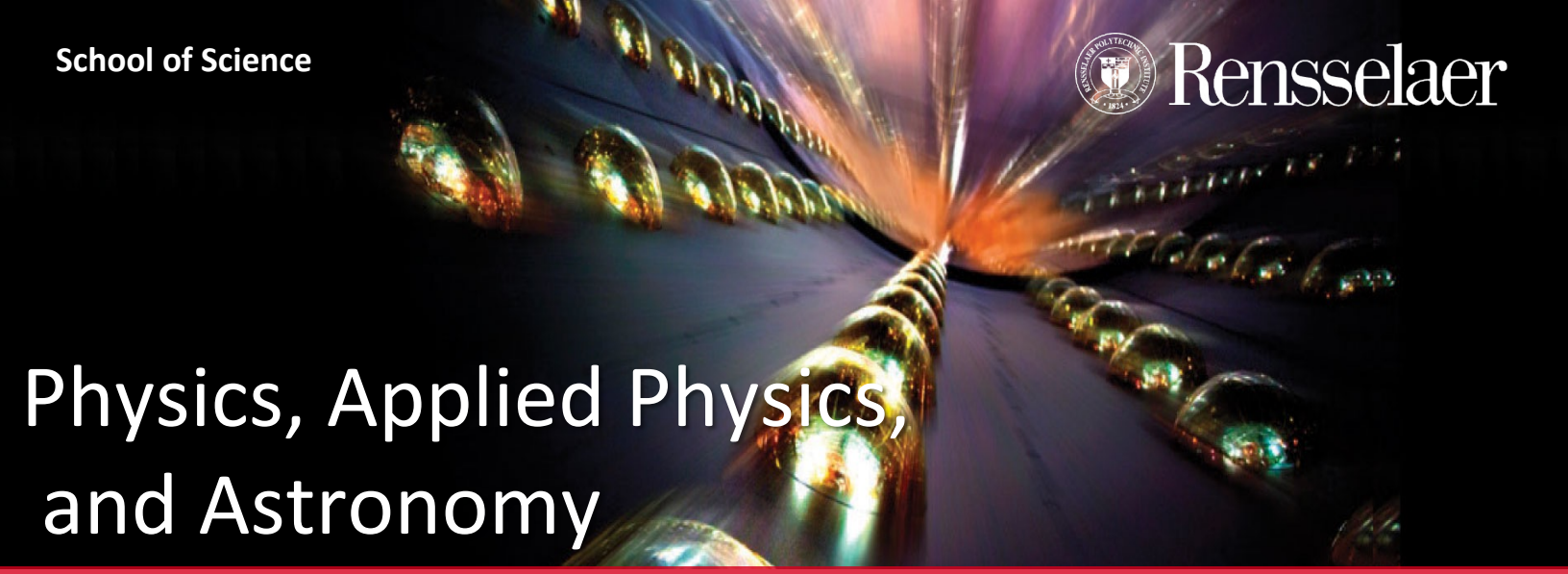
School of Science

Rensselaer



Physics, Applied Physics, and Astronomy

Physics is the source of new concepts about the nature of the universe and is a driving force for new technologies. The fundamental physics research of one generation often leads to the applied physics and technology of the next. Rensselaer's graduate program in physics conducts both fundamental and applied research, in collaboration with researchers from other departments, other universities, industry, or national laboratories.

Quick Facts

Location

The 275-acre Rensselaer campus is located on a hill in a beautiful park-like setting, with a striking combination of traditional ivy-colored buildings and modern facilities. The campus overlooks historic downtown Troy, New York, which his located on the upper Hudson River.

Research Highlights

- 6 affiliated research centers
- 1 research constellation

Faculty

- 20 faculty members
- 5 chaired professors
- 6 APS Fellows
- 4 AAAS Fellows
- 2 MRS Fellows
- 2 AVS Fellows
- 2 IEEE Fellows

For general inquiries, information, or questions, contact our Administrative Associate:

(518) 276-4881

gradphysics@rpi.edu

go.rpi.edu/grad-physics

The Department of Physics, Applied Physics, and Astronomy prepares students to contribute to new concepts and technologies through innovative teaching methods that combine student-faculty interactions, computer-based education, and "hands-on" experience in modern laboratories.

DEGREES OFFERED

Applied Physics B.S.
Astronomy M.S.
Multidisciplinary Science M.S., Ph.D.
Physics B.S., M.S., Ph.D.

MAJOR RESEARCH AREAS

All research areas, including experimental ones, use computational techniques in a variety of ways. One-third of our faculty members conduct computationally-driven research programs.

Astronomy and Astrophysics
Theoretical and numerical astrophysics, galactic structure and evolution, large astronomical surveys, dark matter nature.

Energy Research
Energy harvesting, conversion and transfer, solid-state lighting, complex systems and networks.

Nanoscience and Nanomaterials
Nanoelectronics, Nanophotonics, nanostructures, nano-bio interfaces.

Particle Physics Direct detection of dark matter, lattice field theory, neutrinoless double beta decay.

Optical Physics
Plasmonic structures, light-matter interaction, terahertz spectroscopy, quantum optics and photon entanglement.

