

# TEXAS TECH UNIVERSITY

## DEPARTMENT OF PHYSICS

Lubbock, Texas 79409

<http://www.phys.ttu.edu>

### General University Information

*President:* M. Duane Nellis  
*Dean of Graduate School:* Mark Sheridan  
*University website:* <http://www.ttu.edu/>  
*Control:* Public  
*Setting:* Rural  
*Total Faculty:* 2,944  
*Total Graduate Faculty:* 1,389  
*Total number of Students:* 32,440  
*Total number of Graduate Students:* 5,661

### Department Information

*Department Chairman:* Prof. Nural Akchurin, Chair  
*Department Contact:* Andrea Westbrook, Senior Business Assistant  
*Total full-time faculty:* 21  
*Full-Time Graduate Students:* 69  
*First-Year Graduate Students:* 22  
*Female First-Year Students:* 11  
*Total Post Doctorates:* 12

### Department Address

Box 41051  
Lubbock, TX 79409  
*Phone:* (806) 834-0416  
*Fax:* (806) 742-1182  
*E-mail:* [Andrea.Westbrook@ttu.edu](mailto:Andrea.Westbrook@ttu.edu)  
*Website:* <http://www.phys.ttu.edu>

### ADMISSIONS

#### Admission Contact Information

*Address admission inquiries to:* Prof. Mahdi Sanati, Graduate Recruiter, Department of Physics.  
*Phone:* (806) 834-6169  
*E-mail:* [m.sanati@ttu.edu](mailto:m.sanati@ttu.edu)  
*Admissions website:* [http://www.phys.ttu.edu/grad\\_study.html](http://www.phys.ttu.edu/grad_study.html)

#### Application deadlines

Fall admission:  
*U.S. students:* March 1                      *Int'l. students:* January 15  
Spring admission:  
*U.S. students:* October 1                      *Int'l. students:* June 15

#### Application fee

*U.S. students:* \$60                      *Int'l. students:* \$60

#### Admissions information

For Fall of 2015:  
*Number of applicants:* 55  
*Number admitted:* 16  
*Number enrolled:* 16

#### Admission requirements

*Bachelor's degree requirements:* Bachelors degree in Physics is required for admission to the graduate programs in Physics. For students with a Bachelor's degree in a related field, undergraduate leveling may be required.  
*Minimum undergraduate GPA:* 3.0

#### GRE requirements

The GRE is required.  
*Quantitative score:* 155  
*Verbal score:* 152

*Analytical score:* 3.0

*Mean GRE score range (25th–75th percentile):* 307-321

#### Advanced GRE requirements

The Advanced GRE is recommended.

#### TOEFL requirements

The TOEFL exam is required for students from non-English-speaking countries.  
*PBT score:* 550  
*iBT score:* 79

#### Other admissions information

*Additional requirements:* For the past several years, the average General GRE scores were verbal-152; quantitative-155; total-307. A minimum GRE total score of 307 is required to obtain financial support from the department. The IELTS score of 6.5 or better is also accepted. All new foreign teaching assistants are required to pass an English workshop administered by the University.

### TUITION

Tuition year 2015–16:

Tuition for in-state residents

*Full-time students:* \$9,017 annual

*Part-time students:* \$501 per credit

Tuition for out-of-state residents

*Full-time students:* \$17,569 annual

*Part-time students:* \$976 per credit

Health insurance cost is not included.

*Credit hours per semester to be considered full-time:* 9

*Deferred tuition plan:* Yes

*Health insurance:* Available at the cost of 2,450 per year.

*Academic term:* Semester

*Number of first-year students who received partial tuition waivers:* 15

#### Teaching Assistants, Research Assistants, and Fellowships

Number of first-year

*Teaching Assistants:* 15

Average stipend per academic year

*Teaching Assistant:* \$15,693

*Research Assistant:* \$15,693

*Fellowship student:* \$15,693

Stipend is higher for students with M.S. degree and those who have passed the Ph.D. Qualifying Exam.

### FINANCIAL AID

#### Application deadlines

Fall admission:

*U.S. students:* March 1                      *Int'l. students:* March 1

Spring admission:

*U.S. students:* October 1                      *Int'l. students:* October 1

#### Loans

Loans are available for U.S. students.

Loans are not available for international students.

*GAPSFAS application required:* Yes

*FAFSA application required:* Yes

**For further information**

Address financial aid inquiries to: Prof. Mahdi Sanati, Graduate Recruiter, Department of Physics.

