

UNIVERSITY OF PITTSBURGH

DEPARTMENT OF PHYSICS AND ASTRONOMY

<http://www.phyast.pitt.edu>

Pittsburgh, Pennsylvania 15260

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

1. General

Chancellor: Mark A. Nordenberg

Dean: N. John Cooper

Department Chairman: David Turnshek

Department Telephone Number: (412) 624-9000

Web Site: <http://www.phyast.pitt.edu>

Department Fax Number: (412) 624-9163

Type of Institution: University

Control: Both

Setting: Urban

Total Faculty: Main Campus: 4,485

Total Graduate Faculty: 1,286

Total Students: Main Campus: 27,020

Total Graduate Students: 9,812

Term: Trimester

Annual Graduate Tuition:

Tuition rates for: 2007–08

In-state residents: Full-time—\$14,880 (2 term)

Part-time—\$604/credit

Out-of-state residents: Full-time—\$26,920 (2 term)

Part-time—\$1,103/credit

Deferred tuition plan: Yes

Other Fees:*

Health—\$65 (full-time)

Activities—\$20 (full-time)/\$10 (part-time)

Computing & Network Services—\$150 (full-time)/
\$75 (part-time)

Security, Safety & Transportation—\$90 (full-time
and part-time)

*Fees are per term and subject to change.

2. Number of Faculty in Department

The combined total of full-time faculty in the three professorial ranks is 38. The combined total of full-time, part-time, and other faculty at all ranks is 55.

3. Admission, Financial Aid, and Housing

Address admission inquiries to: Admissions Officer, Department of Physics and Astronomy, 100 Allen Hall, Univ. of Pittsburgh, Pittsburgh, PA 15260. lmh@pitt.edu

Admission deadline (Fall admission): 1/31

Admission information: For fall admission, 2008–09, 70 students were accepted from approximately 310 applicants.

Admission requirements: For admission to the graduate programs, a Bachelor's degree in one of the physical sciences, mathematics or engineering is required with a minimum undergraduate GPA of 3.0 in mathematics and physics specified. The GRE and the GRE Advanced are required under normal circumstances. Students from non-English speaking countries

are required to demonstrate proficiency in English via the TOEFL (550), iBT (80), or IELTS (6.5) exams. (Minimum score).

International Students: See <http://www.ois.pitt.edu/>

Department Financial Aid: Considered at time of admission review. Teaching and research assistantships, several fellowships for new students.

GAPSFAS application required: No

Student Loan Financial Aid deadline: Recommended 90 days prior to term, inquiries to: Financial Aid Office, 4227 Fifth Ave., Alumni Hall, University of Pittsburgh, Pittsburgh, PA 15260

Loans available: Yes (some federal restrictions)

Address housing inquiries to: Dept. Property Management, 127 N. Bellefield Ave., Pittsburgh, PA 15213

<http://www.ocl.pitt.edu> and www.pc.pitt.edu/index.html

Near-campus, various housing available: Limited

On-campus, married student housing available: Yes

Table A—Faculty, Enrollments, and Degrees Granted

Research Specialty	2007–08 Faculty	Enrollment ¹ Fall 2007–08		No. of Degrees Granted ² 2007–08		
		Mas- ter's	Doc- torate	Mas- ter's	Terminal Master's	Doc- torate
Astronomy/ Astrophysics	9	0	17	0(0)	0(0)	2(7)
Atomic, Molecular, & Optical	2	0	0	0(0)	0(0)	0(1)
Chemical Physics	1	0	1	0(0)	0(0)	0(2)
Condensed Matter	12	0	35	0(0)	0(0)	2(14)
General Relativity	2	0	0	0(0)	0(0)	0(4)
Particle Physics	13	0	11	0(0)	0(0)	0(6)
Solid State Physics	2	0	2	0(0)	0(0)	1(3)
Other Specialized	3	0	3	0(0)	0(0)	1(4)
Non-specialized	0	2	9	18(66)	5(23)	0(0)
Total	44	2	79	17(70)	3(9)	6(41)
Full-time Grad. Stud.		0	99			
Part-time Grad. Stud.		0	0			
First-year Grad. Stud.		0	9			
Undergraduate Degrees², 2006–07 (2003–08):						18(94)

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

²Five-year totals in parentheses.

