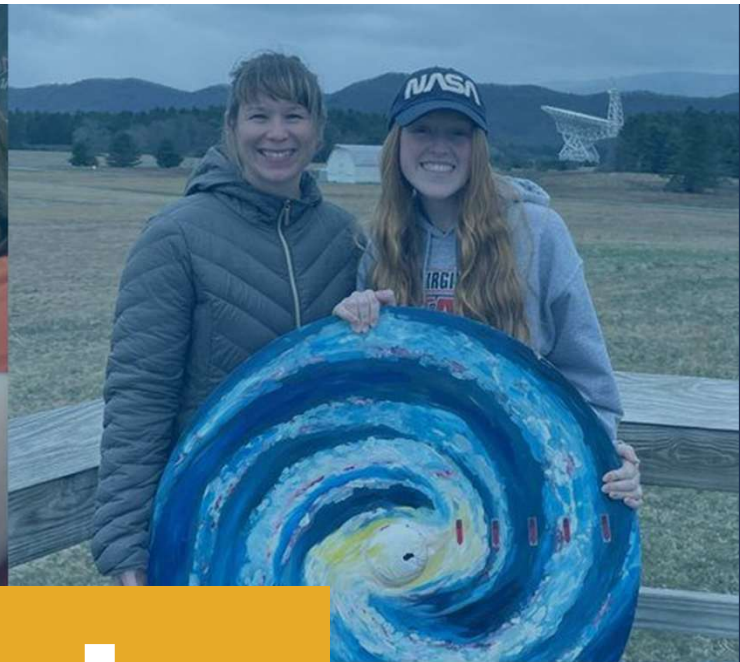




**The goal of orientation is
to present you with
strategies for success in
STEM for college and
beyond.**



Brief questionnaire

Optional Fun Activity



- Designed to get you looking around the building and maybe talking to a few people.
- Scavenger Hunt to find a specific room. (If you happen to already know where it is, I'd appreciate it if you pretend you don't, but join with someone else to give them a hint if they get too lost. Let them wander a little though.)

Do we want to do this?

I could just show you, but that's less fun.

I have some helpers I need to warn.

Planned Schedule

- August 19 Welcome and Introduction to Physics and 191
- August 26 Tips for Success in College and Beyond
- September 2 Self Reflection for Improved Learning
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- November 25 Happy Thanksgiving!
- December 2 Second Day of Student Career Planning Presentations



