ABOUT THIS RESOURCE

This interactive, digital resource is designed to showcase the various research-based graduate programs offered at West Virginia University and to highlight the importance of an education at a university that has a strong commitment to high research activity.

This guide is for prospective master’s (and even prospective PhD) students and will show the ways in which a research-intensive master’s program can prepare you for a variety of academic and professional next steps. Whether you decide to pursue your PhD or whether you simply want to sharpen your skills to boost your career possibilities, this guide will outline how a research-heavy advanced program can help prepare you for professional success. We hope this guide will help you to see the value and importance of research as well as the opportunities such an academic program can provide you.
TABLE OF CONTENTS

4 Research-Based Academia
5 Carnegie R1 Institution
8 WVU’s Research Achievements
10 Understanding Graduate Assistantships
11 WVU Spotlight: Student In Research
14 Reading For Aspiring Researchers
15 Connect With Us
RESEARCH-BASED ACADEMIA

The creation and application of new knowledge is the focus of the work in a research-heavy advanced academic program.

A research-intensive graduate program is designed to help a student develop skills as an independent thinker and professional within their discipline of study. This kind of training prepares students for a life of inquiry leading to a deepening of our collective understanding of the world around us.
CARNegie R1 INStItUTION

There are 115 institutions in the U.S. classified as R1 by the Carnegie Foundation for the Advancement of Higher Education, and WVU’s research classification is described as fitting into the “highest research activity” classification for doctoral universities.

R1 institutions are engaged at the frontiers of knowledge discovery across the spectrum from the Creative Arts and Humanities to the Social Sciences to the Applied and Basic Sciences. These are the best research universities in the U.S. and where the majority of academic research is conducted. Much of the research at R1 universities is funded by federal or private sources.

Students at Carnegie R1 institutions, whether they are studying at the undergraduate or graduate level, have the opportunity to engage in research at the forefront of their discipline. Students at R1 universities also work with faculty who remain active in the discovery of knowledge and who bring the latest findings from their research and that of their colleagues into the classroom.

Students who graduate with a degree from an R1 institution have the most current understanding of the state of the art in their major field of study. In other words, R1 classified schools are up-to-date with the most recent findings and trends impacting that area.
Top Research-Based Graduate Programs

All PhD programs and many MA and MS programs at WVU are research-based. They are further described in the Graduate Catalog, but here are some sample research-based programs for your review:

**Neuroscience**

The doctoral program in Neuroscience is committed to training the next generation of researchers and educators. Successful completion of degree requirements is based on research and scholarly achievement. Students will have opportunities to experience and acquire the skills needed for successful careers as independent scientists, including critical thinking, problem-solving, writing, public speaking, and leadership. After completion of core coursework, students conduct an original research project culminating in a doctoral dissertation. Research experiences include evaluating scientific literature, identifying critical scientific issues, experimental design, grant and manuscript writing, publication of scientific papers, and presentations at national meetings.

“Going to conferences and participating in journal clubs and research forums has taught me to effectively communicate my research and to critically evaluate other research. Pursuing an advanced degree in STEM allows you to develop communication and critical-thinking skills. These skills are not only important for you to achieve your degree but can and will apply to whatever job you pursue post-graduation.”

— Raymond Anderson  
*Neuroscience, PhD Student*

**Mechanical and Aerospace Engineering**

The Department of Mechanical and Aerospace Engineering offers programs in mechanical and aerospace engineering for students to earn bachelor’s, master’s, and doctoral degrees. Students have the option to perform research in interactive settings under the direction of our exceptional faculty. MAE focuses research primarily in the areas of aerodynamics and fluid mechanics; alternative fuels, engines and emissions; bioengineering; control, design and manufacturing; materials science; solid mechanics, materials and structures; robotics; space flight and systems; and thermal sciences.

“A graduate research assistantship will allow you to immerse yourself in your research and be fully engaged. In turn, this will allow you to have a higher understanding at a faster rate enabling you to ask certain questions which will be vital to one’s growth in their particular research field and on a personal level.”

