General University Information
- President: Gregory L. Fenves
- Dean of Graduate School: Marvin L. Hackert
- University website: https://www.utexas.edu

School Type: Public
Setting: Urban
Total Faculty: 3,081
Total Graduate Faculty: 1,956
Total number of Students: 52,186
Total number of Graduate Students: 11,123

Department Information
- Department Chairman: Prof. Jack Ritchie, Chair
- Department Contact: Matthew F. Ervin, Graduate Program Administrator
- Total full-time faculty: 48
- Full-Time Graduate Students: 208
- Female Full-Time Graduate Students: 0
- First-Year Graduate Students: 37
- Female First-Year Students: 5
- Total Post Doctorates: 41

Department Address
2515 Speedway, C1600
Austin, TX 78712
Phone: (512) 471-1664
Fax: (512) 471-9637
E-mail: admissions@physics.utexas.edu
Website: http://ph.utexas.edu

ADMISSIONS

Admission Contact Information
Address admission inquiries to: Admissions Coordinator, Department of Physics, RLM 5.208, University of Texas at Austin, 2515 Speedway, C1600, Austin, TX 78712-1081
Phone: (512) 471-1664
E-mail: admissions@physics.utexas.edu
Admissions website: http://www.ph.utexas.edu/grad-admissions.php

Application deadlines
Fall admission:
U.S. students: December 1
Int'l. students: December 1
Spring admission:
U.S. students: October 1
Int'l. students: October 1

Application fee
U.S. students: $65
Int'l. students: $90

Admissions information
For Fall of 2018:
Number of applicants: 311
Number admitted: 67
Number enrolled: 29

Admission requirements
- Bachelor’s degree requirements: Bachelor’s degree is required.
- Minimum undergraduate GPA: 3.0

GRE requirements
- The GRE is required.

Subjective GRE requirements
The Subjective GRE is required.
No specific score is required, just sufficient comprehension.

TOEFL requirements
The TOEFL exam is required for students from non-English-speaking countries.
PBT score: 550
iBT score: 120

Other admissions information
Additional requirements: The GRE Physics Subject Test is required. The average GRE advanced score for 2011–12 admission was 819. The TOEFL is absolutely required for foreign applicants and cannot be waived, substituted, or delayed. Foreign students who accept teaching assistantships must pass an English language proficiency assessment before any appointment can be made.
Undergraduate preparation assumed: Mechanics at the level of Halliday, Resnick, and Krane, Physics, Vol. 1; electricity and magnetism at the level of Halliday, Resnick, and Krane, Physics, Vol. 2; thermodynamics at the level of Kittel and Kroemer, Thermal Physics; atomic physics at the level of Morrison, Estle, and Lane, Quantum States of Atoms, Molecules and Solids; quantum mechanics at the level of Morrison, Understanding More Quantum Physics.

TUITION
Tuition year 2016–2017:
Tuition for in-state residents
Full-time students: $8,350 annual
Tuition for out-of-state residents
Full-time students: $16,454 annual
All required fees included in the above amounts. Other fees may vary.
Credit hours per semester to be considered full-time: 9
Deferred tuition plan: Yes
Health insurance: Available
Academic term: Semester
Number of first-year students who received full tuition waivers: 37

Teaching Assistants, Research Assistants, and Fellowships
Number of first-year
Teaching Assistants: 25
Research Assistants: 4
Fellowship students: 3
Average stipend per academic year
Teaching Assistant: $27,000
Research Assistant: $27,000
Fellowship student: $27,000

FINANCIAL AID
Application deadlines
Fall admission:
U.S. students: December 1
Int'l. students: December 1
Loans
Loans are available for U.S. students.
Loans are available for international students.
GAPSFAS application required: No
FAFSA application required: No
Texas

U. of Texas at Austin, Phys.

For further information
Address financial aid inquiries to: Admissions Coordinator, Department of Physics, The University of Texas at Austin, RLM 5208, Austin, TX 78712-1081.
E-mail: admissions@physics.utexas.edu

