

power, and specific heat. Two new major pieces of equipment have been added for condensed matter physics research: an X-ray fluorescence spectrometer that is capable of sub *ppm* resolution and a Fourier Transform Infrared spectrometer (FTIR) that permits analysis of spectra in the mid-infrared region. We also have a tunable argon ion laser, a three-stage high temperature furnace, and a fume hood providing a sample preparation environment. This allows us to make many sensitive measurements of condensed matter properties such as resistivity, conductivity, mobility, charge concentration, activation energy, the charge sign of majority carriers, and photoconductivity. It leads us to material science technologies, such as the study of nanowires and nanoparticles. It also leads to bulk samples of novel semiconductors and superconductors, which have great potential for technical applications such as solar cells, sensors, energy conservation, development of high-field magnets, and telecommunications. The Astrophysics Laboratory is loaded with powerful computing equipment, all available to students. It is used for image processing and remote observatory operations. Undergraduate and graduate students can participate in astrophysics research. They use both ground-based telescopes and space observatories, including *Hubble Space Telescope*, *Chandra X-ray Observatory*, and other NASA spacecraft.

We have upgraded instrumentation in our existing Radiation Laboratory and we have begun a new program of research in biomedical physics. In general, the field is subdivided into four subspecialties: nuclear medicine, diagnostic radiology (use of X-rays, MRI, ultrasound, etc.), radiation therapy (the use of radioactive materials produced by accelerators for the treatment of cancer and other diseases), and radiation biology. With the establishment of affiliations with local area medical centers, research opportunities in this field will open up for our students.

We have initiated one of the first medical physics/neuroimaging undergraduate programs in the nation with a grant from the National Institute of Mental Health (NIH/NIMH). Students enrolling in this program will get a chance to intern at the end of the junior year in the finest state-of-the-art laboratories across the nation. Students enrolling in this special degree program will get a chance to intern at the end of their junior year in the finest state-of-the-art laboratories across the nation. Our department has a collaboration with

the VA Medical Center, where students are provided with hands-on instruction on MR scanners and other imaging equipment. The curriculum ranges from courses in MRI/MRS, X-ray imaging, nuclear medicine, and neuroimaging to courses in radiation health physics. This program is designed to provide a solid foundation in physics, biology, and mathematics so that students can tackle the challenges of an interdisciplinary program of graduate instruction in the broad field of neurosciences. The program also aims to serve as a feeder program to graduate schools across the nation. The condensed matter program has recently received a Research Corporation Grant to strengthen its research capabilities in low temperature physics.

The Downing Planetarium, operated by the Physics Department, was completed in the spring of 2000. It has proven highly successful, with more than 200,000 visitors since opening. The planetarium features a computer controlled Minolta MS-10 star projector and a main theater with 74 reclining seats under a 30-foot dome. The facility presents multi-media shows on a daily basis. Physics students have the opportunity to participate in presenting the shows and to assist in planetarium operation.

Adjacent to the planetarium is a campus observatory equipped with a 16-inch Schmidt-Cassegrain telescope and CCD cameras. This observatory has been used for classes and for student research projects. A second observatory with a more advanced 16-inch telescope is operational at a dark site in the Sierra Nevada mountains. This telescope is remotely controlled from campus, and students can download images from it over the Internet without having to go to the telescope site.

**Career Opportunities**

Approximately half of our bachelor's and master's degree graduates have gone directly into graduate school at various institutions, pursuing master's or doctoral degrees in physics or related fields. The other half have found employment in teaching, in industry, in government, and in the medical professions. We have also observed a recent increase in the demand for high school physics teachers.

Physics graduates have the versatility, knowledge, and analytical skills necessary to adapt quickly to the opportunities which arise in the dynamic world of modern science

and high technology. Our graduates report interesting, exciting careers with increasing levels of responsibility and satisfaction.

**Faculty**

- Douglas Singleton, *Chair*
- Gerardo Munoz, *Graduate Coordinator*
- Amir Huda, *Premedical Adviser*
- Vanvilai Katkanant, *Undergraduate Adviser*
- Charles Tenney, *Preoptometry Adviser*
- Steven J. White, *Downing Planetarium Director*
- Manfred Bucher
- Yongsheng Gao
- Raymond Hall
- Pei-Chun Ho
- Frederick Ringwald
- Daqing Zhang

**Bachelor of Science in Physics**

The B.S. in Physics offers preparation appropriate to employment in government and industry involving a range of activities from laboratory work to technical sales. It also offers appropriate background preparation for graduate study in physics and a large number of other fields. With an appropriate choice of electives, it provides a very strong premedical, pre dental, or preoptometry program.

Beyond professional goals, the study of physics provides a deep understanding of fundamental processes which underlie our physical world and fosters methods of inquiry which promote intelligent analysis generally.

**Bachelor of Science Degree Requirements**

<i>Physics Major</i>	<i>Units</i>
<b>Physics requirements</b> .....	<b>47</b>
<i>(see note 1)</i>	
Physics core .....	(33)
PHYS 4A, 4AL, 4B, 4BL, 4C, 102, 104, 105A, 105B, 107A, 110, 115	
Upper-division electives .....	(14)
Includes courses in physics and, with approval, in related fields. Students planning to pursue graduate study in physics are strongly encouraged to take courses from the following list: PHYS 107B, 135, 136, 137, 140, 162, and 170A <i>(see note 2)</i>	