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Department of Physics and Astronomy
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This report, the Department's twenty-fifth, covers the period September 2000 through August 2002. See <http://phys-astro.sonoma.edu> for more information.

1. PERSONNEL

In September, 2000 the faculty consisted of professors Lynn R. Cominsky, John R. Dunning, Samuel L. Greene, Duncan E. Poland (Chair), Saeid Rahimi, Gordon G. Spear (Observatory Director), and Joseph S. Tenn. Greene continued his partial retirement, teaching only in the fall semester during 2000-2001, and retired in December, 2001. In December, 2000 Dr. Philip Plait joined the department, working full-time on NASA-sponsored Education and Public Outreach (E/PO) with Cominsky. At the end of August 2001, Duncan Poland retired, John Dunning joined the Faculty Early Retirement Program and Tenn became Chair. Assistant professors Enrique W. Izaguirre and Brock L. Weiss joined the department in Fall 2001. Dr. Laura Whitlock left the E/PO group in June 2002.

2. INSTRUCTION

A total of 479 students took Descriptive Astronomy, Introductory Observational Astronomy, Extraterrestrial Intelligence and Interstellar Travel, Frontiers in Astronomy, Cosmology, Advanced Observational Astronomy and Special Studies in 2000-01, while 475 took Descriptive Astronomy, Introductory Observational Astronomy, Extraterrestrial Intelligence and Interstellar Travel, Astronomical Imaging, and Cosmology in the following academic year.

The Department awarded 1 B.A. degree and 7 B.S. degrees in 2000-01 and 2 B.A. degrees and 7 B.S. degrees in '01-'02. All degrees are in Physics. There were 46 physics majors in Spring 2001 and 51 in Spring 2002.

3. EQUIPMENT

Optical telescopes are mounted in a sliding-roof observatory on campus. Auxiliary instrumentation for the 0.36-m Schmidt-Cassegrain telescope includes an ST-4 CCD camera, wide field cameras, a grating spectrograph, and a 0.5 Å H α filter. The Epoch Instruments 0.25-m $f/5$ Newtonian telescope is computer-controlled. The system points reliably to within 1-2 arcminutes on the sky. When used with the current ST-7 CCD camera, the resulting images have a 20 arcminute field of view and a 2 arcsecond/pixel image scale. Unguided exposures as long as 5 minutes produce untrailed images. Reliable photometry is feasible for objects as faint as 19th magnitude.

As part of a project in Introductory Quantum Laboratory (Physics 316) two students, Tiffany Borders and Ashley Wiren, developed a spectrometer for the Schmidt Cassegrain telescope. With this instrument these students were able to perform calibrations and measure spectra for selected 1st-4th magnitude stars.

4. RESEARCH AND SCIENCE EDUCATION

Cominsky continued as lead of the Education and Public Outreach (E/PO) program for the Gamma-ray Large Area Space Telescope (GLAST), adding responsibility for the Swift E/PO program in June 2002. (Swift is due for launch in late 2003, while GLAST is scheduled for launch in 2006.) Plait is the group's Program Manager, and Tim Graves (SSU physics graduate with distinction in August, 2001) joined the E/PO group as Instructional Technology Consultant in October, 2001. Spear has also joined the GLAST E/PO effort, with specific responsibility for the development of the GLAST Telescope Network (GTN.) The GTN will involve high school and college students in ground-based observations of gamma-ray bursts and active galaxies, to accompany the future high-energy gamma-ray observations that will be done using Swift and GLAST. SSU students Gray Slater, Tiffany Borders and Michelle Curtis also supported the E/PO efforts during the past two years. Sarah Silva (SSU physics graduate cum laude with distinction in June 2002) who was the group's student supervisor and web curator for several years prior to graduation, was hired as Assistant Program Manager after graduation.

In January, 2001, Cominsky's E/PO group began supporting NASA's Structure and Evolution of the Universe Education Forum, creating folders of educational materials that showcase the missions in this scientific theme area. Ten thousand of these folders were distributed to educators in conferences throughout 2001. In the spring of 2002, the E/PO group created kits of materials on the theme of "Seeing and Exploring the Universe." Thus far 5000 of these kits have been distributed. The materials in both the 2001 folder and the 2002 kits can be downloaded from <http://universe.sonoma.edu>.