HOUSING

Availability of on-campus housing
Single students: Yes
Married students: No

For further information
Address housing inquiries to: Division of Housing and Food Service, P.O. Box 7666, The University of Texas at Austin, Austin, TX 78712-7666.
Phone: (512) 471-3136
Housing aid website: http://www.utexas.edu/student/housing/

Table A—Faculty, Enrollments, and Degrees Granted

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Master’s</td>
<td>Doctorate</td>
<td>Master’s</td>
</tr>
<tr>
<td>Atomic, Molecular, &amp; Optical Physics</td>
<td>8</td>
<td>16</td>
<td>33</td>
</tr>
<tr>
<td>Biophysics</td>
<td>2</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Condensed Matter</td>
<td>15</td>
<td>28</td>
<td>42</td>
</tr>
<tr>
<td>Cosmology &amp; String Theory</td>
<td>7</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>High Energy Physics</td>
<td>5</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Nonlinear Dynamics</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Particles and Fields</td>
<td>2</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Plasma and Fusion</td>
<td>4</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>Relativistic Heavy Ion Physics</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Relativity &amp; Gravitation</td>
<td>1</td>
<td>–</td>
<td>2</td>
</tr>
<tr>
<td>Statistical &amp; Thermal Physics</td>
<td>1</td>
<td>–</td>
<td>1</td>
</tr>
<tr>
<td>Non-specialized</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Total</td>
<td>49</td>
<td>68</td>
<td>136</td>
</tr>
<tr>
<td>Full-time Grad. Stud.</td>
<td>–</td>
<td>67</td>
<td>133</td>
</tr>
<tr>
<td>First-year Grad. Stud.</td>
<td>–</td>
<td>27</td>
<td>–</td>
</tr>
</tbody>
</table>

GRADUATE DEGREE REQUIREMENTS

Master’s: Master of Arts; The time required for the degrees will average about one calendar year plus one semester for a student with a strong undergraduate background. Requirements include 30 semester hours with a “B” average. Eighteen to 24 semester hours, including the thesis, must be in the major program. The minor, which is obligatory, consists of a minimum of six hours in a supporting subject or subjects outside the major program. Each program must include at least 30 semester hours of graduate work, including the thesis. All completed work included in the degree program at the time of admission to candidacy must have been taken within the previous six years. The Master of Science in Applied Physics: This degree is designed to provide students with a broad background in physics and related fields, with an emphasis on those aspects of the science most used in an industrial setting. The required physics courses include PHY 380N, 387K, and 389K, a course in the physics of sensors, and a technical seminar. A thesis is also required. The supporting work must be in engineering, chemistry, or geological sciences.

Doctorate: A student must fulfill the following requirements to be admitted to candidacy for the Ph.D. degree in Physics: (1) fulfill the core course requirements described below; (2) show evidence of exposure to modern methods of experimental physics—this exposure may be gained in a senior-level laboratory course taken by the student as an undergraduate and approved by the graduate advisor and the chairman of the Graduate Studies Committee by previous participation in an experimental program or in Physics 380N; and (3) fulfill the oral examination requirement described below. Core courses: During the first two years of graduate studies, the student must take four core courses: Classical Mechanics (385K), Statistical Mechanics (385L), Electromagnetism I (387K) or Electromagnetism II (387L), and Quantum Mechanics I (389K) or Quantum Mechanics II (389L). The student must earn an official grade of at least “B” in each course and must maintain a grade point average of at least 3.0 in the four courses. The student may ask for the grade he or she earns in Physics 380N to be substituted for the grade in one of the core courses when the average is computed. A well-prepared student may seek to fulfill the core course requirement by earning satisfactory grades on the final examinations for some of these courses rather than by registering for them: in this case, the student does not receive graduate credit for these courses and the grade is not counted toward the required average. Oral qualifying examination: After satisfying the first two requirements above, and within 27 months of entering the program, the student must take an oral qualifying examination. The examination consists of a presentation before a committee of four physics faculty members, one of whom is a member of the Graduate Studies Subcommittee. The presentation is open to all interested parties. It is followed by a question-and-answer period restricted to the student and the committee. The questions during this session are directed to clarifying the presentation and determining whether the student has a solid grasp of the basic material needed for research in his or her specialization. The student passes the examination by obtaining a positive vote from at least three of the four faculty members on the oral qualifying committee. Each program of work for the doctoral degree must include at least four advanced courses in physics; a list of acceptable courses is maintained by the Graduate Studies Subcommittee. The program must also include three courses outside of the student’s area of specialization; one of these must be an advanced physics course, another must be outside of the Department of Physics, and the third may be either an advanced physics course or a course outside of the Department of Physics. A dissertation is required of every candidate, followed by a final oral examination covering the dissertation and the general field of the dissertation.