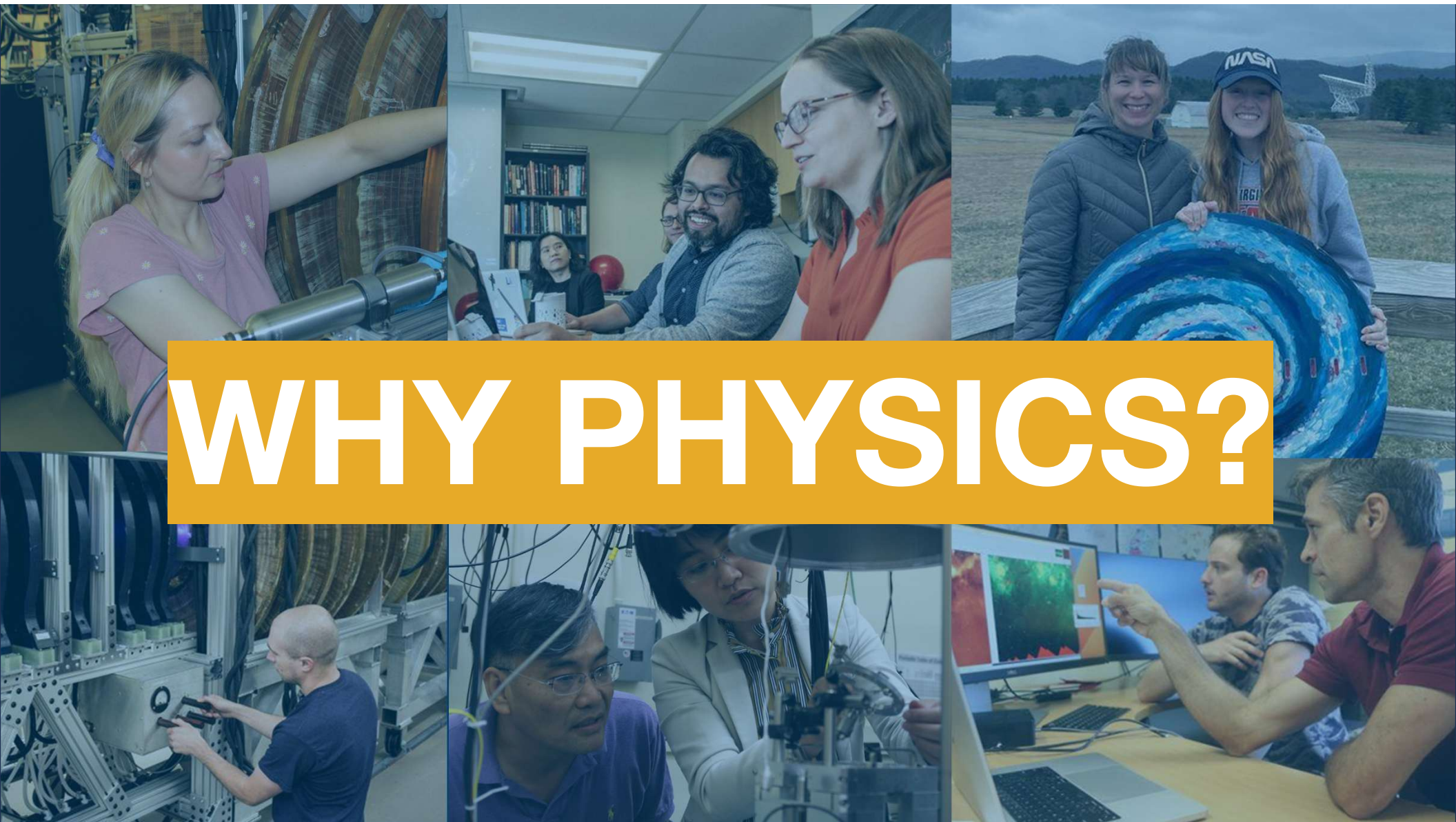
Anyone want to show off a good memory?

Introductions

Name

Hometown

Something fun about you



WHY PHYSICS?

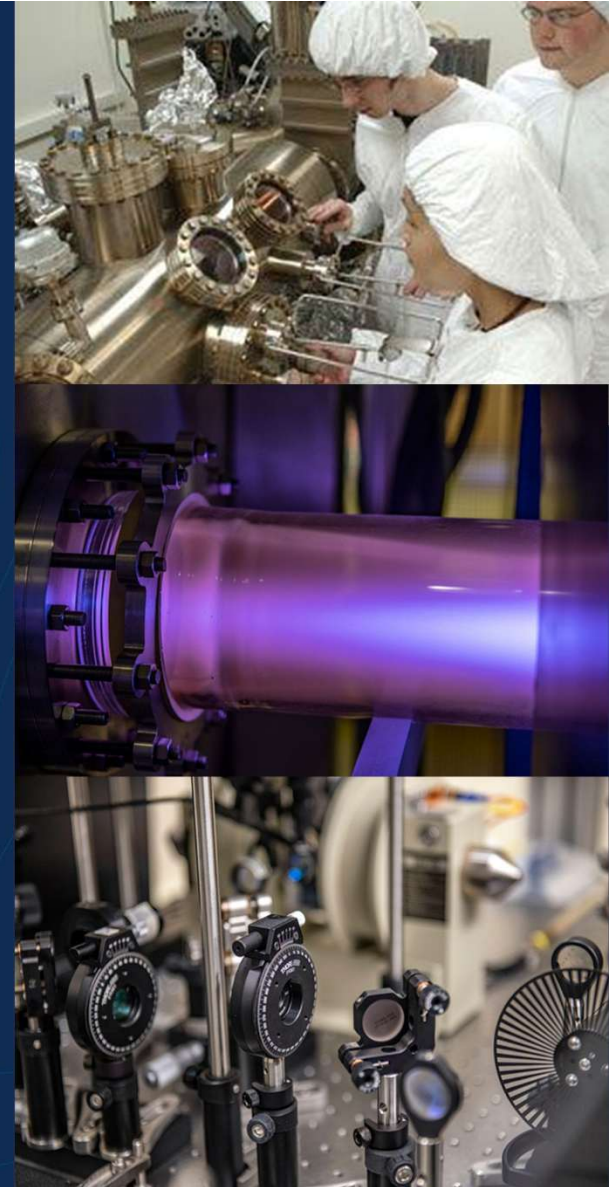
If you are interested in quantum computing, artificial intelligence, space, clean energy, lasers, science fiction, or you just like to learn how things work, *then Physics is for you!*

SKILLS PHYSICS MAJORS DEVELOP...