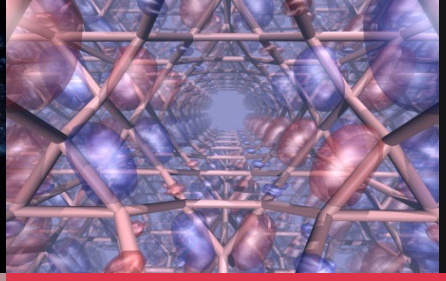
Condensed Matter and Statistical Physics
Molecular electronics, quantum molecular dynamics, semiconductor materials and devices, thin film morphologies and transport, low-dimensional systems, machine learning for materials, complex systems and networks.

AFFILIATED RESEARCH CENTERS

These centers provide students access to state-of-the-art facilities, including supercomputers, a class 100 microfabrication clean room, thin film deposition laboratories, and scanning probe microscopy laboratories.

- Center for Biotechnology and Interdisciplinary Studies (CBIS)
- Center for Materials, Devices, and Integrated Systems (cMDIS)
- Center for Computational Innovations (CCI)
- Lighting Enabled Systems & Applications (LESA)
- Lighting Research Center (LRC)
- Network Science and Technology Center (NeST)

9/2021

FACULTY AND RESEARCH AREAS

Physics, Applied Physics, and Astronomy

PROFESSOR

Gyorgy Korniss
Department Head
Statistical physics, complex systems, and networks; Synchronization and extreme fluctuations; Social dynamics; Cascading failures in complex networks.

Joel Giedt
Associate Department Head
Strongly interacting systems beyond the Standard Model of particle physics using lattice gauge theory methods, including supersymmetric gauge theories and models of compositeness at high scales.

Shawn-Yu Lin
Photonic crystals, plasmonics, nano-photonics, silicon photonics, solid state lighting, solar energy applications.

Heidi Newberg
Structure and evolution of the Milky Way galaxy using stars as tracers; n-body simulations to determine the density distribution of dark matter using Volunteer Computing with MilkyWay@home; large surveys including SDSS, LAMOST and Gaia.

Peter Persans
Development and implementation of advising, mentoring, and professional development programs for students.

John Schroeder
Glass and nanoparticle physics; Protein condensation and protein misfolding in human ocular systems and applications to other protein misfolding human neuro degenerate diseases.

Michael Shur
THz electronics. Physics of semiconductor materials and devices. Physics of color rendition. Deep Ultraviolet Light Emitting Diodes.

Humberto Terrones
Computation of electronic and optical properties of low-dimensional systems, including layered materials. Bridging the gaps between theory and experiment. State of the art Raman characterization to compare with first-principles theory.

Gwo-Ching Wang
Single element and compound semiconductor thin films on van der Waals substrates for optoelectronic applications. Magnetic property of ultrathin metallic films using surface magneto-optical Kerr effect (SMOKE). Structural property of 2D TMDC layers and graphene using electron diffraction (RHEED and LEED).

Christian Wetzel
Electronic band and defect structure of wide band gap semiconductor materials and devices for energy efficiency by means of epitaxy and optical spectroscopy. This work supports the Lighting Enabled Systems & Applications (LESA).

Shengbai Zhang
First-principles structural and electronic properties of a broad range of solid-state materials from crystalline, amorphous semiconductors, metals, to various nanostructures.

ASSOCIATE PROFESSOR

Ethan Brown
Chair of Graduate Recruiting
Dark matter direct detection, neutrinoless double beta decay (nEXO), experimental particle physics.

Esther Wertz
Light-matter interactions of single molecules with plasmonic nanostructures, super-resolution microscopy.

Ingrid Wilke
Ultrafast and Terahertz (THz) Spectroscopy. Research. Development of terahertz radiation sources, detectors and systems. Investigation of properties of materials at THz frequencies.

ASSISTANT PROFESSOR

Moussa N'Gom
Quantum optics and wavefront structured light fields to develop new tools for light-matter interaction for imaging and to address the core problem of photon entanglement degradation.

Trevor Rhone
Exploiting machine learning tools to support materials science research. Data-driven studies of two-dimensional magnetic materials, catalytic reactions and Li-ion battery materials.

Victor Robles
Formation of galaxies in the Local Group and early universe, cosmological hydrodynamics simulations using FIRE astrophysics, ultra-light axions and alternative dark matter models, cosmology.

Yong Zheng
Formation and evolution of galaxies and surrounding gas structures using hydrodynamic simulations and multi-wavelength observations with HST, Keck and FAST

AFFILIATED FACULTY

Nadarajah Narendran
Professor of Architecture; Director, LRC
Solid state lighting systems applications and reliability test methods. Additive manufacturing of illumination systems and components.

Boleslaw Szymanski
Professor of Computer Science; Director, NeST
Network science, social networks, complex systems.

Rena Huang
Associate Professor of Electrical, Computer, and Systems Engineering
Optoelectronic devices, integration and packaging, 3-D integrated microsystems

Ravishankar Sundararaman
Associate Professor of Materials Science and Engineering
Computational material science, electronic properties, nanomaterials.

Jian Shi
Associate Professor of Materials Science and Engineering
Spintronic and quantum materials for computing and energy.

To apply, learn more at
admissions.rpi.edu/graduate

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