SPECIAL EQUIPMENT, FACILITIES, OR PROGRAMS

Modern facilities for graduate study and research include a large-scale cryogenic laboratory; nuclear magnetic and electron paramagnetic resonance laboratories; extensive facilities for tunneling and force microscopy and nanostructure characterization, SQUID magnetometry, and electron spectroscopy; well-equipped laboratories in optical spectroscopy, quantum optics, femtosecond spectroscopy and diagnostics, and electron–atom and surface scattering; and facilities including a table-top 100-terawatt laser for strong-field physics studies for turbulent flow and nonlinear dynamics experiments and two petawatt lasers (one Titanium sapphire providing 30J in 30fs and another glass laser at 200J in 150fs).

Plasma physics experiments are conducted at the major national tokamaks in Boston and San Diego and on the local machine,
the Helimak. Experiments in high-energy heavy ion nuclear and particle physics are conducted at large accelerator facilities such as Brookhaven National Laboratory (New York), Fermi National Laboratory (Illinois), and Germany’s Deutsches Electron Synchrotron.

Theoretical work in plasma physics, condensed matter physics, acoustics, nonlinear dynamics, relativity, astrophysics, statistical mechanics, and particle theory is conducted within the Department of Physics.

Students have access to excellent computer and library facilities, including Ranger, the 10th fastest computer at 504 Tflops.

The Department maintains and staffs a machine shop, student workshop, low-temperature and high-vacuum shop, and an electronics design and fabrication shop.

### Table B—Separately Budgeted Research Expenditures by Source of Support

<table>
<thead>
<tr>
<th>Source of Support</th>
<th>Departmental Research</th>
<th>Physics-related Research</th>
<th>Outside Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal government</td>
<td>$15,018,485</td>
<td></td>
<td></td>
</tr>
<tr>
<td>State/local government</td>
<td>$1,735,176</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-profit organizations</td>
<td>$1,086,944</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business and industry</td>
<td>$84,298</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>$1,289,191</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$17,214,194</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table C—Separately Budgeted Research Expenditures by Research Specialty

<table>
<thead>
<tr>
<th>Research Specialty</th>
<th>No. of Grants</th>
<th>Expenditures ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atomic, Molecular, &amp; Optical Physics</td>
<td>11</td>
<td>$1,405,050</td>
</tr>
<tr>
<td>Biophysics</td>
<td>8</td>
<td>$657,436</td>
</tr>
<tr>
<td>Condensed Matter Physics</td>
<td>51</td>
<td>$4,256,947</td>
</tr>
<tr>
<td>Cosmology &amp; String Theory</td>
<td>9</td>
<td>$705,873</td>
</tr>
<tr>
<td>Nonlinear Dynamics</td>
<td>2</td>
<td>$290,047</td>
</tr>
<tr>
<td>Relativistic Heavy Ion Physics</td>
<td>5</td>
<td>$796,372</td>
</tr>
<tr>
<td>Particles and Fields</td>
<td>18</td>
<td>$1,800,824</td>
</tr>
<tr>
<td>High Energy Density Science</td>
<td>18</td>
<td>$3,133,129</td>
</tr>
<tr>
<td>Plasma and Fusion</td>
<td>27</td>
<td>$4,094,069</td>
</tr>
<tr>
<td>Statistical &amp; Thermal Physics</td>
<td>3</td>
<td>$119,446</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>152</strong></td>
<td><strong>$17,214,193</strong></td>
</tr>
</tbody>
</table>

### FACULTY

**Professor**


Coker, W. R., Ph.D., University of Georgia, 1966. Nuclear Physics. Theoretical nuclear physics, with emphasis on scattering and reactions of hadrons and nuclei at medium energies.


