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

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

- Astronomy and Astrophysics
  Computational astronomy, galactic structure and evolution, large astronomical surveys, dark matter.
- 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)

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

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.

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

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.

ASSOCIATE PROFESSOR

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

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

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.

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

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