— Cullen Boyle  
*Mechanical and Aerospace Engineering, PhD*
Public Health

A **Master of Public Health** degree is a multidisciplinary professional degree focused on the application of science, research and theoretical knowledge toward the prevention of disease. The WVU MPH program prepares students for promising careers providing evidence-based solutions to complex health issues. Graduates leave our program with the skills necessary to work in a variety of public health settings such as health departments, clinics, and federal agencies.

“From leaders at the Injury Control Research Center (which is one of 10 funded CDC centers in the nation) to the Comprehensive Opioid Addiction Treatment (COAT) clinic at Chestnut Ridge along with so many others, I knew WVU had the best researchers tackling this issue. In fact, I have had the opportunity to serve as a graduate research assistant at the Injury Control Research Center where I work on substance abuse (primarily opioid) related projects.”

— Sara Warfield

*Public Health, PhD Student*

Exercise Physiology

The **Exercise Physiology** master’s program is designed for students who wish to engage in an intensive research training experience, in preparation for further training in a PhD, or MD or similar postgraduate program. Typically, we will accept up to five students in the thesis track each year and usually offer 2-3 students an assistantship (stipend and tuition fee waiver). Selections for assistantships are competitive and are based on experience as well as academic qualifications and letters of recommendation.

“In order to truly understand the scientific process, it takes more than an undergraduate research experience and reading academic journals. Real innovation comes from intimately knowing the area of research you are in and further asking the next set of logical questions that can bring you to new and unexplored regions of study; an advanced degree in the STEM field helps to set the premise for this type of thought.”

— Quincy Hathaway

*Exercise Physiology, PhD Student*
WVU’S RESEARCH ACHIEVEMENTS

• WVU faculty generate over $127 million annually in sponsored contracts and research grants.
• The Blanchette Rockefeller Neurosciences Institute, the world’s first institute devoted to the study of human memory, is at WVU.
• WVU engineer Dan Carder, who led the research team that broke open the Volkswagen emissions scandal, was named to the 2016 Time 100, the magazine’s annual list of the 100 most influential people in the world.
• WVU astrophysicist Sean McWilliams was part of the LIGO team international collaboration that made the most important physical discovery of the past century: the detection of gravitational waves.
• Maura McLaughlin and Duncan Larimer from the Department of Physics and Astronomy were part of a global team of astronomers who detected for the first time repeating short-duration bursts of radio waves from an enigmatic source, likely located well beyond the edge of the Milky Way galaxy.

Faculty Expertise

The faculty who work with graduate students have themselves earned a PhD through similar programs of study from universities across the world. They are experts with very specific knowledge of the discipline in which they work and are skilled at guiding graduate students to gain a similar level of expertise.

• 54 Total number of WVU Fulbright Scholars
• 19 WVU faculty members have been named Carnegie Foundation Professors of the Year
• 85 percent of full-time instructional faculty hold the highest academic degree in their field
Value of Research in Grad School

In general, a research-based master’s degree program is designed to provide the student with a foundation from which they can pursue advanced study leading to a PhD. Some students find that the skills they learn at the master’s level are sufficient for them to achieve their career goals and so they do not pursue a PhD. Others find that by enhancing their skill set they have the opportunity to advance in their current organization.

Just a few of the career fields that require or benefit from research-based master’s degrees are:

- Academia
- Federal Government
- Curriculum
- Engineering
- Marketing
- Medicine
- Public Health

In addition to developing students as innovators in their field, there are a variety of benefits to participating in a research-heavy graduate program. For instance, students pursuing a research-intensive graduate program can expect to:

**Develop Critical Thinking Skills**
Students have the opportunity to develop essential critical thinking skills, incorporating self-awareness and open-mindedness into their work.

**Provide In-Depth Perspectives**
Students learn to explore and discuss multiple perspectives, worldviews, and cultural norms.

**Exercise Creative Solutions**
Students learn to focus on factual information while also forming innovative perspectives on a variety of topics.

**Strengthen Communication Skills**
By working together in an interdisciplinary manner, students learn to communicate by practicing skills needed to effectively convey and receive information.

**Prepare Students for Careers in Emerging Fields**
Thanks to research, there are many advancements in technology, medicine, and other scientific industries. Research-intensive programs help students to prepare for careers in new and emerging fields.
UNDERSTANDING GRADUATE ASSISTANTSHIPS

Graduate assistantships are a form of academic employment for which students must apply and be accepted based on academic excellence and faculty referral. Graduate assistants receive a tuition waiver based on the tasks they perform for faculty members or departments.