Dicus, D. A., Ph.D., University of California, Los Angeles, 1968. Particles and Fields. Field theory of strong, weak, and electromagnetic interactions; astrophysical implications of the weak force.


Downer, M. C., Ph.D., Harvard University, 1983. Atomic, Molecular, & Optical Physics. Condensed Matter Physics. Atomic and molecular physics; atomic physics; femtosecond spectroscopy; condensed matter surfaces; high-field atomic and plasma physics.


Kaplunovsky, V., Ph.D., Tel Aviv University, 1983. Cosmology & String Theory. Particle theory; string phenomenology.


Lang, K., Ph.D., University of Rochester, 1985. High Energy Physics. Rare decay of the K-meson.


Markert, C., Ph.D., Johann Wolfgang Goethe Universität, 2001. Nuclear Physics. Nuclear physics; relativistic heavy-ion physics; the quark-gluon plasma (QGP) phase.

Markert, J. T., Ph.D., Cornell University, 1987. Condensed Matter Physics, Physics and other Science Education. Experimental condensed-matter physics; crystal growth; high-Tc materials; magnetic materials; magnetic resonance; magnetic microscopies.

Matzner, R. A., Ph.D., University of Maryland, 1967. Relativity & Gravitation. General relativity and cosmology; manifolds with little symmetry; kinetic theory; conservation laws in general relativity; black hole physics and gravitational radiation.


Associate Professor


Paban, S., Ph.D., Universitat de Barcelona, 1988. Chair, Graduate Studies Committee. Cosmology & String Theory. Quantum mechanics; particle phenomenology; string theory.


Assistant Professor

Alvarado, José, Ph.D., Massachusetts Institute of Technology, 2013. Biophysics. Soft matter; fluid mechanics; active matter.


Gordon, Vernita, Ph.D., Harvard University, 2003. Biophysics. Experimental biological physics; multicellular systems; the role of physics and spatial structure in developmental and evolutionary systems; biological physics and engineering of membranes.


Onyisi, Peter, Ph.D., Cornell University, 2008. High Energy Physics. Experimental investigation of electroweak symmetry breaking and searches for new particles and interactions; computing with large datasets of structured data.

Potter, Andrew C., Ph.D., Massachusetts Institute of Technology, 2013. Condensed Matter Physics. Quantum materials, Topological phases of matter, Strongly correlated electron systems, Non-equilibrium quantum dynamics and many-body localization.

Zimmerman, Aaron, Ph.D. Relativity & Gravitation. General Relativity, black holes, gravitational waves, numerical relativity, strong gravity.

Professor Emeritus


Chiu, C. B., Ph.D., University of California, Berkeley, 1965. Particles and Fields. Theoretical particle physics, particularly in quantum chromodynamics; confinement problems; subquark and sublepton models; theories in hadron collisions.


Moore, C. F., Ph.D., Florida State University, 1964. Nuclear Physics. Detection and measurement of the interactions and involvement of the nuclear continuum in scattering experiments; atomic interactions in highly ionized atoms.


Riley, P. J., Ph.D., University of Alberta, 1962. Nuclear Physics. Experimental studies of the nucleon-nucleon interaction at medium energy; actions in decaying plasmas; environmental effects on spectra.


Thompson, J. C., Ph.D., Rice University, 1956. Condensed Matter Physics. Studies of electronic states in disordered systems (metallic and semiconducting) by galvanomagnetic parameters; optical properties; photoemission; the metal-nonmetal transition.