- Problem-solving
- Simulation & modeling
- Experimental design
- Making connections
- Programming & coding
- Organization & analysis
- Communication
- Equipment design

... and many more!

These are life skills that apply very broadly!



FIVE MYTHS ABOUT PHYSICS

MYTH #1: NATURAL ABILITY

TRUTH: You don't have to be naturally good at science or math to excel in physics! Anyone can excel in physics with the right effort and attitude.

While helpful, you do not need to be a genius at either math or physics to well in either, but you do need a commitment to work on improving your ability.

Math and physics are different skills

In math, you're often asked to solve a well-defined problem. In physics, you're asked to look at a messy real-world situation and create a simplified model of it. The challenge is deciding what matters, what can be neglected, and which physical laws connect the situation to the mathematics.

Physics is the science of modeling reality. Reality is complicated; models are simpler.

A large part of learning physics is learning which simplifications and approximations preserve the essential physics and which ones do not. We make simplifications not because we are lazy, but we are trying to understand what matters.

Assume a spherical cow of uniform density.



...while ignoring the effects of gravity.



...in a vacuum.



bastard theoretical physicists
How do you sleep at night?

FIVE MYTHS ABOUT PHYSICS

MYTH #1: NATURAL ABILITY

TRUTH: You don't have to be naturally good at science or math to excel in physics! Anyone can excel in physics with the right effort and attitude.

MYTH #3: NOT JUST LAB WORK

TRUTH: Physics opens doors to a wide range of high-paying careers. Physicists are among the best paid of all graduates while doing work that benefits society.

MYTH #2: GRADES

TRUTH: A difficult major like physics gives you an advantage. Even if you do not get perfect grades, it shows grad schools and employers that you are willing to take on a new challenge.

MYTH #4: WHO CAN DO PHYSICS?

TRUTH: Physics is for anyone and everyone. You don't have to look a certain way or be from a certain background to thrive as a physicist or astronomer.

MYTH #5: IN THE REAL WORLD

TRUTH: Physics answers questions that no other field can answer, and it is fundamental to other fields and major advancements.



CAREERS IN PHYSICS AND ASTRONOMY

Physicists and astronomers can be found working in countless disciplines and industries. Here are a few examples!

- Acoustical engineering
- Additive or bio manufacturing
- Advocacy and science communication
- Aeronautics and aerospace engineering
- Biophysics
- Climatology
- Computer science
- Data science
- Education and teaching
- Energy science
- Exercise science and physiology
- Finance
- Game design
- Law (e.g. patent, IP & tech rights/transfer)
- Machine learning
- Materials science and engineering
- Mechanical engineering
- Medical physics and digital healthcare
- Meteorology
- Optics and photonics
- Public policy
- Quantum science
- Robotics
- Sales and marketing
- Semiconductors

EXAMPLE APPLICATIONS

FORENSIC SCIENCE



Matching torn/broken pieces of duct tape is a common need in evidence analysis, but it can be unreliable to match with certainty. In collaboration with Forensics, students and faculty at WVU Physics developed a quantitative machine learning model to test duct tape matches. The model was used successfully in court!



MEDICINE

“Physics is the basis of understanding many principles of physiology! From muscle function to cardiovascular blood flow to neurobiology, understanding physics is critical to the study of medical physiology and ultimately patient care.”



Dr. Mark Paternostro
Professor of Physiology and Pharmacology, WVU School of Medicine
Member of the WVU Medical School Admissions Committee





RESEARCH & ACADEMICS

ACADEMIC OPPORTUNITIES

We offer multiple Areas of Emphasis to help you personalize your learning experience. If you're not sure what you are interested in, that's fine, too!