Phone: (806) 834-6169

E-mail: m.sanati@ttu.edu

**HOUSING****Availability of on-campus housing**

Single students: Yes

Married students: No

**For further information**

Address housing inquiries to: University Student Housing, Wiggins Complex, 3211 18th Street, Box 41141, Lubbock, TX 79409.

Phone: (806) 742.2661

E-mail: housing@ttu.edu

Housing aid website: <http://housing.ttu.edu/>

**Table A—Faculty, Enrollments, and Degrees Granted**

Research Specialty	2014–15 Faculty	Enrollment 2014–2015		Number of Degrees Granted 2014–2015 (2011–2014)		
		Mas-ter's	Doc-torate	Mas-ter's	Terminal Master's	Doc-torate
<b>Astrophysics</b>	4	–	1	2	–	–
<b>Atomic, Molecular, &amp; Optical Physics</b>	3	–	–	–(2)	–	–
<b>Biophysics</b>	1	–	2	–(7)	–	–(8)
<b>Condensed Matter Physics</b>	6	7	10	7(25)	–	2(6)
<b>High Energy Physics</b>	5	–	2	–(2)	–	1(3)
<b>Physics and other Science Education</b>	2	–	–	–(3)	–	–
<b>Total</b>	21	7	15	9(39)	–	3(17)
<b>Full-time Grad. Stud.</b>	–	14	55	–	–	–
<b>First-year Grad. Stud.</b>	–	7	15	–	–	–

**GRADUATE DEGREE REQUIREMENTS**

**Master's:** The M.S. with Thesis requires a minimum of 24 hours of graduate course work and 6 hours of thesis with a minimum GPA of 3.0. A thesis based on a research problem and a final oral exam over the research problem are required.

**Doctorate:** A minimum of 60 hours beyond the B.S. degree plus 12 hours of dissertation with a minimum GPA of 3.0. A minimum of 3 years of graduate study beyond the B.S. degree with 1 year of residence beyond the M.S. degree or equivalent is required. After completing the core courses, typically after one year, all candidates must pass the Prelim Qualifying Exam (a written and oral exam over the core curriculum). A dissertation on an original research project and an oral defense of the dissertation are required. Ph.D. degrees with either physics or applied physics options are offered. A specialization in chemical physics, in cooperation with the Department of Chemistry and Biochemistry, is also available.

**Other Degrees:** Dissertation may be written in absentia.

**SPECIAL EQUIPMENT, FACILITIES, OR PROGRAMS**

Program in experimental particle physics; J. Fred Bucy and Odetta Greer Bucy Chair in Physics, Dr. Richard Wigmans.

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

Source of Support	Departmental Research	Physics-related Research Outside Department
<b>Federal government</b>	\$2,154,954	\$2,002,875
<b>State/local government</b>		
<b>Non-profit organizations</b>		
<b>Business and industry</b>		
<b>Other</b>	\$160,000	
<b>Total</b>	\$2,314,954	\$2,002,875

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

Research Specialty	No. of Grants	Expenditures (\$)
<b>Astrophysics</b>	4	\$1,000,357
<b>Biophysics</b>	1	\$245,686
<b>Condensed Matter Physics</b>	7	\$865,911
<b>Particles and Fields</b>	3	\$744,000
<b>Total</b>	15	\$2,855,954

**FACULTY****Distinguished University Professor**

**Estreicher**, Stefan K., Ph.D., Zürich, 1982. Paul Whitfield Horn Professor. *Condensed Matter Physics*. Ab initio calculations, molecular dynamics, heat flow and defects in materials.

**Wigmans**, Richard, Ph.D., Vrije Universiteit Amsterdam, 1975. J.F. Bucy and O. Greer Bucy Chair in Physics. *High Energy Physics*. Experimental high-energy particle physics; particle detectors; calorimetry; astrophysics; cosmology.

**Chair Professor**

**Akchurin**, Nural, Ph.D., University of Iowa, 1990. Department Chair. *High Energy Physics*. Experimental particle physics at the LHC and particle detectors.

**Professor**

**Duncan**, Robert V., Ph.D., University of California, Santa Barbara, 1988. Vice President for Research. *Condensed Matter Physics*. Experimental low-temperature physics.

**Huang**, Juyang, Ph.D., State University of New York at Buffalo, 1987. *Biophysics*. Experimental and theoretical membrane biophysics; liposome technology; drug delivery; biochip; fluorescence microscopy; X-ray diffraction; Monte Carlo simulations.

