

**LSU**

College of  
Science

Department of Physics & Astronomy



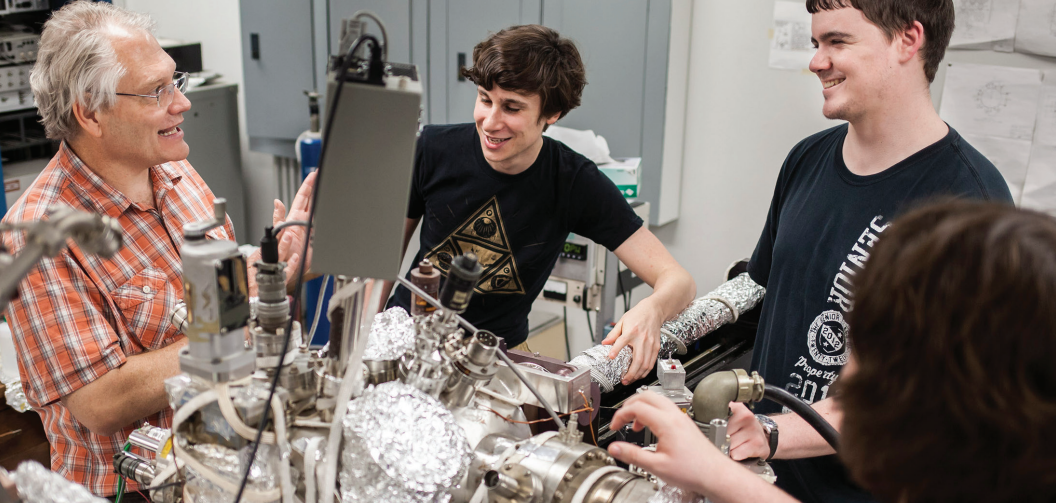
*Among our faculty is a National Academy member, many fellows of the American Physical Society and the Optical Society of America, the American Association for the Advancement of Science Fellows, and other distinguished researchers.*



## GRADUATE STUDIES IN **PHYSICS & ASTRONOMY**

Louisiana State University is a leading Carnegie Research I institution and the flagship university of Louisiana. LSU's Department of Physics & Astronomy offers PhD programs in physics and astronomy, as well as MS and PhD programs in medical physics. Our graduate students also have an option of obtaining a certificate in materials science as part of their progress towards a PhD.

Our faculty lead research on a wide range of cutting-edge topics, from investigating properties of nature on the Planck scale and the physics of subatomic particles to making, modeling, and studying novel magnets and superconductors, and exploring superclusters of galaxies.

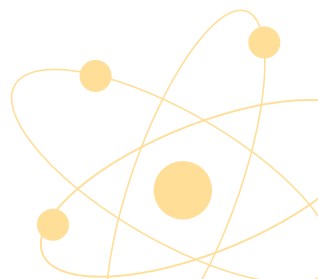


*Professor Phillip Sprunger and students conduct research in the Surface Science Lab.*

## STIPENDS & TUITION WAIVERS

All our graduate students receive assistantships and/or fellowships with competitive salaries. Our healthy research funding provides most students, beyond their second year, with support from research grants. This allows you to fully focus on specific projects, accelerating progress toward your PhD. In many cases, you will participate in collaborative projects between groups. This creates a collegial atmosphere where interactions are encouraged and expertise is easily exchanged.

*Our program is highly ranked  
by US News & World Report.  
[phys.lsu.edu](http://phys.lsu.edu)*