COMPUTATIONAL PHYSICS

MEDICAL PHYSICS

PROFESSIONAL PREPARATION

SPACE PHYSICS

PHYSICS TEACHING

SCHOLARSHIP OPPORTUNITIES

There are about a dozen scholarships awarded to Physics majors every spring within our department. Additionally, WVU offers other scholarships institutionally and based on outstanding achievement.

RESEARCH OPPORTUNITIES

Laboratory and research experience can enhance career opportunities, and the WVU Physics and Astronomy laboratories and computational facilities are world-class!

ASTRONOMY & ASTROPHYSICS

CONDENSED MATTER PHYSICS

PHYSICS EDUCATION RESEARCH

PLASMA AND SPACE PHYSICS

Condensed matter physics is the study of the physical properties of condensed phases of matter, like solids and certain exotic liquids.

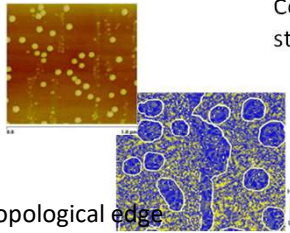


Research Opportunities: Condensed Matter Physics

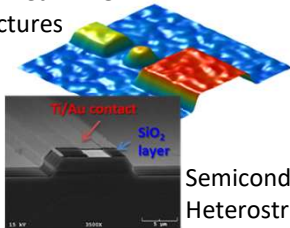


Low-Dimensional Systems

Quantum dots



Confined 2DEG structures

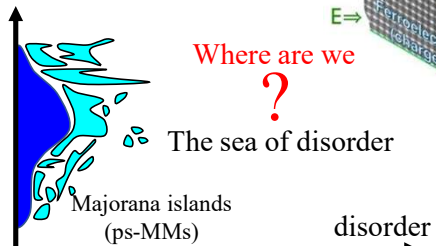
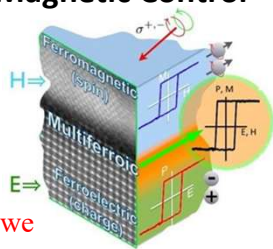


Semiconductor Heterostructures

Topological edge channels

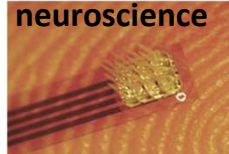
Novel Magnetism / Magnetic Control

Majorana fermions

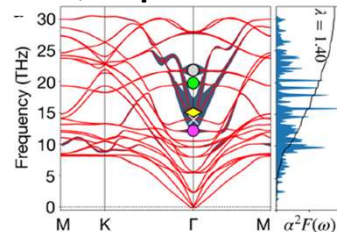


Topological and Quantum Matter

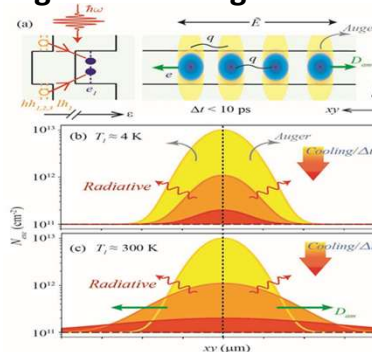
Bionanotech/ neuroscience



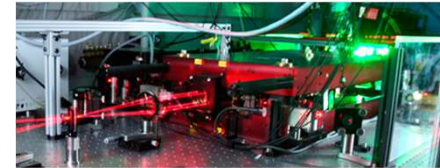
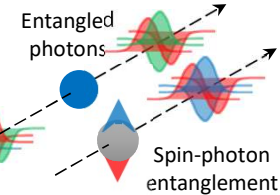
Quasiparticles



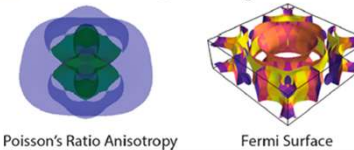
Energy- Efficient / Solar Light Harvesting Devices



Quantum Information / Optical Control



Tetragonal NiTi_2



Materials Design and
Machine Learning



EXPLORING NEW FRONTIERS.