DEPARTMENTAL RESEARCH SPECIALTIES AND STAFF

Theoretical

Condensed Matter Physics. Ab initio electronic structure calculations of the physical, electronic, and magnetic (including non-colinear magnetic systems) properties of solids, surfaces, interfaces, and liquids; molecular dynamics calculations of properties of solids, liquids, and crack propagation; density functional theory; Berry phases in polarization theory and spinwave theory; block electrons in magnetic fields, quantum Hall effect; quantum theory of thin-film growth and surface diffusion; theory of mesoscopic phenomena, phonon calculations and lattice dynamics for high Tc superconductors; theory of atom surface interactions; physisorption; chemisorption. Chelikowsky, de Wette, Demkov, Fiete, Gavenda, Kleinman, MacDonald, Marder, McCormick, Niu, Swift, Thompson.

Nonlinear Dynamics. Dynamics of materials, especially fracture and dislocation dynamics; instabilities and turbulence in fluids, granular media, liquid crystals, and chemical reaction-diffusion systems; chaos in low-dimensional dynamical systems. Marder, McCormick, Morrison, Swift, Swinne.

Nuclear Physics. Scattering and reactions of hadrons and nuclei at medium energies; nuclear structure in the low-energy region using neutron-scattering techniques; nuclear structure and reaction mechanism. Coker, C. Markert, Moore, Riley, Udagawa.

Particles and Fields. Phenomenological studies of the properties of matter ranging from medium-energy physics; symmetries in elementary particle physics; field theory of strong interactions; the physics of superdense matter; quantum chromodynamics; confinement problems; subquark and sublepton models; supersymmetry; quantum optics, basic quantum field theory, and quantum mechanics; classical mechanics; particle phenomena in terms of algebraic and group-theoretical methods; electromagnetic interactions. Böhm, Chiu, Dicus, Gieson.

Physics Education. Curriculum development and evaluation at the university level; science teacher preparation program; computer-based education. Chiu, Gieson, Marder, Orbach.

Plasma and Fusion. Kinetic theory and transport theory; turbulent heating; collisionless shock waves; plasma turbulence; computer simulation of plasmas; stability theory controlled fusion; plasma dynamics. Berk, Drummond, Fitzpatrick, Hazeltine, Horton, Morrison, Oakes.

Relativity & Gravitation. Quantum theory of space-time; techniques of quantization in curved space-time; string theory; path integration; stochastic processes; critical phenomena in gravitational collapse; computational relativity; cosmology; exact solutions in general relativity; conformal properties of space time; manifolds with little symmetry; kinetic theory; conservation laws in general relativity; black hole physics; black hole interactions; gravitational radiation; interaction of matter with gravitation. Fischler, Matzner, Schieve, Weinberg, Zimmerman.

Statistical & Thermal Physics. Nonequilibrium statistical physics; thermodynamic processes; nonequilibrium quantum statistical mechanics; quantum chaos; mesoscopic physics; non-linear dynamics; complex systems theory; Brownian motion. Reichl, Schieve.

The Weinberg Theory Group. Research spans the range from studies of physics at the most fundamental level to exploration of phenomenologically relevant current issues in elementary particle physics. On the more fundamental level, the work continues in gravity and quantum cosmology, conformal field theories, superstring theories, and M theory, with special attention to the links between these topics and to the implication of superstring and M theory for effective field theories at accessible energies. Such theories offer the hope of uniting all forces including gravitation in a theory of superstrings. So far, it seems that these theories allow for the first time a satisfactory elimination of the infinities that have plagued all earlier quantum theories of gravitation. Distler, Fischler, Kaplunovsky, Kilic, Matzner, Paban, Weinberg, Zimmerman.

Experimental

Atomic, Molecular, & Optical Physics. Atom optics; quantum transport in optical lattices; quantum chaos with ultracold atoms; ultracold collisions; Bose-Einstein condensation; search for atomic electric dipole moment; state-resolved molecular-surface scattering and gas-surface dynamics; the Raman spectroscopy; electron diffraction; neutrino rest mass experiments; laser spectroscopy of nanoparticles; development of new materials; molecular collision and sonoluminescence; femtosecond spectroscopy; high-power lasers; wake-field accelerators; terawatt lasers; optical properties of nanostructured plasmas at high fields. Ditmire, Downer, Fink, Fromhold, Hegelich, Heinzen, Kato, Lai, Raizen, Sitz.