**Myles**, Charles W., Ph.D., Washington University, 1973. Graduate Advisor. *Condensed Matter Physics*. Theoretical and computational materials physics, with emphasis on semiconductor materials. Clathrate materials and thermoelectrics. Electronic properties of defects, electronic nanostructures, properties of semiconductor alloys. High electric field transport. Molecular Dynamics and Monte Carlo computer simulations.

**Owen**, Benjamin J., Ph.D., California Institute of Technology, 1998. *Astrophysics, Relativity & Gravitation*. Gravitational waves and relativistic astrophysics.

**Associate Professor**

**Gibson**, Thomas L., Ph.D., Oklahoma, 1982. Quantum collision theory; low-energy positron-molecule collisions; concurrent computational techniques; Monte Carlo simulations.

**Glab**, Wallace L., Ph.D., University of Illinois at Urbana-Champaign, 1984. Undergraduate advisor. Experimental atomic and molecular physics; laser spectroscopy of excited

states of atoms and molecules; multiphoton ionization and photoelectron spectroscopy of small molecules.

**Grave de Peralta**, Luis, Ph.D., Texas Tech University, 2000. *Electrical Engineering*. Bio-nano-photonics, nanotechnology, plasmonics, quantum optics, nanoscopy.

**Kaye**, Anthony B., Ph.D., Georgia State University, 1998. *Condensed Matter Physics, Nano Science and Technology*. Growth and optical properties of transition metal oxides.

**Kunori**, Suichi, Ph.D., Tohoku University, 1981. *High Energy Physics*. Experimental High Energy Physics.

**Lamp**, C. David, Ph.D., University of Missouri, Columbia, 1984. *Condensed Matter Physics, Physics and other Science Education*. Experimental solid state physics; uniaxial stress transient spectroscopy; semiconductor materials; materials science; physics education; science training for secondary school teachers.

**Lee**, Sung-Won, Ph.D., University of Glasgow, 2000. *High Energy Physics*. Experimental Particle Physics; precision measurements of Standard Model physics and searches for physics beyond the Standard Model at CERN LHC.

**Maccarone**, Thomas J., Ph.D., Yale University, 2001. Graduate Advisor. *Astrophysics*. X-ray binaries, globular clusters, binary stellar evolution.

**Sanati**, Mahdi, Ph.D., University of Cincinnati, 1999. Graduate Recruiter. *Condensed Matter Physics, Materials Science, Metallurgy*. Theoretical condensed matter physics; structural phase transformation in solids; solitons in physical systems.

**Thacker**, Beth A., Ph.D., Cornell University, 1990. *High Energy Physics*. Then Physics Education Research; assessment, modern and quantum physics, pedagogy.

**Volobouev**, Igor, Ph.D., Southern Methodist University, 1997. *High Energy Physics*. Jet reconstruction algorithms; Advanced data analysis techniques for HEP; CMS experiment at CERN.

#### Assistant Professor

**Corsi**, Alessandra, Ph.D., Sapienza University, 2007. *Astrophysics*. Gamma-ray bursts, Supernovae, LIGO data analysis.

**Sand**, David, Ph.D., California Institute of Technology, 2005. *Astrophysics*. Dwarf galaxies, supernovae, time domain astrophysics, and resolved stellar populations.

#### Professor Emeritus

**Borst**, Walter L., Ph.D., University of California, Berkeley, 1968.

**Hatfield**, Lynn L., Ph.D., Arkansas, 1966.

**Lichti**, Roger L., Ph.D., University of Illinois, 1972.

**Thomas**, Henry C., Ph.D., Vanderbilt University, 1950.

#### Research Professor

**Lodhi**, M. A. K., Ph.D., London, England, 1963. Nuclear and Particle Physics; Space Science; New and Renewable Energy.

#### Distinguished Adjunct Professor

**Hussain**, Fazle, Ph.D., Stanford University, 1969. *Fluids, Rheology*. Fluid mechanics.

#### Adjunct Professor

**Blawdziewicz**, Jerzy, Ph.D., University of Warsaw, 1986. *Biophysics*. Physics of soft matter and biophysics.

**Cheng**, Kwan Hon, Ph.D., University of Waterloo, 1983. Experimental biophysics; time-resolved fluorescence spectroscopy; membranes; nuclear magnetic resonance imaging; biochips.