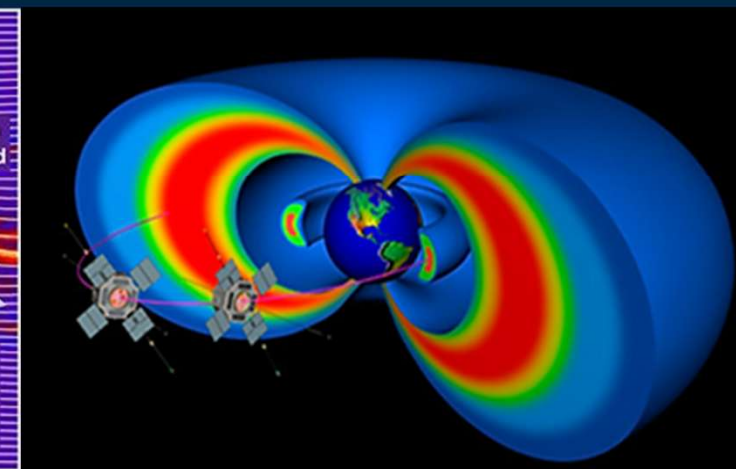
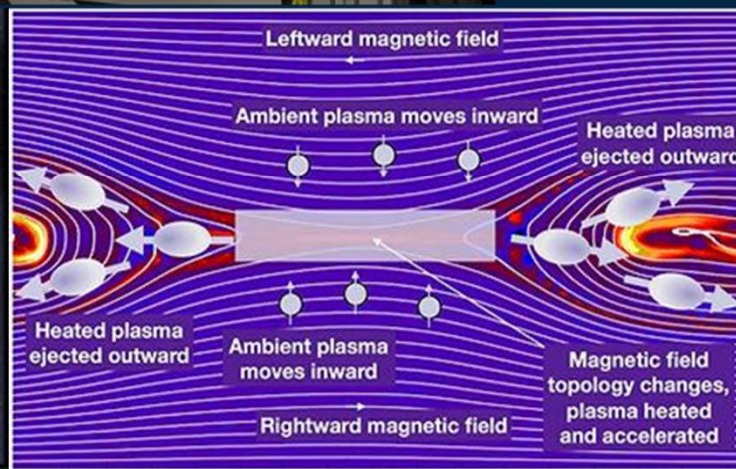
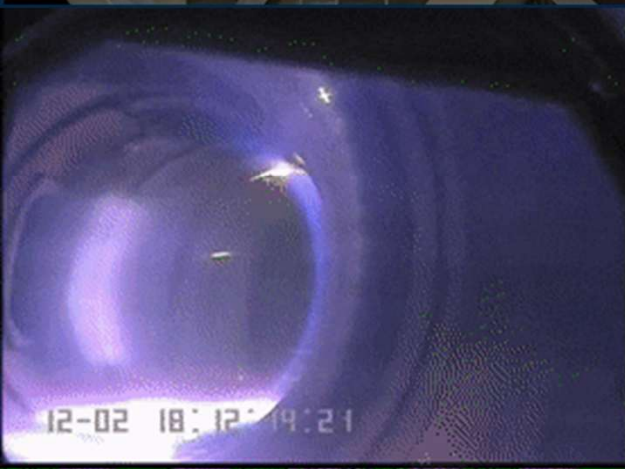
As the only facility in the world capable of making three-dimensional measurements of ions' and electrons' motion at kinetic scales, we're leading the way toward important applications in space weather, magnetically confined fusion, and astrophysical plasmas.

Research Opportunities: Plasma & Space Physics



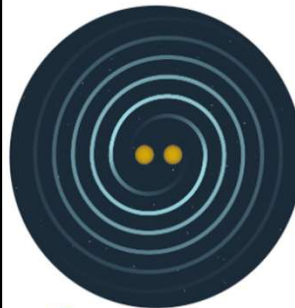
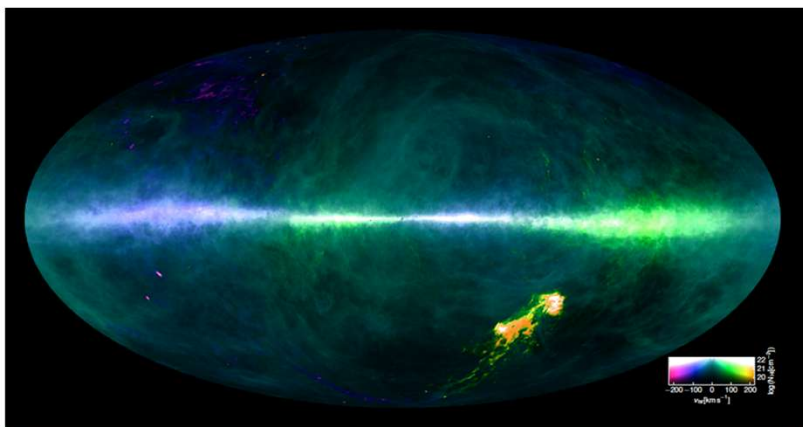
WVU Plasma & Space Physics studies the fourth state of matter. Cutting-edge lab facilities house sophisticated devices for generating plasmas and instrumentation for measuring the properties of plasma.