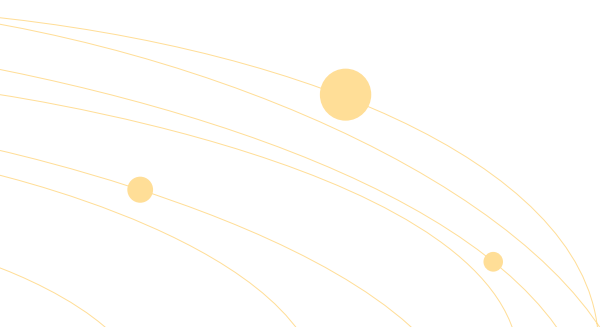


## RESEARCH AREAS

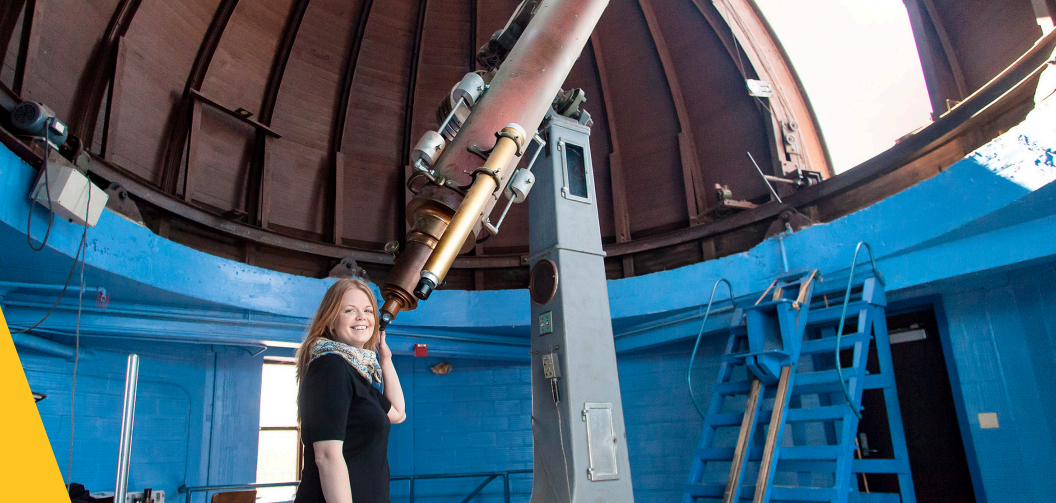
*Sponsored research expenditures from federal, state, and private sources average more than \$8 million annually.*

### ASTRONOMY AND ASTROPHYSICS

LSU astronomers and astrophysicists use ground-based and space-based telescopes plus theory to study compact objects – objects like black holes and neutron stars whose behavior is dominated by the effects of gravity. They work on the evolution of R Coronae Borealis stars, dust formation and evolution in core collapse supernovae, nova evolution and the progenitors of supernovae, and variability in black hole systems. They observe black hole systems with Fermi GBM and Kepler, and participate in the Large Synoptic Survey Telescope (LSST) Transients Science Collaboration and the Galactic Bulge Survey based on Cerro Tololo, Chandra, and VISTA observations. The experimental high energy astrophysics group is involved in the CALET project to observe very high energy cosmic ray electrons on the International Space Station, observations with Fermi GBM, terrestrial gamma flash observations of gamma rays from lightning, and very high energy cosmic ray studies with Auger.







*Ashley Pagnotta observes with the Alvan Clark telescope in the Landolt Observatory on the LSU campus.*

## CONDENSED MATTER AND MATERIALS PHYSICS

Condensed matter is the most diverse field of physics, covering a variety of problems that are of intense fundamental and practical interest. Our group of 14 faculty has a strong materials synthesis and characterization effort, both in bulk and at nanoscale, focused on new superconductors, magnetic compounds, semiconductors, correlated materials, and novel interface physics. Our on-campus facilities for reaching ultra-low temperatures and high magnetic fields, utilize spin and charge spectroscopic probes (photoemission, neutron scattering, scanning tunneling spectroscopy) for comprehensive investigations of these systems. The Institute for Advanced Materials coordinates interdisciplinary materials research on campus across departmental and college boundaries. You can obtain a materials science certificate while pursuing a PhD. The computational physics group develops and implements novel many-body approaches and algorithms to address the most challenging problems in correlated electron physics, and collaborates with our Center for Computation and Technology, with some of the most powerful supercomputers in the world. Our theorists combine first principles calculations of the electronic and lattice properties with the predictive theories of emergent correlated behavior, including unconventional superconductivity and its interplay with magnetism, low-dimensional physics, physics of heterostructures, as well as studies of quantum critical behavior and implementation of condensed matter models in cold atomic gases. You can obtain a materials science certificate while pursuing a PhD.

## RESEARCH AREAS

*Our faculty have achieved university as well as national awards, and are widely recognized for their research, teaching, and authorship of textbooks.*

