

DREXEL UNIVERSITY

DEPARTMENT OF PHYSICS

Philadelphia, Pennsylvania 19104

Students Accepted For Degree	FIELDS		
	Physics	Astronomy	Related Fields
Doctorate	X		
Master's	X		

1. General

President: Constantine Papadakis
Dean of the College of Arts and Sciences: Donna Murasko
Department Head: Michel Vallières
Department Telephone Number: (215) 895-2708
Type of Institution: University
Control: Private
Setting: Urban
Total Faculty: 1,413
Total Students: 19,845
Total Graduate Students: 6,939
Annual Graduate Tuition:
All Graduate Students: \$760/cr. hr.
Tuition rates for: 2006–07
Deferred tuition plan: Yes
General Fees: \$210 full-time
 \$105 part-time
Term: Quarter

2. Number of Faculty in Department

The combined total of full-time faculty in the three professorial ranks is 21. The combined total of full-time, part-time, and other faculty at all ranks is 26.

3. Admission, Financial Aid, and Housing

Address admission inquiries to: Director of Graduate Admissions
Graduate application fee required: \$50 (waived for online application)
Admission deadline (Fall admission): 9/1. 3/1 for consideration for financial support (TA/RA)
Admission information: For fall admission, 2007–08, 12 students were accepted with full financial support from 155 applicants.
Admission requirements: For admission to the graduate programs, a Bachelor's degree in an approved program is required with a minimum undergraduate GPA of 3.0/4.0 specified. The GRE general and Physics Subject tests are required for financial aid. Students from non-English speaking countries are required to demonstrate proficiency in English via the TOEFL exam. Minimum acceptable score for admission is 550, but opportunities for financial aid are greater for TOEFL scores near or above 600. Teaching assistants educated in non-English-speaking countries must complete a special English program.
Undergraduate preparation assumed: A minimum math preparation of differential equations is essential, and some physics intermediate courses, such as Symon, *Mechanics*; Corson and Lorrain, *Electricity and Magnetism*; Merzbacher, *Quantum Mechanics*. Programs tailored to individual students' backgrounds and needs.
Address financial aid inquiries to: Dr. Michael Vogeley, Director of Graduate Studies, Department of Physics
GAPSFAS application required: No
Financial aid deadline: 3/1

Loans available: No

Address housing inquiries to: Office of Residential Living

On-campus, single student housing available: Yes

Cost/quarter: \$2,520 (undergraduate priority)

On-campus, married student housing available: No

Table A—Faculty, Enrollments, and Degrees Granted

Research Specialty	2006–07 Faculty	Enrollment ¹ Fall 2006		No. of Degrees Granted ² 2005–06 (2001–06)			Median No. of Years for 2006–07 Ph.D.'s
		Mas-ter's	Doc-torate	Mas-ter's	Terminal Master's	Doc-torate	
Astrophysics	4	0	7	0(0)	1(4)	0(2)	
Atmos./Space Phys., Cosmic Rays	1	0	0	0(0)	0(0)	0(0)	
Atomic, Molecular, & Optical Physics	0	0	0	0(1)	0(0)	1(2)	
Biophysics	6	0	13	3(4)	0(5)	1(4)	
Condensed Matter Physics	3	0	3	0(0)	3(4)	0(1)	
Low Temperature Physics	1	0	0	0(0)	0(0)	0(0)	
Nuclear Physics	1	0	0	0(0)	0(0)	0(1)	
Particles & Fields	3	0	3	0(2)	0(0)	0(0)	
Physics Education	1	0	0	0(0)	0(0)	0(0)	
Other Theoretical/Math.	1	1	7	1(4)	0(0)	1(4)	
Non-specialized		0	4	0(0)	0(0)	0(0)	
Total		1	37	4(11)	4(13)	3(14)	
Full-time Grad. Stud.			38				
Part-time Grad. Stud.			1				
First-year Grad. Stud.			9				
Median Years in Grad. Study (2004–05 Degrees)							
Undergraduate Degrees, 2004–05 (2000–05):8(30)					8(30)		

¹ Students not yet committed to a research specialty are entered under non-specialized.

² Five-year totals in parentheses.

4. Graduate Degree Requirements

Master's: The requirement for the Master's degree is 45 quarter credits in an approved program. The student is required to maintain at least a 3.0 GPA. There is no thesis or foreign language requirement for the M.S. degree. There is no specific residence requirement for the M.S. degree. There are no examinations required for the M.S. degree.

Doctorate: In addition to required graduate-level coursework in physics, the successful Ph.D. candidate must (a) pass the Ph.D. candidacy examinations, both written and oral; (b) satisfy a residence requirement of one academic year; and (c) perform original research, write a satisfactory thesis describing that research, and defend the thesis in an oral examination. There is no foreign language requirement.