4. Graduate Degree Requirements

Doctorate: Ph.D. students must successfully complete the following six graduate-level core courses: Dynamical Systems (one term), Statistical Mechanics and Thermodynamics (one term), Classical Electricity and Magnetism (two terms), and Non-relativistic Quantum Mechanics (two terms). Exemptions from any of these courses may be granted if a student has successfully completed an equivalent course elsewhere. Students must complete these core courses with a quality point average of at least 3.00, which corresponds to a B average; they must also maintain a QPA of at least 3.00 in all of their graduate courses. In order to satisfy the Ph.D. Comprehensive Examination requirement, students must achieve a

score of at least 60% on the final examination in each of the six core courses. This requirement must be fulfilled within the first two years unless an extension is granted. After passing the Ph.D. Comprehensive Examination, the student must find a research advisor and begin the process that leads to Admission to Candidacy and ultimately to the preparation and defense of a satisfactory dissertation. All Ph.D. students are required to serve for two terms as a Teaching Assistant in introductory undergraduate laboratories or recitations. An exemption may be granted if a student has substantial prior teaching experience. There is no foreign language requirement. There is a residence requirement of six full terms, with a total of 72 credit hours. Under some circumstances up to two terms of prior graduate work may be transferred from another institution.

Master's: Candidates for the M.S. degree must satisfy the Preliminary Evaluation, which requires the successful completion of at least one course in each of the following core subjects: Dynamical Systems, Statistical Mechanics and Thermodynamics, Electricity and Magnetism, and Quantum Mechanics, with a final examination score of at least 50% for courses at the graduate level or 60% for courses at the advanced undergraduate level. M.S. candidates may elect one of three alternative options to earn the degree: (1) Submit a thesis and successfully complete at least six courses (at least four must be at the graduate level and the balance at the advanced undergraduate level); (2) Submit no thesis but successfully complete at least eight courses (at least four must be at the graduate level and the balance at the advanced undergraduate level); (3) Submit no thesis but successfully complete at least six courses at the graduate level. M.S. students must maintain a quality point average of at least 3.00, which corresponds to a B average, in the core subjects **and** in all of their courses. There is no foreign language requirement. There is a residence requirement of two full terms with a total of 24 credits.

Other Programs: Interdisciplinary research programs may be arranged on a case-by-case basis. There have been Physics Doctorates awarded for work done in collaboration with the faculty members in the Chemistry Department, the Mathematics Department, the Materials Science Department, the Electrical and Chemical Engineering Departments, the Department of Biological Sciences, the Department of Computational Biology and the Department of Radiology in the School of Medicine, among others.

Special Equipment, Facilities, or Programs: The Department of Physics and Astronomy is located on the main campus in a complex of five interconnecting buildings. The Department facilities include a professionally-staffed machining shop, electronics shop, and glass-blowing shop, as well as extensive Departmental and University computer resources. Departmental students have easy access to the facilities and expertise available at the Peterson Institute of NanoScience and Engineering (PINSE) on the University campus and the Pittsburgh Supercomputing Center (PSC). Other local facilities include Allegheny Observatory. Experimentals in particle physics are carried out at national and international facilities such as Fermi National Laboratory in Chicago and CERN in Switzerland. Similarly, astrophysics/cosmology ground-based programs are conducted at national and international observatories located at, for example: Kitt Peak and Mount Hopkins, in Arizona, Cerro Tololo, Las Campanas, and La Silla in Chile; Mauna Kea in Hawaii; and Apache Point in New Mexico for collection of Sloan Digital Sky Survey data.

Pitt faculty also make use of space-based telescopes, for example: the Hubble Space Telescope; the Chandra X-ray Telescope; and the GALEX UV Telescope. Pitt faculty are also members of several current and/or future large-telescope consortia: the Sloan Digital Sky Survey (SDSS); the Atacama Cosmology Telescope (ACT); the Panaramic Survey Telescope & Rapid Response System (Pan-Starrs); and the Large Synoptic Survey Telescope (LSST).