### NEUTRINO, HIGH ENERGY, & NUCLEAR PHYSICS

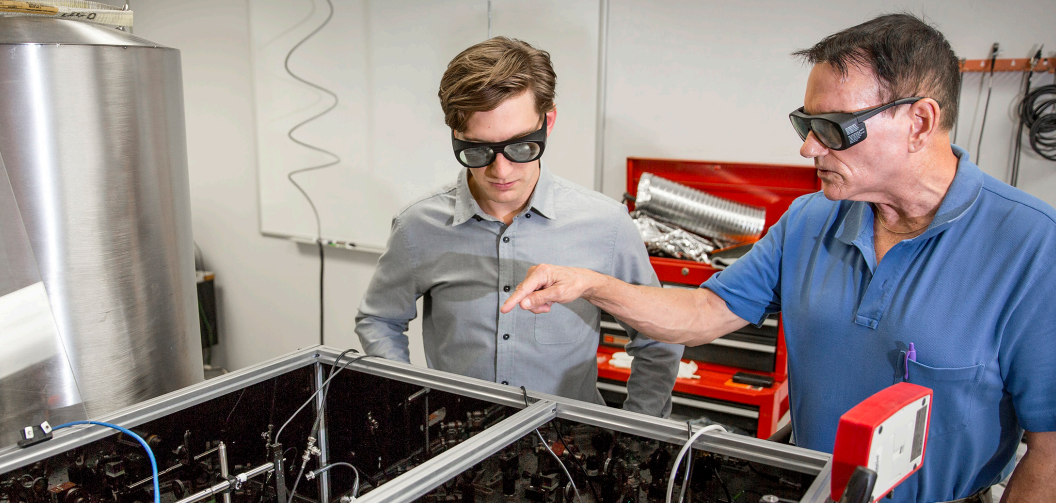
LSU experimenters are measuring neutrino oscillation parameters with the T2K long-baseline neutrino experiment in Japan and are preparing the next generation neutrino experiment, DUNE, at FermiLab to search for an asymmetry between matter and anti-matter. We are also exploring the origin of the highest energy cosmic rays at the Pierre Auger Observatory in Argentina. Cosmic rays and black holes are our targets for balloon flights over Antarctica and the Fermi satellite. We investigate nuclear properties and reactions that are important for understanding the origin of the elements, astrophysical explosions, and how nuclei form from fundamental forces. We develop new experimental techniques, used at leading accelerator facilities, and employ our novel ab initio nuclear theory on some of the fastest supercomputers.

### EXPERIMENTAL GRAVITY

LSU scientists are part of a world-wide collaboration searching for gravitational waves. LSU is at an advantage, with one of the largest and most diverse groups in the world, with the Laser Interferometer Gravitational-wave Observatory [LIGO] only 30 miles away. The LSU group contributes to the research and installation of the LIGO detectors, to the characterization and calibration of the detectors' data, and to the analysis of the data searching for collisions of neutron stars and black holes, supernova explosions, cosmological background, and the unknown. An on-campus laboratory researches the fundamental science and technologies that will make the next generation of detectors possible.

### THEORETICAL GENERAL RELATIVITY

LSU theorists have been able to apply quantum mechanics to black holes and show that they are not infinitely dense in their interior. They have also been able to follow the collision of inspiraling black hole binaries



*Todd Moulder with Jonathan Dowling*

over the entire event. LSU has one of the best theoretical GR groups in the world, close access to some of the fastest supercomputers in the world on campus, plus a close connection with the LSU gravitational wave experimentalists from LIGO, one of only two facilities like this in the country.

## ATOMIC, MOLECULAR, OPTICAL PHYSICS & QUANTUM SCIENCE

With seven professors, the LSU group in theoretical atomic, molecular, and optical physics is among the largest in the country. One of our specialties is quantum sciences and technologies, including quantum optics, information, sensing, imaging, and photonic materials. Entanglement, superposition, and interference are all aspects of quantum theory that were once regarded as strange and, in some cases, as nuisances. Nowadays, we understand these phenomena to be features that are the enabling fuel for a new quantum theory of information and computation, in which seemingly magical possibilities, such as teleportation, are becoming reality. A second focus area is ultrafast AMO physics. Our attosecond theory group works closely with experimental groups around the world, studying the interaction between atoms or molecules and ultrafast laser fields, in order to explore and understand electron dynamics at the sub-femtosecond time scale.

## MEDICAL AND HEALTH PHYSICS

To meet the increasing demand of hospitals, clinics, and industry for trained medical physicists and health physicists, LSU offers an MS and PhD degree in medical physics and health physics. Medical physicists research new imaging and treatment technologies for early detection, diagnosis, and treatment of human disease. X-ray and gamma ray detection is studied for imaging breast, heart, and other diseases. Synchrotron radiation is studied for new therapy and imaging methods. Applications of image-guided radiotherapy, tomotherapy, and gated radiotherapy and development of new electron therapy technology are being studied with Mary Bird Perkins Cancer Center.

## STUDENT TESTIMONIALS

LSU's medical physics faculty have consistently encouraged the development of my personal research and career goals. They have supported me in applying for and receiving a Fulbright Fellowship and helped me to design master's, Fulbright, and PhD research projects that are not only original, innovative, and high-impact, but that I feel passionately about.

