

# Head

Lehigh University

# Subhead

Department of Physics

## Program(s) of Study

The department offers a program of coursework and research leading to the M.S. and Ph.D. degrees in physics. The active research areas of the department include Atomic, Molecular and Optical Physics, Condensed Matter Physics, Fluids, Complex Fluids and Polymers, Plasma Physics, and Statistical Physics. Experimental, theoretical, and computational projects are underway in most areas. Active collaborations also exist with research programs in other departments at Lehigh, particularly Electrical Engineering, and Materials Science and Engineering.

The department's graduate program is designed mainly to lead to a Ph.D. degree. Most students who enter with a bachelor's degree earn a Master's degree after three semesters and one summer. Some of these students have structured their Master's program with some specialization so that they are prepared for employment when they complete the program, but others treat the Master's program as just part of the core program for the Ph.D. program. The student must do either a research project (Physics 491) or a Master's thesis for the Master's degree. The Master's Program requires 30 credit hours of course work (including the three credits of a research project or six credits on Master's Thesis research).

The Ph.D. program includes a set of core courses, including some at the advanced graduate level that provide the broad background in physics that is so important in the long run, specialized courses relevant to the research area of the student, and the research for the Ph.D. dissertation. Most students take five to six years to complete the Ph.D (including the time for an M.S.)

## Research Facilities

Research in the Physics department is carried out in the Sherman Fairchild Center for the Physical Sciences, which consists of two connected buildings containing a wide variety of laboratory and computer facilities, as well as offices, classrooms, and lecture halls. Major equipment includes a 3-MeV Van de Graaff accelerator; three electron spin resonance laboratories; ultraviolet, visible, and infrared spectrophotometers; liquid nitrogen, hydrogen, and helium cryogenic equipment; shock tubes; cosmic ray detectors; many specialty lasers (gas, dye, and solid state); a 20J pulsed laser facility; crystal growing facilities; a mass spectrometer, large interferometers, a Raman spectrometer, an electron microscope, and a high density plasma source; optical multichannel analyzers; streak cameras; and digital signal processors.

The Physics department also maintains a well equipped machine shop employing two skilled machinists. This facility can handle precision machine work, vacuum welding jobs of moderate size, etc. The Department employs two experienced electronics technicians who are able to do in-house servicing of much of our electronics instrumentation.

Lehigh University provides high quality computer resources to support the research of faculty and students. The University is completely networked through a digital PBX system that provides access to hundreds of microcomputers and workstations on campus as well as connections to the internet. The Lehigh University library system, which houses more than 1,000,000 volumes also offers catalog access, searching, and other library services through the computer network.

Lehigh University is a charter member of the Internet2 project. A high-performance connection (155 megabits per second) to the Mid-Atlantic Gigapop in Philadelphia for Internet2 (MAGPI) allows members of the campus community to participate in research and educational activities with other Internet2 schools, as well as with corporations and research sites on the various interconnected national and international high-speed networks.

## **Financial Aid**

Teaching assistantships are normally available for graduate students. For 2002–2003, the stipend for beginning teaching assistants is \$16,800 for twelve months, and tuition is remitted for the standard course load (up to nine hours of course work per semester). Also, summer support may be available during the summer prior to beginning graduate study. Some university endowed fellowships are available to outstanding candidates; the stipend depends on the particular award. Research assistantships are available for advanced students and typically furnish a twelve-month stipend.

## **Cost of Study**

Tuition for 2002–2003 is \$920 per credit hour for teaching and research assistants, but nearly all assistantships include full tuition credit.

## **Living and Housing Costs**

Graduate students at Lehigh live in a wide variety of accommodations. These range from apartments and rooms within walking distance of campus to modern garden apartments a few miles away. Expenses can be reasonable, especially if accommodations are shared. The University operates a 148-unit five-building garden apartment complex for married and graduate students, located on the Saucon Valley campus. The monthly cost for an efficiency is \$395, for a one-bedroom apartment is \$460–495, and for a two-bedroom apartment is \$510–535 plus electricity. Free bus service to the main campus is provided hourly.

## Student Group

The department has about 30 graduate students, of whom nine are women. All full time graduate students currently receive financial aid from Lehigh. 50% of the graduate students are currently U.S. citizens.

## Student Outcomes

Recent physics graduates are employed in academic and industrial positions. The academic positions include post-doctoral positions, but several have found tenure track assistant professorships at institutions including the following: United States Naval Academy, Drew University, Moravian College (PA), Lebanon Valley College (PA), King's College (PA), Kutztown University (PA), and Rowan College (NJ). Industrial positions include NIST, Lucent Technology, Texas Instruments, and Brookhaven National Laboratory.

## Location

Lehigh University is located in Bethlehem, PA. The immediate vicinity is urban, but the greater Lehigh Valley area includes many scenic, rural areas. Bethlehem is 50 miles north of Philadelphia and 75 miles southwest of New York City. The University is located near several major highways and the Lehigh Valley International Airport.