Table B—Appointments to Graduate Students, 2007–08

Title of Appointee	Appointments		Academic Load Allowed in Credit Hours	Hours of Service Per Week	Stipend for Academic Year (\$)
	Total	First year			
Semester					
Teaching Assistant	30	16	15	15–20	13,995 ¹
Research Assistant	47	0	15	15–20	13,995 ¹
Teaching Fellow	2	0	15	15–20	14,560 ¹
Part-time Instructors	3	0	15	15–20	n/a
A. W. Mellon Fellow	2	0	15	0	16,500 ²
Zaccheus Daniel Fellow	1	0	15	0	8,350 ²
Mary L. Wargha Fellow	1	1	15	0	16,500 ^{2,3}
E. Baranger Fellow (new for Fall 2005)	0	0	15	0	16,500 ²
GK12 Fellow	1	0	15	0	30,000
Total	88	18			

¹These are two-term salaries. Some third term appointments are available. Most courses are offered during the first two terms. Students are encouraged to engage in research during the third term. Scholarships covering tuition and required fees supplement these appointments. Individual medical insurance is covered.

²Two-term stipend available in 8- or 12-month payments. May be supplemented with third term teaching or research from department, if available.

³Supplemental funds of \$4,000 for travel, research, and other professional expenses during the first year.

University fellowships exist for certain groups who continue to be underrepresented in the national pool of earned doctorate degrees as well as within the professorate at the University.

5. Personnel Engaged in Separately Budgeted Research, 7/07–6/08

Professorial faculty	26
Other faculty	6
Postdoctoral appointments	16
Graduate Students	61
Undergraduate Students	48
Nonteaching research personnel	4
Total	161

6. Separately Budgeted Research by Source of Support 7/07–6/08 (\$K)

	Departmental Research
Federal government	\$5,769
Other	0
Total	\$5,769

7. Separately Funded and Managed Laboratories: Allegheny Observatory

Table C—Separately Budgeted Research Expenditures

Research Specialty	No. of Grants	Expenditures (\$K)
Astronomy & Astrophysics	30	807
Atomic, Molecular & Optical	0	0
Condensed Matter & Solid State	38	2,854
General Relativity	4	68
Particle Physics	20	1,299
Other	14	741
Total	106	5,769

FACULTY

Professors

- Boyanovsky**, Daniel, Ph.D., California, Santa Barbara, 1982. Theoretical condensed matter physics; particle astrophysics, and astrophysics and cosmology
- Coalson**, Rob, Ph.D., Harvard, 1984. Chemical physics.
- Duncan**, H. E. Anthony, Ph.D., MIT, 1975. Theoretical particle physics.
- Dytman**, Steven A., Ph.D., Carnegie-Mellon, 1978. Experimental particle physics, neutrino physics.
- Hillier**, D. John, Ph.D., Australian National, 1984. Theoretical and observational astrophysics; computational physics.
- Jasnow**, David M., Ph.D., Illinois, 1969. Theory of phase transitions; statistical physics, biological physics.
- Johnsen**, Rainer, Ph.D., Kiel, Germany, 1966. Experimental atomic and plasma physics.
- Koehler**, Peter F. M., Ph.D., Rochester, 1967. Experimental high-energy particle physics; physics education research.
- Levy**, Jeremy, Ph.D., California, Santa Barbara, 1993. Experimental condensed matter, quantum information.
- Maher**, James V., Ph.D., Yale, 1969. Provost. Experimental solid state physics; critical phenomena; physics of fluids.
- Petek**, Hrvoje, Ph.D., California, Berkeley, 1985. Experimental condensed matter/AMO, nanoscience, solid-state physics.
- Roskies**, Ralph Z., Ph.D., Princeton, 1965. Director, Supercomputer Center. Theoretical particle physics; use of computers in theoretical physics.
- Schulte-Ladbeck**, Regina, Ph.D., Heidelberg, 1985. Astrophysics.
- Shepard**, Paul, Ph.D., Princeton, 1969. Experimental particle physics.
- Snoke**, David W., Ph.D., Illinois, 1990. Experimental condensed matter and solid state physics.
- Stewart**, G. Alec, Ph.D., Washington, 1969. Dean, University Honors College. Experimental solid-state physics.
- Turnshek**, David A., Ph.D., Arizona, 1981. Chair of the Department. Astrophysics; extragalactic astronomy; observational cosmology.
- Wu**, Xiao-Lun, Ph.D., Cornell, 1987. Experimental condensed matter; biological physics.

Associate Professors

- Boudreau**, Joseph, Ph.D., Wisconsin, 1991. Experimental particle physics.
- Devaty**, Robert P., Ph.D., Cornell, 1973. Experimental solid state physics.