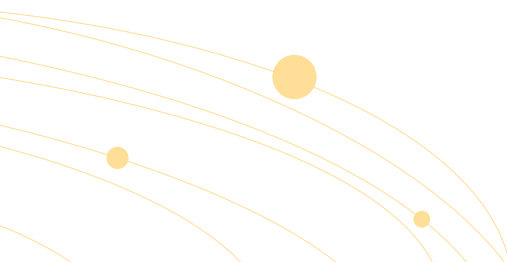
*Lydia Wilson Jagetic, Medical Physics*

Of all the schools that I visited, only LSU's faculty and staff made me feel like I wouldn't be another cog in a machine. Everyone seemed more invested in helping me achieve my goals while treating me as an individual. It's something that has continued and made the experience all the better.

*Ed Montiel, Astronomy*

The faculty and staff are very helpful and involved with their students – not to mention connected to collaborators all over the globe. My own thesis study revolves around a cosmic-ray instrument that will be deployed on the International Space Station! Through LSU I have been afforded wonderful opportunities for research with collaborators at NASA, and in Japan and Italy, STEM outreach through a series of public lectures, and travel to interesting places across the world!

*Nick Cannady, Astronomy*







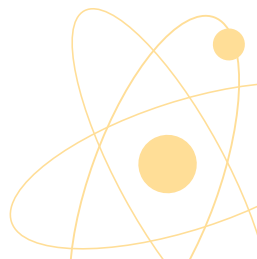
*Lydia Wilson Jagetic, Medical Physics*

I grew up in a small town and did my undergraduate work at a small liberal arts college. This made LSU very intimidating to me when I was choosing graduate programs. However, LSU made the transition very easy by providing me with access to everything I needed to succeed, from the local high performance computing resources, all the way to having passionate professors who are experts in their research fields helping me at each step along my path.

*Seth Camp, Atomic and Molecular Physics*

Joining the Physics Graduate Program at LSU is for sure the best decision I made in my life. My research experience in the Quantum Science at Technologies group at LSU has been superlative. I have had the opportunity to collaborate internationally, and to present and publish my research at top quality venues. This has helped me now find my dream postdoctoral offer!

*Kaushik Seshadreesan, Quantum Physics*



## CAMPUS LOCATION

*Located on the Mississippi River, the University campus, with its magnificent live oaks, magnolias, and crepe myrtles, is one of the most beautiful in the country.*

## LSU AND BATON ROUGE

LSU is just minutes from vibrant downtown Baton Rouge, the state capital and a cultural crossroads between the Cajun country with its center in Lafayette [55 miles to the west] and the birthplace of jazz and home of Mardi Gras, New Orleans [80 miles to the southeast]. Baton Rouge – sometimes called “Red Stick” from its French translation – and the surrounding areas are home to more than 800,000 people. Visit [visitbatonrouge.com](http://visitbatonrouge.com) to learn more about the city.

## CAREER LAUNCH

Our recent graduates have gone on to work at all major national laboratories, such as Brookhaven, Fermilab, Los Alamos, NIST, and Oak Ridge; major companies, such as Boeing, Dow Chemical, ExxonMobil, and IBM; NASA, and the American Museum of Natural History; and prestigious universities, including Harvard, Harvard Medical School, Princeton, Ohio State, Maryland, and Johns Hopkins.

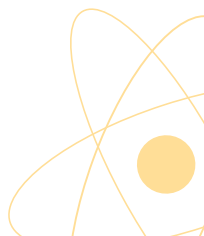


*Students and faculty gather in the Quad for the annual crawfish boil.*

## APPLY NOW

You can be an integral part of this vibrant program at LSU that combines world-class research with extensive course offerings, including accessible and engaged faculty and friendly fellow graduate students. *Application deadlines are January 15 for fall and October 15 for spring admission. Apply for the LSU Graduate School online at [gradapply.lsu.edu](https://gradapply.lsu.edu).*

*\*Note: We waive the application fee for domestic students. For foreign applicants who are unable to pay the fee, we also consider applications sent directly to the department, but these take longer to process, and should be sent well in advance of the deadline to ensure full consideration. For more information, visit [phys.lsu.edu](https://phys.lsu.edu).*



LOVE PURPLE  
LIVE GOLD

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Science

Learn more at  
[phys.lsu.edu](http://phys.lsu.edu)  
or call 225-578-2261  
E-mail: [gradstudy@phys.lsu.edu](mailto:gradstudy@phys.lsu.edu)