Thesis: Thesis may be written *in absentia*.

Special Equipment, Facilities, or Programs: The department stresses multidisciplinary work both inside and outside of the department. Special facilities and laboratories include:

(1) *Astrophysics Facilities:* Numerical Astrophysics Facility, primarily networked LINUX workstations emphasizes theoretical and numerical studies of stars, star clusters, the early Universe, galaxy distributions, cosmology modeling and gravitational lensing. Large file server provides access to

Sloan Digital Sky Survey data. The facility also employs special purpose high performance computers, such as the Gravity Pipeline Engine (GRAPE). It also includes a new 48 dual AMD processors distributed memory Beowulf cluster. The Joseph R. Lynch Observatory houses a 16 inch Mead Schmidt-Cassegrain telescope equipped with SBIG CCD camera.

- (2) *Biophysics Facilities*: (a) Pulsed Laser laboratory focuses on the development of instrumentation systems and their application to the measurement of time-dependent biophysical and biochemical phenomena. Laser photolysis of caged ATP and caged Ca²⁺ techniques are examples which are being used in the study of the molecular mechanism of muscle contraction. (b) Modulated excitation kinetics laboratory uses frequency domain techniques to follow internal dynamics of biological molecules. (c) Spatially resolved kinetics laboratory uses simultaneously resolved spatio-temporal data at microscopic resolution to follow biological self-assembly processes, such as polymerization of sickle hemoglobin. (d) Atomic Force Microscope (AFM) facility to study elastic properties of protein molecules. (e) Graphics/Computational facility utilizes a SUN Microsystem V880 4 processors shared memory system, a SUN Microsystem Blade 200 high-end graphic workstation, an SGI Origin 200 server, and an SGA Octane Graphic workstation. 44 dual Xeon Beowulf cluster. (f) Preparative laboratory provides facilities for biological sample purification and characterization.
- (3) *Condensed Matter Facilities*: Ultra-low temperature laboratory has a dilution refrigerator, ³He and ⁴He cryostats and microwave sources to study quantum phenomena in nano- and microscale devices, superconducting qubits, nanostructures and quantum fluids and solids.
 - (a) *Magnetic material*: laboratory conducts research on amorphous magnetic thin films, fiber optical sensors, and high-T_c superconductors. (b) Surface science laboratory has scanning probe microscopy to study surface structure interfaces at the atomic level.
- (4) *Particle Physics Facilities*: Detector development laboratory provides experimental support for an international research program in nonaccelerator particle and nuclear physics performing tests of invariance principles and conservation laws, and neutrino oscillations.
- (5) *General Support Facilities*: Include an electronics shop capable of custom design and fabrication of electronics and computer components, and a machine shop to assist in the design, construction, and repair of mechanical component.
- (6) *Parallel Computing server*: 32 dual processors Pentium III computers linked via fast ethernet switches form a general purpose parallel computing server.

Table B—Appointments to Graduate Students, 2006–07

Title of Appointee	Appointments		Academic Load Allowed in Credit Hours	Hours of Service Per Week	Stipend for Academic Year (\$)
	Total	First year			
Quarter					
Teaching Assistant ^{1,2}	25	9	9	20	15,000
Research Assistant ^{1,2}	8	0	9	20	15,000–18,000
Self-supported	6	0	9	–	
Total	39	9			

¹ 3-month summer appointments also available.

² Plus tuition remission.

Table C—Separately Budgeted Research Expenditures

Research Specialty	No. of Grants	Expenditures (\$)
Astrophysics	22	1,161,100
Biophysics	8	651,200
Condensed Matter	1	42,000
Particles & Fields	2	89,500
Total	33	1,943,800