**Holtz**, Mark W., Ph.D., Virginia Polytechnic Institute, 1987. Materials Physics, nanoscience, optical properties of condensed matter; semiconductors, epitaxy.

**Poirier**, L. William, Ph.D., University of California, Berkeley, 1997. *Chemical Physics*. Theoretical and Computational Chemistry and Chemical Physics.

**Quitevis**, Edward L., Ph.D., Harvard University, 1981. Joint Professor. Ultrafast spectroscopy; nonlinear optics; photophysics; molecular aggregates; membranes and micelles; liquids. (Chemistry.).

#### Adjunct Associate Professor

**Bernussi**, Ayrton A., Ph.D., State University of Campinas, 1990. *Condensed Matter Physics, Nano Science and Technology*. Nanophotonics, Plasmonics, Sub-wavelength microscopy, and THz spectroscopy.

**Fan**, Zhaoyang, Ph.D., Northwestern University, 2001. *Materials Science, Metallurgy*. Wide bandgap semiconductors and Nanomaterials for energy applications.

**Pal**, Ranadip, Ph.D., Texas A&M University, 2007. *Electrical Engineering*. Bioinformatics and biophysics.

### DEPARTMENTAL RESEARCH SPECIALTIES AND STAFF

#### Theoretical

Applied Physics. New and renewable energy sources; power conversion systems for space use. Photoconductive switch simulations. Duncan, Lodhi.

Astrophysics. Neutron star structure, oscillations, and microphysics. Owen.

Atomic, Molecular, & Optical Physics. Theory of vibration-rotation fine structure and intramolecular forces. Low-energy electron-molecule collisions; Computational techniques. Gibson, Glab.

Biophysics. Cell membranes; cholesterol domains; multibody interactions; anomalous diffusion; Monte Carlo and dynamic simulations. Cheng, Huang.

Condensed Matter Physics. Defects in semiconductors, molecular dynamics and Monte Carlo simulations; breakdown in semiconductors; impurities and complexes in semiconductors; molecular orbital theory. Thermal conductivity of nano wires. High field transport, clathrates and thermoelectrics. Structural phase transformation in solids. Estreicher, Myles, Sanati.

Physics and other Science Education. Assessment, student understanding of Quantum Mechanics and Modern Physics, curriculum development, comparison of students taught traditionally and non-traditionally, science training for secondary school teachers. Lamp, Thacker.

Relativity & Gravitation. Gravitational wave emission, binary black holes. Owen.

#### Experimental

Applied Physics. High voltage breakdown of insulators. Aging of insulators in the space environment; electric arcjet thrusters; high power microwaves. High-speed plasma diagnostics. Materials physics and characterization. Hatfield.

Astrophysics. The astrophysics group at Texas Tech has a variety of streams of research on extreme environment astrophysics. We pursue observations which are multi-wavelength (spanning the range from radio through TeV) and multi-messenger (with a strong level of participation in LIGO). We have strong efforts in supernovae, gamma-ray bursts, studies of compact objects, and studies of the lowest density stellar populations – ultrafaint dwarf galaxies – as well as the highest density stellar populations – globular clusters. Corsi, Maccarone, Owen, Sand.

Atomic, Molecular, & Optical Physics. Laser spectroscopy; pulsed and cw fluorescence. Laser applications. Electromagnetic interactions. Secondary electron emission from insulators. Glab.

Biophysics. Molecular spectroscopy of membranes; quantitative magnetic resonance imaging; membrane electrophysiology,

Liposome technology; fluorescence microscopy; X-ray diffraction; drug delivery system; biochip conformal radiation dosimetry. Cheng, Huang.

Condensed Matter Physics. Magnetism. Muon spin rotation defect characterization. Semiconductor materials, nanoscience; optical properties; Raman scattering. Photonics; Plasmonics. Bernussi, Fan, Grave de Peralta, Holtz, Kaye.

High Energy Physics. Compact Muon Solenoid (CMS); experiment at CERN; Advanced research and development in calo-

rimetry and other particle detectors; Massive data analyses and development of novel algorithms for particle identification in collider experiments. Akchurin, Kunori, Lee, Volobouev, Wigmans.

Nano Science and Technology. Bio-nano-photonics, nanotechnology, plasmonics, quantum optics, nanoscopy, wide band-gap semiconductors and nanomaterials for energy applications, sub-wavelength microscopy, and THz spectroscopy. Bernussi, Fan, Grave de Peralta, Kaye.

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