- Kosowsky**, Arthur, Ph.D., Chicago, 1994. Theoretical and Experimental cosmology and astrophysics.
- Leibovich**, Adam, Ph.D., California Institute of Technology, 1997. Director of Graduate Studies. Theoretical particle physics.
- Mueller**, James A., Ph.D., Cornell, 1989. Undergraduate Program Director. Experimental particle physics.
- Naples**, Donna, Ph.D., Maryland, 1993. Experimental neutrino physics.
- Paolone**, Vittorio, Ph.D., California, 1990. Experimental high-energy particle physics.
- Savinov**, Vladimir, Ph.D., Minnesota, 1996. Experimental particle physics.
- Singh**, Chandralekha, Ph.D., California, Santa Barbara, 1993. Polymer physics; physics education research.
- Swanson**, Eric, Ph.D., Toronto, 1991. Theoretical particle physics.

Assistant Professors

- D'Urso**, Brian, Ph.D., Harvard, 2003. Experimental condensed matter physics, nanoscience.
- Dutt**, Gurudev, Ph.D., University of Michigan, 2004. Experimental condensed-matter/AMO science, quantum information.
- Freitas**, Ayres, Ph.D., University of Hamburg, 2002. Theoretical particle physics.
- Liu**, W. Vincent, Ph.D., Texas at Austin, 1999. Theoretical condensed matter.
- Newman**, Jeffrey, Ph.D., U. C. Berkeley, 2000. Astrophysics, extragalactic astronomy, observational cosmology.
- Wood-Vasey**, Michael, Ph.D., California at Berkeley, 2004. Astrophysics, extragalactic astronomy, observational cosmology.
- Salman**, Hanna, Ph.D., Weizmann Institute of Science, 2002. Experimental biological physics.
- Zentner**, Andrew, Ph.D., The Ohio State University, 2003. Theoretical cosmology.

Professors Emeriti

- Anderson**, John H., Ph.D., Chicago, 1954.
- Baranger**, Elizabeth U., Ph.D., Cornell, 1954.
- Bayfield**, James E., Ph.D., Yale, 1967.
- Biondi**, Manfred A., Ph.D., MIT, 1949.
- Cleland**, Wilfred E., Ph.D., Yale, 1964.
- Cohen**, Bernard L., Ph.D., Carnegie-Mellon, 1950.
- Drisko**, Richard M., Ph.D., Carnegie-Mellon, 1955.
- Engels**, Jr., Eugene, Ph.D., Princeton, 1962.
- Garfunkel**, Myron P., Ph.D., Rutgers, 1951.
- Gatewood**, George D., Ph.D., Pittsburgh, 1972.
- Gerjuoy**, Edward, Ph.D., California, Berkeley, 1942.
- Goldburg**, Walter I., Ph.D., Duke, 1955.
- Halliday**, David, Ph.D., Pittsburgh, 1942.
- Hazard**, Cyril, Ph.D., Manchester, 1954.
- Janis**, Allen I., Ph.D., Syracuse, 1957.
- Lowe**, Irving J., Ph.D., Washington (St. Louis), 1957.
- Newman**, Ezra T., Ph.D., Syracuse, 1956.
- Pratt**, Richard H., Ph.D., Chicago, 1959.
- Saladin**, Juerg X., Ph.D., Eidgenossische Technische Hochschule, Switzerland, 1959.
- Stehle**, Philip, Ph.D., Princeton, 1944.
- Tabakin**, Frank, Ph.D., MIT, 1963.
- Vincent**, C. Martin, Ph.D., Witwatersrand, South Africa, 1966.
- Yates**, John T., Ph.D., M.I.T., 1960.
- Zipf**, Edward C., Ph.D., Johns Hopkins, 1961.

Adjunct Associate Professors

- Boyd**, Steven, Ph.D., University of Sydney, 1998.
- Connolly**, Andrew, Ph.D., Imperial College (University of London), 1993. Astrophysics; extragalactic astronomy; observational cosmology.
- Yang**, Judith, Ph.D., Cornell, 1993. Materials Science & Engineering.