The E/PO group presented three posters at the joint winter meeting of the AAS and AAPT in San Diego in January 2001. Plait conducted workshops for teachers on the electromagnetic spectrum, using materials developed as part of the Swift E/PO program at the Gamma 2001 meeting in April, 2001, and again at the 113th Meeting of the Astronomical Society of the Pacific in July 2001. Spear presented a poster about the GTN for the winter AAS meeting in Washington DC in January, 2002. In March, 2002 Cominsky and Silva presented workshops to 7th and 8th grade girls about NASA's LEARNERS Space Mysteries project at SSU's Expanding Your Horizons day, and Cominsky gave the same workshop a week later to teachers at the National Science Teacher's Association meeting in San Diego. Space Mysteries are interactive web-based video games that teach physical science and mathematics. Two mysteries are now available to be solved at <http://mystery.sonoma.edu>. In June, 2002 Cominsky participated in the first NASA Office of Space Science Education Conference, held in Chicago where she presented a poster paper on the GLAST Educator Ambassador Program (co-authored with Phil Plait), and moderated a

panel session. In July, 2002 Spear presented an invited paper "Gamma rays and Blazars: More Work for Variable Star Observers" at the Second High Energy Workshop for Amateur Astronomers sponsored by the AAVSO and Marshall Space Flight Center in Waikoloa Beach, Hawai'i.

The E/PO group trained NASA Educator Ambassadors at SSU in mid-July, 2002. Ten master teachers and curriculum designers were previously selected in national competitions organized by SSU, and are representing the GLAST, Swift and SEU Education Forum projects. The Educator Ambassadors help develop, test and disseminate educational materials for NASA.

Spear has initiated a program to monitor a number of gamma-loud active galaxies (AGNs) in the V and I bands. These objects will be extensively observed by GLAST; the SSUO will continue to monitor their optical activity before and during the GLAST mission. This set of optically bright ($m < 18$) blazars forms the basis of the observing list for the GLAST Telescope Network (GTN). Students Tiffany Borders, Jen Price, and Gray Slater are contributing to this observing program. Light curves have been constructed for objects 3c66a, BL Lac, and Mrk501. For more information on the GTN, see <http://glast.sonoma.edu/gtn>.

Spear is continuing a program to observe and analyze interacting binary systems that exhibit apsidal motion. Systems that are observed will be able to provide information about internal stellar structure and relativistic apsidal motion. Systems being observed include DI Her, IU Aur, and Z Dra. Spear and student Jen Price obtained and reduced DI Her data over the summer of 2002. Primary and secondary minima were determined for this object.

Spear is also attempting to determine periods for some of the variable stars discovered by the Hipparchos mission. Student Tiffany Borders has been searching for variable stars in the anti-center region of the Milky Way.

Student Jen Price has been monitoring various minor planets (2002 JR9, 2002 LT24, 2002 LW, 759 Vinifera, 322 Phaeo, 670 Ottegebe, 231 Vindobona) in order to determine the depth of magnitude that the SSUO 0.25-m Epoch is capable of reaching. These data will be used to obtain an observatory number for the SSUO site from the Minor Planet Center.

5. MISCELLANEOUS

SSU's optical observatory was used 14 times for public viewing nights, 43 times for class visits, and 112 nights for research. There were over 350 visitors.

The Department presented its *What Physicists Do* public lecture series, under Tenn's direction, for the 60th through 63rd semesters. Visiting speakers on astronomical topics were Randy Phelps (CSU, Sacramento), Imke de Pater, Andrew Jaffe, & Ben Oppenheimer (UCB), Iwona Sakrejda, Norman Glendenning, & Kevin Lesko (LBNL), Giorgio Gratta (Stanford), Melora Larson, Steve Collins, & Thomas Jarrett (JPL), Greg Laughlin, Max Bernstein, & Diane Wooden (NASA ARC), Nicholas Suntzeff (CTIO), and Wallace Tucker (Harvard-Smithsonian CfA & UCSD).