 West Virginia University
CENTER FOR KINETIC PLASMA PHYSICS



Astronomy & Astrophysics uses ground and spaced-based telescopes to study pulsars, gravitational waves, fast radio bursts, neutral hydrogen in our galaxy and beyond, and the processes through which stars are formed.

Research Opportunities: Astronomy & Astrophysics



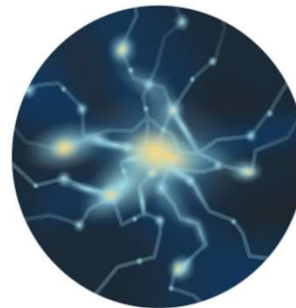
Gravitational Wave
Astrophysics



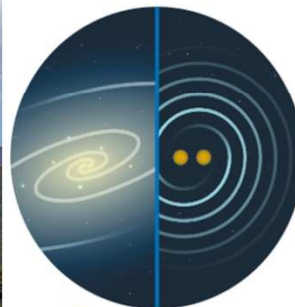
Interstellar Medium



Galaxy Formation and
Evolution



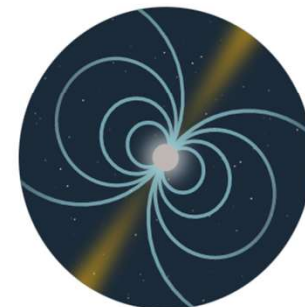
Cosmology



Multi-Messenger
Astronomy



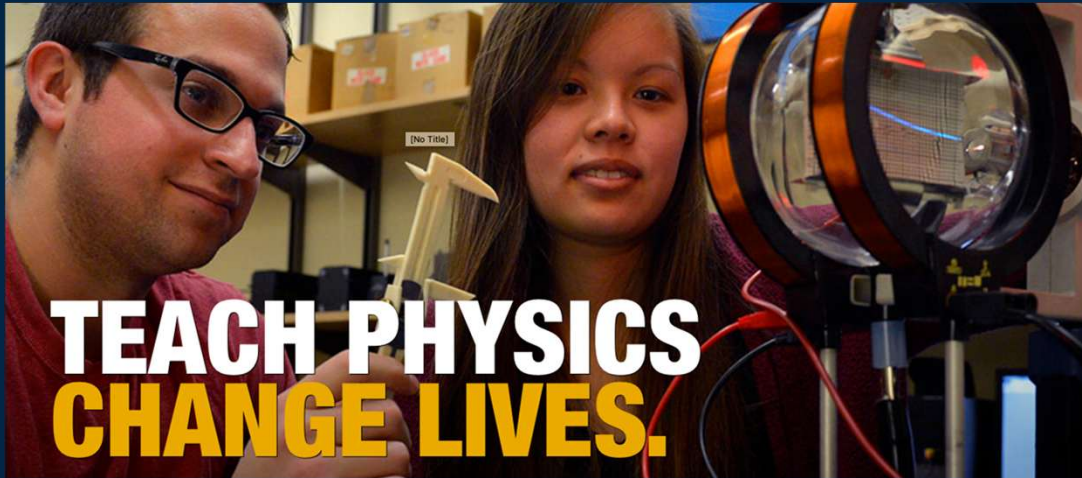
Fast Radio Bursts



Neutron Stars



Radio Instrumentation



TEACHING MAKES A DIFFERENCE

- Teachers are highly desired nationwide, particularly in STEM fields like Physics and Astronomy.
- Education improves through scientific inquiry and the use of data-led approaches.
- Most importantly, STEM education lifts society, and leads to a brighter tomorrow for everyone!

Research Opportunities: Physics Education Research



OUR PARTNERS



Center for Excellence in
STEM Education

OUTREACH OPPORTUNITIES

Students in the department have tons of opportunities to get involved on campus and in the community...