Research Professors

- Choyke**, W. James, Ph.D., Ohio State, 1952. Experimental Solid state physics; defect states in semiconductors, large-bandgap spectroscopy.
- Weisheit**, Jon, Ph.D., Rice, 1970. Theoretical atomic physics, astrophysics.
- Winicour**, Jefferey, Ph.D., Syracuse, 1964. General relativity numerical relativity.

Research Associate Professors

- Heberle**, Albert, Ph.D., Stuttgart (Germany), 1993. Experimental condensed matter and solid-state, nanoscience.
- Rao**, Sandhya, Ph.D., Pittsburgh, 1994. Astrophysics; extragalactic astronomy; observational cosmology.
- Zhao**, Jin, Ph.D., University of Science and Technology of China, 2003. Experimental condensed matter, nanoscience.

Lecturer

- Clark**, Russell, Ph.D., Louisiana State, 1997. Physics education research, neutrino physics.

RESEARCH SPECIALTIES**Theoretical**

- Astrophysics and Cosmology.** Early universe physics; statistical cosmology; radiative transfer. Boyanovsky, Hillier, Kosowsky, Weisheit, Zentner.
- Atomic Physics.** Interactions of electrons and photons in the field of an atom; atomic processes in high temperature/density plasmas; bremsstrahlung; pair production. Pratt.
- Condensed Matter, Solid State and Statistical Physics.** Phase transitions; disordered systems; nonequilibrium behavior; polymer physics; biological physics; atomic cold gases; superconductivity; quantum kinetics. Boyanovsky, Goldschmidt, Jasnow, Liu.
- Particle Physics.** Gauge field theories; lattice calculations; non-perturbative effects; weak interaction models and phenomenology; heavy-quark physics; super symmetry. Duncan, Freitas, Leibovich.
- Intermediate Energy Physics.** Medium-energy reactions with photons and mesons; heavy quark phenomenology; QCD

modeling; spin density matrix physics; mathematical methods for nonlinear dynamics. Swanson, Tabakin.

General and Numerical Relativity and Relativistic Astrophysics. Gravitational lensing; Gravitational radiation and black hole physics. E. Newman, Winicour.

Experimental

Applied Physics. surface science; polymers; computational physics; optoelectronics; quantum computing; porous semiconductors; large bandgap semiconductors interdisciplinary research. Choyke, Coalson, Devaty, Heberle, Levy, Snoke, and selected members of the departments of biological science, chemistry, material science, electrical engineering, and chemical engineering.

Astrophysics. Local and distant galaxies; quasars; studies of quasar absorption line systems; statistical analysis of the properties of galaxies; clustering and large-scale structure; dark matter and dark energy; cosmic microwave background; positional astronomy and searches for planetary systems around nearby stars; massive stars; model stellar atmospheres. Connolly, Gatewood, Hazard, Hillier, Kosowsky, J. Newman, Rao, Schulte-Ladbeck, Wood-Vasey, Turnshek, Zentner.

Atomic and Atmospheric Physics. Experimental low-energy plasma physics; electron-ion recombination and ion-atom/molecule reactions; applications to planetary atmospheres; airglow studies; thermospheric dynamics. Johnsen.

Condensed Matter. Nanoscience; biological physics; solid state physics; phase transitions; large bandgap semiconductors; quantum well phenomena; ferroelectrics; coherence phenomena in condensed gases and solids; semiconductor spintronics and quantum computation; atomic-scale optical spectroscopy; ultrafast phenomena; pattern formation; two-dimensional condensed matter systems; turbulence. Choyke, Devaty, D'Urso, Dutt, Goldburg, Heberle, Levy, Lowe, Petek, Salzman, Snoke, Wu, Zhao.

Particle Physics. Study of the properties of elementary constituents of matter (quarks and leptons) at the Tevatron proton-antiproton collider, located at the Fermi National Accelerator Laboratory. Involved with the European Large Hadron Collider, which may uncover the elusive Higgs boson as well as a spectrum of new particles arising from "supersymmetry." Studies of fundamental properties of neutrinos, such as oscillations, mass differences, and neutrino-nucleus interactions. Boudreau, Cleland, Dytman, Mueller, Naples, Paolone, Savinov, Shepard.

Physics Education Research. Identification of sources of student difficulties in learning concepts in both introductory and advanced-level physics courses; design, implementation, and outcome assessment of changes in curricular offerings/pedagogical methods that are designed to reduce these difficulties. Clark, Koehler, Singh.