Situated in beautiful Bozeman, MT, the Department of Physics at Montana State University pursues experimental and theoretical research in many areas of modern physics. Our department is committed to excellence in research as demonstrated by many world-renowned research groups as well as fostering an equitable and inclusive community of physics researchers, educators, and students.

Physics department at a glance:
- 19 faculty members
- 70 graduate students
- PhD and MSc degrees
- $6 million/year in research
- Research & teaching stipends available

ASTROPHYSICS AND EXTREME GRAVITY

Faculty members in the Department of Physics lead world-renowned research groups specialized in applying the laws of physics to explain astrophysical problems. Using observational and theoretical methods, they investigate stellar and supermassive black holes, galaxy evolution, neutron stars, star formation, and extreme astrophysical phenomena such as binary black hole mergers. These groups collect and analyze data from state-of-the-art ground-based and space-based telescopes as well as the LIGO and NANOGrav gravitational wave observatories. Research activities in these areas include creating theoretical models to interpret astronomical observations of neutron stars and black holes, developing analysis algorithms and big data techniques for astronomical data, performing observations across the electromagnetic spectrum, and developing new observational instruments.

FACULTY: Neil Cornish · Bennett Link · Anne Lohfink · David Nidever · Amy Reines · Sachiko Tsuruta · Hang Yu

CONDENSED MATTER, OPTICS, AND QUANTUM SCIENCES

The Department of Physics is home to world-leading groups that explore new materials and systems that exhibit exotic behavior where quantum mechanics dominates. These groups synthesize and characterize new compounds for applications from quantum technologies to energy harvesting, fabricate and test prototype devices, investigate novel phases of matter, develop new lasers and detectors for advanced technologies, measure exceptionally weak forces such as gravity, and build quantum systems from trapped atoms and ions. Research activities in these areas engage industrial partnerships and interdisciplinary collaborations with materials scientists, mathematicians, computer scientists, chemists, and biologists, exposing students to a broad range of research areas, technologies, and future employment opportunities.

FACULTY: Nick Borys · Brian D'Urso · Matt Jaffe · John Neumeier · Aleks Rebane · Anton Vorontsov
RESEARCH FACULTY: Loc Duong · Amir Hasani · Krishna Rupavatharam · Charles Thiel
MAJOR PROGRAMS: MonArk NSF Quantum Foundry · Applied Quantum CORE · Spectrum Lab

PHYSICS EDUCATION

The MSU Physics Education Research (PER) Group concentrates on public outreach, and research that investigates myriad aspects of undergraduate and graduate education. Our research includes examining and developing strategies to improve the epistemic beliefs of students in introductory astronomy courses, psychometric analysis of known assessment tools in PER, and working with the STEM Storytellers. We collaborate with various groups and institutions including the Montana Engineering Education Research Center, the NASA Heliophysics Education Consortium, and the College of Education as well as other faculty members across MSU.

FACULTY: Shannon Willoughby · New Faculty in Fall 2024

SOLAR AND SPACE PHYSICS

The MSU Solar Physics and Space Research groups are among the world's most prominent groups researching the Sun and the high-energy particle phenomena in the near-earth environment. With collaborations and partnerships around the world, these groups study aspects of the Sun, Earth's magnetosphere, and energetic particles in the near-earth environment, mostly from spacecraft, sub-orbital rockets, or high-altitude balloons. The Solar Physics group studies aspects of the Sun including the corona, flares, coronal mass ejections, and the solar wind. The Space Research group develops, builds, and launches experiments to study the ionizing radiation in the near-earth environments.

FACULTY: Rachael Filwett · Charles Kankelborg · Dana Longcope · Jiong Qiu · John Sample