Cominsky, in her capacity as AAS/High Energy Astrophysics Division Press Officer, organized press briefings for

the Division meeting held in Honolulu, Hawaii in November, 2000. See <http://perry.sonoma.edu/head2000>. As Swift Press Officer, she appeared on PBS television station KQED-TV's Digital West, discussing the State of the Skies. She also organized four press briefings at the Gamma 2001 Symposium (see <http://perry.sonoma.edu/gamma2001>.) As Deputy press officer for the AAS Summer meeting in Pasadena, CA, she moderated many press briefings and then appeared on NPR's Talk of the Nation/Science Friday, reviewing the highlights of the conference. Hear it at: <http://search.npr.org/cf/cmn>. For the Two Years of Science with Chandra Symposium, she co-organized two press briefings, and moderated the NASA Television broadcast of the discovery of X-ray flares from our Galactic Center.

Press activities continued during 2002, when she moderated five press briefings at the AAS winter meeting in Washington DC, including the Q&A with newly appointed Presidential Science Advisor John Marburger III, and moderated one press briefing and assisted with two others at the AAS HEAD meeting in Albuquerque, NM. See <http://perry.sonoma.edu/head2002>. This was her last stint as Press Officer for the High Energy Astrophysics Division of the AAS. After six years, as HEAD's first and only press officer, she has passed the microphone on to a new volunteer (NASA/GSFC's Dr. Ilana Harrus.)

During 2001-2002, Cominsky gave invited physics colloquia about GLAST science at the University of Oregon and at Western Kentucky University in Bowling Green, discussed astronomy education in a keynote address to the Sonoma County Office of Education's Astronomy and Space Symposium, and described various gamma-ray astronomy missions and their use of a global telescope network at the Global Hands On Universe conference in Berkeley. Spear also participated in this conference, lecturing on SSU's Robotic Telescope and contributing to a special session on the Remote Telescope Markup Language (RTML). Cominsky described the wonders of the gamma-ray universe to over 800 people attending the Silicon Valley Astronomy Lecture Series at Foothill College, in Los Altos, CA and again to the San Francisco Amateur Astronomers. At the 30th Coral Gables Conference on Cosmology and Particle Physics, Cominsky gave an invited lecture about X-ray observations of black holes.

In December, 2001 Cominsky was appointed to a Federal Advisory Committee that recommends policy to NASA: the Structure and Evolution of the Universe Subcommittee (SEUS) of the Space Science Advisory Committee.

Tenn presented a poster paper, "What Can You Do with a Bachelor's Degree in Physics?" at the national meeting of the AAPT in San Diego in January 2001 and again at the combined northern and southern California sections of the AAPT in San Luis Obispo in spring 2002. He presented "The Bruce Medalists" to the Historical Astronomy Division of the AAS in Washington in January 2002. He continues to maintain and expand the Bruce Medalists website at: <http://phys-astro.sonoma.edu/BruceMedalists>.

Plait has been very active with his Bad Astronomy public outreach efforts. He still maintains the Bad Astronomy website (<http://www.badastronomy.com>), and has written sev-

eral astronomy articles for Astronomy magazine, both online and in print, as well as Space Illustrated, Muse magazine, and the German newspaper *Die Frankfurter Allgemeine Zeitung*. He completed writing a book, titled “Bad Astronomy,” which was published in March 2002. He has given numerous invited lectures, including the Sonoma County Office of Education’s Astronomy and Space Symposium, a talk about astronomy at the Center For Inquiry-West (a skeptic society in Los Angeles), a talk at the Carnegie Science Center in Pittsburgh, PA, and several planetaria including the Chabot Space and Science Center in Oakland, CA, and the Sudekum Planetarium in Nashville, TN. Plait also consulted on the pilot for a skeptical television program called “Conspiracy Zone,” the topic of which was a debunking of the conspiracy theory that NASA faked the Apollo Moon missions, and has appeared on several radio and television talk shows discussing general astronomy and his website.

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