FACULTY

Professors

- Bose**, Shymalendu, Ph.D., Maryland, 1967. Fullerenes and carbon nanotubes; superconductivity; x-ray and electron spectroscopies of solids
- DiNardo**, N. John, Ph.D., Pennsylvania, 1982. Studies of surfaces and interfacial phenomena in solids (metals, semiconductors, and insulators), polymer thin films, and biomaterials; scanning probe microscopies, inelastic electron-scattering spectroscopy (HREELS) and photoelectron spectroscopy.
- Ferrone**, Frank, Ph.D., Princeton, 1974. Experimental and theoretical protein dynamics; kinetics of biological self-assembly. Sickle Hemoglobin.
- Finegold**, Leonard X., Ph.D., London, 1959. Biophysics; granular physics.
- Gilmore**, Robert, Ph.D., MIT, 1967. Analysis of data from chaotic dynamical systems; applications of group theory to problems in atomic, molecular, nuclear, and solid state physics.
- House**, Frederick B., Ph.D., Wisconsin, 1965. Satellite meteorology; Earth energy budget.
- Lane**, Charles C., Ph.D., Cal. Tech., 1987. Nonaccelerator-based particle physics. Solar neutrinos and neutrino oscillations (Projects CHOOZ and KamLAND).
- Lim**, Tech-Kah, Ph.D., Adelaide, 1968. Physics education.
- McCray**, James A., Ph.D., Cal. Tech., 1962. Professor Emeritus. Laser photolysis of caged-compounds.
- McMillan**, Stephen L. W., Ph.D., Harvard, 1983. Stellar dynamics; large-scale computations of stellar systems.
- Steinberg**, Richard I., Ph.D., Yale, 1969. Experimental tests of invariance principles and conservation laws; solar neutrinos and neutrino oscillations (Project CHOOZ).
- Tyagi**, Somdev, Ph.D., Brigham Young, 1976. Physics of high-temperature superconductivity; magnetic properties of thin-sputtered films of amorphous metallic alloys; fiber optical sensors giant magnetoresistive (GMR) materials.
- Vallières**, Michel, Ph.D., Pennsylvania, 1972. Department Head. Large-scale shell-model calculations; computer architecture for nuclear physics problems.
- Venkataraman**, T. S., Ph.D., Worcester Polytechnic, 1976. Physics and Engineering education.
- Yuan**, Jian-Min, Ph.D., Chicago, 1973. Theoretical and computational biophysics, biological pathways and networks, protein folding and stability, protein aggregation, systems biology, and nonlinear dynamics.

Associate Professors

- Vogele**, Michael S., Ph.D., Harvard, 1993. Cosmology; Sloan Digital Sky Survey; formation of structure in the universe.
- Yang**, Guoliang, Ph.D., Southern Illinois, 1992. Atomic force microscope (AFM) study of single protein molecules; elastic properties of individual DNA and protein molecules.

Assistant Professors

- Ghosh**, Avijit, Ph.D., Columbia, 1999. Theoretical/computational biophysics. Protein folding. Drug binding. Solvation models, signal transduction pathways, computational and numerical methods.
- Goldberg**, David M., Ph.D., Princeton, 2000. Gravitational lensing; cosmic microwave background; cosmology; computational physics.
- Maricic**, Jelena, Ph.D., Hawaii, 2005. Neutrino Oscillations, Geoneutrinos, Solar Neutrinos, and Neutrino Applications.
- Ramos**, Roberto, Ph.D., Washington, 1999. Low temperature condensed matter physics, quantum computing, nanoscience, quantum fluids and solids.
- Richards**, Gordon, Ph.D., Chicago, 2000. Quasars, Quasars Absorption Lines, Gravitational Lensing, Galaxy Evolution, Sloan Digital Sky Survey.

Research Faculty

- Aprelev**, Alexey, Ph.D., St. Petersburg, 1995. Experimental Biophysics.
- Constantin**, Anca, Ph.D., Ohio U., 2004. Active galactic nuclei.
- Ivanova**, Maria, Ph.D., Leningrad Nuclear Physics Institute, USSR Academy of Sciences, 1986. Experimental biophysics.
- MacNiece**, Peter, Ph.D., Cambridge, 1994. Solar Physics; Magnetohydrodynamics; high-performance computing; parallel adaptive mesh refinement techniques.
- Olson**, Kevin, Ph.D., Massachusetts. Development of parallel, numerical algorithms for Astrophysics applications.
- Vespirini**, Enrico, Ph.D., Pisa, 1994. Evolution of galaxies and globular clusters, numerical simulations.

Woerdman, Dara, Ph.D., Baltimore, 1996.

Postdoctoral Fellows

- Allred**, Joel, Ph.D., Washington, 2005. Simulations of solar and stellar flares.
- Su**, Meihong, Ph.D., Beijing, 2002. Protein unfolding/refolding with single molecule manipulation methods.

Visiting Faculty

Hoyle, Fiona, Ph.D., Durham, 2000. Cosmology, galaxy surveys.

RESEARCH SPECIALTIES AND STAFF**Theoretical**

- Astrophysics. Goldberg, Hoyle, McMillan, MacNiece, Richards, Vogeley.
- Atmospheric Science. House.
- Biophysics. Ghosh, Yuan.
- Condensed Matter Theory. Bose.
- Mathematical Physics. Gilmore.
- Nuclear Physics. Vallières.

Experimental

- Applied Physics. Tyagi.
- Biophysics. Ferrone, Finegold, McCray, Yang.
- Condensed Matter Physics. DiNardo, Ramos, Tyagi.
- Nonaccelerated-based Particle Physics. Lane, Maricic, Steinberg.