## The University and the Department

The University offers a wide variety of resources for the personal and professional development of its diverse student body. Organizations exist for theatre, music, volunteer and community service, intramural athletics, religious activities, and various hobbies.

The Department of Physics is part of the College of Arts and Sciences, which is one of four Colleges at Lehigh University. Physics graduate students may participate in all university sponsored activities.

## Applying

For admission to the graduate programs, a Bachelors degree in physics or a related field is required with a minimum undergraduate GPA of 3.0. The GRE is required. The minimum acceptable score suggested for admission is verbal 550, quantitative 650, total 1,200. The GRE Advanced is required. The minimum acceptable score suggested for admission is 600. Students from non-English speaking countries are required to demonstrate proficiency in English via the TOEFL exam and the University SPEAK test for teaching assistants. Applicants are normally expected to have TOEFL scores of at least 600 (for the old, paper-based test) or 250 (for the new, computer-based test). The deadline for applications for fall admission and financial aid is March 15.

## Correspondence and Information

Address correspondence to:

Graduate Admissions Officer  
Department of Physics  
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Bethlehem, PA 18015

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fax: (610) 758-5730  
email: physics@lehigh.edu  
web: www.physics.lehigh.edu

## The Faculty and Their Research

Glenn Bateman, Research Professor, Ph.D. (Princeton, 1970), Theoretical and computational plasma physics.

Ivan Biaggio, Assistant Professor, Ph.D. (ETH Zürich, 1993), Nonlinear optics, four-wave mixing, self-assembled supramolecular films for guided-wave applications, and charge transport in polar crystals and organic semiconductors.

Garold Borse, Professor, Ph.D. (Virginia, 1966), Nuclear theory. Investigation of anomalous properties of spherical-vibrational nuclei using the techniques of boson expansion.

Gary G. DeLeo, Professor and Chair, Ph.D. (Connecticut, 1979), Theoretical solid state physics. Electronic structure of deep-level defects in semiconductors using molecular orbital theory and molecular dynamics.

Volkmar Dierolf, Associate Professor, Ph.D. (Utah, 1992) Solid state physics and integrated optics.

Robert T. Folk, Professor, Ph.D. (Lehigh, 1958), Theory of very light nuclei. Elastic properties of solids.

W. Beall Fowler, Professor Emeritus, Ph.D. (Rochester, 1963), Theoretical solid state physics. Calculations of electronic properties of defects in insulators and semiconductors using molecular orbital theory. Theory of defects near oxide-semiconductor interfaces.

James D. Gunton, Professor, Ph.D. (Stanford, 1967), Theoretical statistical physics. Kinetics of first-order phase transitions and the development of order from disorder. Pattern formation in nonlinear nonequilibrium systems.

A. Peet Hickman, Professor, Ph.D. (Rice, 1973), Theoretical atomic and molecular physics. Quantum mechanical calculations of atom-atom collisions important in the atmosphere.

John P. Huennekens, Professor, Ph.D. (Colorado, 1982), Experimental atomic and molecular physics. Studies of collisional processes in atomic vapors including excitation transfer, energy pooling, velocity-changing collisions, and line broadening.

Alvin S. Kanofsky, Professor, Ph.D. (Pennsylvania, 1966), High-energy experimental physics.

Yong W. Kim, Professor, Ph.D. (Michigan, 1968) Experimental atomic and statistical physics. Interaction of high-power lasers with plasmas and plasmas. Self-organized criticality and  $1/f$  dynamics in granular media.

Arnold H. Kritz, Professor, Ph.D. (Yale, 1961), Theoretical and computational plasma physics. Studies of heating and transport effects in magnetically confined toroidal plasmas.

Research is closely related to experiments at major fusion laboratories.

Jerome Licini, Associate Professor, Ph.D. (M.I.T., 1987), Experimental solid state physics. Quantum transport behavior of electrons. Conduction in ultra-small silicon MOSFETs and gallium arsenide devices at low temperature and high magnetic field.

George E. McCluskey, Jr., Professor, Ph.D. (Pennsylvania, 1965), Binary stars. Space astronomy.

Daniel Ou-Yang, Professor, Ph.D. (UCLA, 1985), Experimental studies of complex fluids such as polymer solutions, colloidal suspensions, and surfactant solutions. Kinetic, structure, and thermodynamics of polymers at liquid-solid interfaces.

Russell A. Shaffer, Associate Professor, Ph.D. (Johns Hopkins, 1962), Theoretical physics.

Michael Stavola, Professor, Ph.D. (Rochester, 1980), Experimental solid state physics. Vibrational spectroscopy and uniaxial stress techniques are used to study point defects in semiconductors.

Jean Toulouse, Professor, Ph.D. (Columbia, 1981) Experimental solid state physics. Structural and ferroelectric phase transitions in disordered or partially ordered crystals. High  $T_c$  superconductivity. Dynamic effects of defect motion in solids.

George D. Watkins, Professor Emeritus, Ph.D. (Harvard, 1952), Experimental solid state physics. Studies of point defects in elemental and compound semiconductors. Magnetic resonance and optical spectroscopy in solids.