In addition to payment, graduate assistantships are a strategic way for PhD and master’s degree students to gain practical field experience, deepen academic understanding, and network with thought leaders and students in their field.

WVU offers 3 kinds of graduate assistantships:

West Virginia University awards approximately 1,700 graduate assistantships annually to incoming and continuing graduate students. All graduate assistants must be accepted into a graduate degree program and are required to be enrolled full-time while employed during the fall and spring terms (9 credits or more).

Graduate teaching assistants teach courses, laboratory sections, and recitation sections, or provide other forms of instructional assistance.

Graduate research assistants help faculty members with their research activities.

Graduate service assistants typically work in one of the administrative or service offices of WVU in positions related to their program of study and that contribute to their educational experience.

Regular graduate assistants work an average of 20 hours per week and partial graduate assistants work an average of 10 hours per week as teaching, research, or service assistants.

For additional information on Graduate Assistantships visit the Graduate Education and Life website.
Impact Technology with a PhD in Physics — Tips from a Researcher

“STEM education generates critical thinkers and promotes innovations that lead to novel ideas, products, and new technology — which is very important for the sustainable economic growth of this country.”

- Sobhit Singh Physics, PhD Graduate

Tell me a little bit about yourself. What’s your name, age, and where are you from?

My name is Sobhit K. Singh. I am 26 years old. I started my PhD degree when I was 21. I am from India. My home town – Shravasti – is particularly famous for its associations with the life of Lord Buddha. Lord Buddha spent most of his monastic life in Shravasti.

Where did you study before attending WVU?

I attended Lucknow Christian Degree College (Lucknow, India) to pursue a Bachelor of Science (B.Sc.) degree. After finishing my B.Sc. in 2008, I joined Indian Institute of Technology Guwahati (IIT-G) for a master’s degree (M.Sc.) in Physics. During my M.Sc., I was introduced to the materials research field by Prof. Subhash Thota.

I started my research career as an experimental condensed matter physicist, but now I am doing theoretical quantum mechanical calculations to discover new materials and predict their properties. Knowledge gained during my master’s degree has greatly helped me to comprehend the fundamental properties of materials and is incredibly assisting me in discovering and designing novel materials.

Tell me about the Physics program you just completed at WVU. What, in particular, did you study/research?

I completed the PhD program in the Physics and Astronomy department of WVU. I had been very fortunate to be a part of the computational materials research group led by Prof. Aldo Romero.

My research involved discovery of new material and their characterization using first-principles calculations. In particular, I studied materials that have strong spin-orbit coupling, i.e. coupling between the electron’s spin and orbital motion around the nucleus. By utilizing this feature, whose effects are not yet fully understood in many materials, we can efficiently harness the spin degree of freedom of electrons and develop the long-sought spin-electronics (spintronics) technology.

This technology will enormously increase the power of computers and other electronic devices compared to the present generation of electronic systems.
Why do you think pursuing an advanced degree in a STEM field is important for people who want to promote innovation in your field?

Well, as the saying goes that “Once a new technology rolls, you are either part of the steamroller, or part of the road”. There is no middle ground.

In the past century, STEM and STEM education has been consistently pervading and influencing our lifestyles. It is continuously expanding into every aspect of our lives. An advanced degree in STEM opens a plethora of job and career opportunities for students. STEM education generates critical thinkers and promotes innovations that lead to novel ideas, products, and new technology - which is very important for the sustainable economic growth of this country.

I believe that USA became a world leader because of the fact that people here realized the importance of STEM education long ago, and they paid appropriate deserving attention to STEM field.

Can you tell me a little bit about your dissertation?

Of course. My PhD dissertation focused on the materials in which electron’s spin and orbital degrees of freedom are strongly coupled, which means by playing with one degree of freedom we can control another one. I paid special attention to bismuth (Bi) and antimony (Sb) based compounds. These two elements inherit very strong spin-orbit coupling compared to the other elements in the periodic table. Although, we have been using Bi-Sb alloys since past some decades in designing thermoelectric coolers for practical purposes, - these alloys are among one of the best thermoelectrics yet known – their many other important features were unknown.