Biophysics. Elastic properties of cells; motility of cells; bacterial competition; dynamics of swimming organisms; biofilms; spatial structures formed through intercellular interactions; adhesion phenomena; cell mechanics; cargo transport in cells; molecular motors (dynamics and regulation); membranes; assembly of biological complexes; diffusive and ballistic Brownian motion; biopolymers; characterization of single biomolecules; microtubule mechanics; yeast mechanics; membrane fusion; thermal noise imaging. Alvarado, Florin, Gordon.

Condensed Matter Physics. Surface and thin-film magnetism; dynamics of magnetization reversal; magnetic switching; Barhakanbe noise; domain dynamics; magnetic and electronic effects in ultrathin-film multilayers and nanostructures; normal and superconducting properties of high-temperature superconductors; nonlinear optical response of solids; femtosecond spectroscopy of solid-state systems; nanostructure
fabrication and characterization based on scanning tunneling microscopy; intrinsic phenomena at surfaces and interfaces studied by electron diffraction, spectroscopy, atom surface scattering, linear and nonlinear optical spectroscopy; scanning probe techniques, including near-field optical microscopy; thin-film nucleation and growth; cluster physics, mesoscopic phenomena in solids; materials synthesis including novel magnetic and superconducting materials; transport and magnetic characterization; strongly correlated electron systems; mechanical properties of materials including fracture. de Lozanne, Demkov, Downer, Erskine, Lai, Li, Marder, J. Markert, Shih, Tsoi, Yao.

High Energy Physics. Properties of elementary particles, particularly kaons, B-mesons, and neutrinos; rare decays of the kaons; tests of conservation laws and CP violation; B-meson decays; information on CP violation; neutrino oscillation measurements; information on neutrino mass; detector development; applications of particle detectors to medical imaging. Experiments are conducted at national and international accelerator laboratories. Andeen, Lang, Onyisi, Ritchie, Schwitters.

Nonlinear Dynamics and Complex Systems. Pattern formation and chaotic dynamics of diverse systems; planetary fluid dynamics (especially internal gravity waves in the oceans); viscous fingering; crack propagation in amorphous and crystalline solids; rupture in rubber; friction; control of atomic and molecular motion; trapping of different isotopes; trapping and cooling of macroscopic particles (microspheres); dynamics of Brownian motion; stretching and wrinkling of thin sheets and graphene; physics education research (people dynamics). See also, biophysics. Florin, Gordon, Marder, McCormick, Morrison, Raizen, Swinney.

Plasma and Fusion. Plasma turbulence and transport; plasma heating; plasma propulsion; plasma spectroscopy; plasma diagnostics; plasma processing; atomic reactions in plasmas. Bengtson, Ditmire, Downer, Gentle, Hegelich.

Relativistic Heavy Ion Physics. The research focuses on two experiments: (1) E896 (using the AGS at the Brookhaven National Laboratory), a definitive search for the short-lived HO di-baryon, a strangeness $= -2$, 6-quark object predicted by bag models. E896 also searches for other short-lived objects composed of strange hadrons that may be produced in high-energy nucleus-nucleus collisions. (2) STAR [Solenoidal Tracker at RHIC (Relativistic Heavy Ion Collider)] at the Brookhaven National Laboratory to study primordial matter at conditions of extreme temperature and pressure. Such matter is produced through central collisions of circulating beams of Au ions of momenta 100 GeV/c per nucleon (total center-of-momentum energy = 40 TeV). STAR searches for evidence of the formation of a quark-gluon plasma (a phase of nuclear matter in which quarks and gluons are not confined within nucleons or mesons) and for evidence of the restoration of the fundamental chiral symmetry of the strong interaction at high temperature. Both experiments explore the most fundamental physics and chemistry of nature as it may have existed during the early evolution of the Universe (about $10^{-7}$–$10^{-6}$ seconds after the Big Bang). C. Markert, Moore, Riley.