Protection Agency in Las Vegas, Nevada. He is also a part-time graduate student at the University of Nevada, Las Vegas, pursuing a master's degree in physics with a specialization in biophysics. He writes "I have found my physics background to be more than adequate and very valuable both in my career and in my graduate studies.