So in my research, I explored the complete phase-diagram of Bi-Sb alloys and discovered several new crystal structures of these alloys that could host remarkable properties. These new structures are promising candidates for applications in spintronics, thermoelectrics, and quantum computing industry. In addition to the structure prediction, my research revealed the existence of an emergent quantum phenomenon in a very special family of materials which arises due to the coexistence of two distinct type of novel quasi-particles.

One notable result from my research is the theoretical prediction that one can efficiently create and harness the dynamics of Weyl fermions in solid crystals. Weyl fermions, quantum particles that were recently detected in a lab after a long persistent search of 88 years, promise to conduct electricity at ultra-high speed without any energy loss or resistance. One year after my prediction, a team of scientists from Princeton and California State University experimentally verified my theoretical claims.

Did you participate in a graduate assistantship?

Yes. I served in a graduate assistantship as a TA in the physics department for almost two years.

As a TA, I taught undergraduate physics laboratory courses, proctored exams, and graded answer sheets of students. I truly enjoyed the teaching part of this job. I also designed some new experiments for undergrads and helped professors in reforming the existing labs.

Tell me about one faculty member who really made a difference in your education at WVU as a PhD student.

Prof. Mohindar S. Seehra. He has really made a big difference in my academic life and helped me to become what I am today. He has been an outstanding mentor, collaborator, and a great source of inspiration to me.

In the early years of my PhD degree, I worked in his laboratory and performed experiments. It was he who
(in his own words) and encouraged me to get some training and experience in theoretical research for the
good of my long-term research career. Following his advice and my own passion to acquire a more profound
understanding of materials research, I joined the research group of Prof. Romero and completed my PhD in
theoretical research. However, I continued collaborating with Prof. Seehra and kept publishing with him.

**Tell me about your new position in New Jersey. How did WVU prepare you for success in that position?**
After my PhD, I joined the theoretical condensed matter physics group at Rutgers as a Postdoctoral Research
Associate. Here, I am working with Prof. David Vanderbilt and Prof. Karin Rabe to understand and unveil
mysteries of the novel materials.

It is indeed a big step in my academic life, and I must say that WVU fully prepared me for it. The coursework,
research experience, training opportunities, and most importantly scholarships and fellowships at WVU
greatly helped me to achieve this success.

My PhD advisor, Prof. Aldo H. Romero, always encouraged me and supported me to attend conferences and
interact with the rest of the science community and learn from the experience. He gave me the freedom I
needed to think innovatively and produce ideas. The scholarships and honors at WVU always inspired me to
work harder and stay determined to achieve my long-term goals in academia.

I hope one day I will be able to help other Mountaineers by giving back to the WVU community.

**What's your favorite thing about WVU?**
I loved so much about WVU — the Mountaineer spirit, awesome people, and the elegant campus. I made
really nice friends and memories to cherish forever at WVU. I always felt at home on WVU’s campus, and the
Physics department was like a big family to me!
READING FOR ASPIRING RESEARCHERS

- How Does R1 Status Affect Grad Students Who Do Research?
- 6 STEM Careers for Creative Minds
- 5 Graduate Programs for People Who Love Research
- 3 Reasons the State of West Virginia Needs Public Health Professionals

SUBSCRIBE TO SUMMIT AHEAD
West Virginia University’s Admissions professionals hope that this guide has been helpful in informing you of the various academic options here at WVU.

Here’s a bit more information on West Virginia University as an institution: West Virginia University is located in beautiful Morgantown, WV, a community noted for its central location near Pittsburgh, Washington, D.C., Cleveland, and New York City. Founded in 1867 as a land-grant institution, WVU promises to “… deliver high-quality education, excel in discovery and innovation, model a culture of diversity and inclusion, promote health and vitality, and build pathways for the exchange of knowledge and opportunity between the state, the nation, and the world.”

The stimulating graduate community of scholar-teachers and passionate learners at WVU creates an environment that welcomes your desire to grow, to learn, and to add to the growing body of knowledge in your field. As a WVU graduate learner, you engage in internationally recognized academic programs.

If you want more information about graduate admission requirements, financial aid, or to learn more about the graduate application process, visit WVU’s Office of Graduate Admissions & Recruitment website.

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