WVU PLANETARIUM AND OBSERVATORY

Our students work as telescope assistants and assist with public planetarium shows and outreach events. The Planetarium thrives through student participation!

SOCIETY OF PHYSICS STUDENTS (SPS)

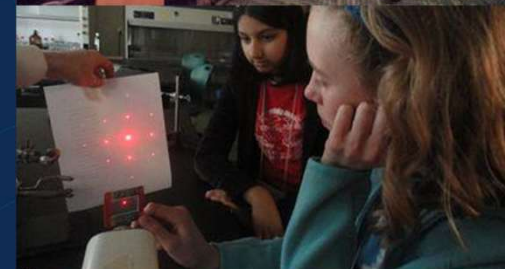
SPS meets regularly to host community and departmental events. Additionally, they often participate in research projects and attend/host national physics conferences!

QUANTUM TECHNOLOGY CLUB (WVUQT)

WVUQT is for anyone interested in learning about how quantum computing and supercomputers work. They host lectures and learn hands-on skills!

ASTRONOMY CLUB

Astronomy Club is highly active in the community, often traveling to the Green Bank Telescope for research and learning experiences!



OUR STUDENTS ARE DOING GREAT THINGS!

Graduates from WVU Physics and Astronomy program can be found doing incredible work around the world...

Academics

- Massachusetts Institute of Technology
- Johns Hopkins University
- Penn State University
- University of Virginia
- University of California – Davis
- Murray State University

Government

- Naval Surface Warfare Center
- National Institute of Standards and Technology (NIST)
- National Energy Technology Laboratory (NETL)

Industry & Healthcare

- Applied Materials
- Skyworks
- MARVEL SNAP
- Cree
- Mission Tracker
- Schweitzer
- Halliburton
- L3Harris
- Mayo Clinic
- Evolent Health



ALUMNI CAREER PROFILES



Scott Cushing

B.S. 2011, Ph.D. 2015

- After graduation, he worked as a post-doc at UC Berkeley.
- Now, Dr. Cushing is an **Assistant Professor of Chemistry at Caltech.**



Virginia Cunningham

B.S. 2015

- After graduation, she obtained her Ph.D. from the University of Maryland.
- Now, Dr. Cunningham is a **post-doc at the Space Telescope Science Institute (STScI)** in Baltimore, MD.

ALUMNI CAREER PROFILES



Brent Shapiro-Albert

Ph.D. 2021

Since graduation, Dr. Shapiro-Albert worked as a **Science Writer and Community Advocate for Universe Sandbox**, a physics-based space simulation video game.



Jack Powers

B.S. 2020

After graduation, ENS Powers joined the **United States Navy as a Surface Warfare Officer (Nuclear Option)** using specialized skills learning from his degree in Physics.

Professionalism includes reading your emails

Every internship opportunity, scholarship announcement, research opening, registration issue, graduation reminder, and recommendation request response will come through your university email. If you don't read it, opportunities disappear.

Faculty cannot individually text every student. Email is the official mechanism by which we notify you about opportunities and requirements.

Nobody gets fired for not checking Instagram. In the workplace, people can get fired for not checking email.

If your emails are too cluttered, try organizing them. For example, you could create a physics folder, turn on notifications for university emails, or use unroll.me or similar.

More professionalism/success tips in next two classes

Next Class: John Stewart

- Tips for Success in College and Beyond
- I will not be in town. Giving an invited talk.
- Bring a notebook. Take some notes.



293 students met John yesterday

Assignments/Grading

- In class reflections (need any notebook) 20%
 - Guided Study Session and Reflection 15%
 - AI Reflection Assignment 15%
 - Career Interests and Goals Assignment 15%
 - End of semester Career Planning Presentation 15%
 - General engagement/attendance 20%
-
- A (90-100%), B (80-89.9%), C (70-79.9%), D (60-69.9%), F<60

Recommend study assignment first since careers and AI classes come later, but your choice.

You could start any of these 3 today if you wanted to get a head start.

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PHYSICS



HOME



191 CLASS



293 CLASS



ADDITIONAL
MATERIALS



BACK TO
RESEARCH

191 First Year Seminar Syllabus

Fall 2026 Teaching Schedule (Subject to Change)

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QUESTIONS?