WV-INBRE NEWSLETTER

The Impact of Summer Research on the Career Choices of Biology Students at Wheeling Jesuit University

Robert D. Shurina, Ph.D., Chair, Biology Department,
Wheeling Jesuit University

Over the past several decades, there has been an increased emphasis on student research in undergraduate education. The benefits of a strong undergraduate research program include enhanced student learning, increased student competence in science, technology, engineering and math (STEM), understanding the methods and process of research and increased interaction among students and students and faculty. Undergraduate research has also been reported to be an effective tool in increasing student retention. For these reasons, it is common for undergraduate colleges or universities to have some research opportunities for students. Some of these institutions now require one or more years of research for graduation.

Wheeling Jesuit University is a small liberal arts university located in the northern panhandle of West Virginia. Founded in 1954 as the only Catholic institution in the state, Wheeling Jesuit educates students for life, leadership and service. Enrollment is about 1,100 undergraduates and 350 master degree candidates. A substantial number of our students are the sons and daughters of coal miners or steel workers and are first generation college students. Many of these students want to work in the health-related professions after graduating; consequently, the most popular majors are the natural and clinical sciences. Among the natural sciences, biology is the most popular major. Graduation rates for our students over the past 20 years demonstrate that the Biology department is growing [see figure 1].

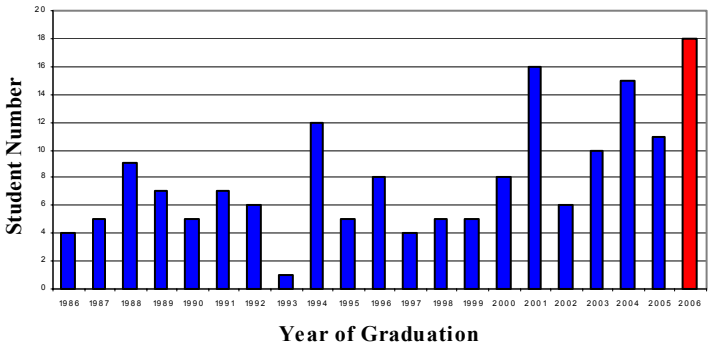

Figure 1. Wheeling Jesuit Biology Graduation Rates by Year

(continued on page 2)

Institutions of the WV-INBRE

Lead Universities

Marshall University
West Virginia University

Network Research Institutions (NRIs)

Alderson-Broaddus College
Fairmont State University
West Liberty State College
West Virginia State University
Wheeling Jesuit University

Network Outreach Institutions (NOIs)

Bluefield State College
Concord University
Davis & Elkins College
Shepherd University
West Virginia Wesleyan College

Inside this issue:

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Over the past 20 years, 46% of all biology students have graduated between 2001 and 2005. This year, we expect to graduate 18; the largest graduating Biology class in the history of our institution. A substantial number of our biology majors cite our research opportunities as one of their primary reasons for attending Wheeling Jesuit University. Research provides a valuable learning experience for our students and is an important factor in helping them achieve their career goals. Students learn skills and techniques that are necessary for both graduate and professional programs and for seeking employment.

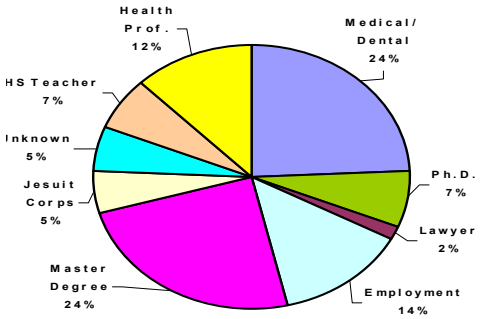

Figure 2. Career Choices of Wheeling Jesuit University Biology Graduates

Figure 2 (above) indicates the career choices for biology students who graduated between the years 2001 and 2005. Thirty-two of our graduates have entered graduate, medical or dental programs. Fourteen of these thirty-two students are in medical or dental schools, four are in doctoral programs and fourteen have entered master degree programs in the biological sciences. Of the remaining graduates, seven have entered the health professions as nurses, nurse practitioners, physical therapists or respiratory therapists. Four are now high school teachers, three have entered the Jesuit Volunteer Corps, one student has gone on to obtain a law degree, and eight other graduates have gone to secure employment in other fields. The career choices of three of our graduates are unknown. Overall, the success rate for our biology graduates is very good.

The career choices of our graduates are greatly influenced by their participation in summer undergraduate research. In the past five years, 22 of our 58 graduates (38%) have had a paid summer research experience. Figure 3 and Figure 4 (right) show a comparison of career choices for students who have or have not had a summer research experience. The acceptance into graduate or medical programs among students with summer research experience is 87%, compared with a 42% rate for students who have not participated in summer research. It is noteworthy that this difference is due to the number of students who have been accepted into medical and doctoral programs rather than to those pursuing a master degree. All students pursuing doctoral degrees have had summer research experience. Furthermore, the acceptance rate into medical schools for students with summer research experience is twice that for students without. The remaining students with summer research have entered into the health professions as nurses, nurse practitioners or physical therapists, or they are volunteers in the Jesuit Corps. Of the volunteers, all have indicated that they intend to enroll in graduate programs after their commitment to the Jesuit Corps.

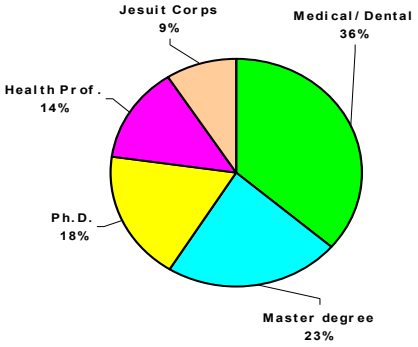

Figure 3. Career Choices of Biology Graduates With Summer Research Experience

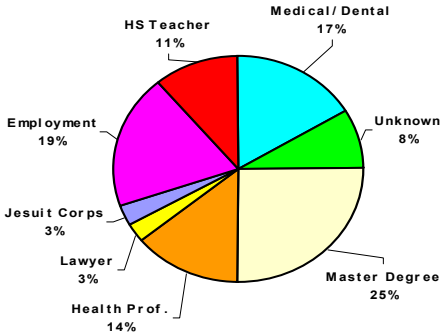

Figure 4. Career Choices of Biology Graduates Without Summer Research Experience

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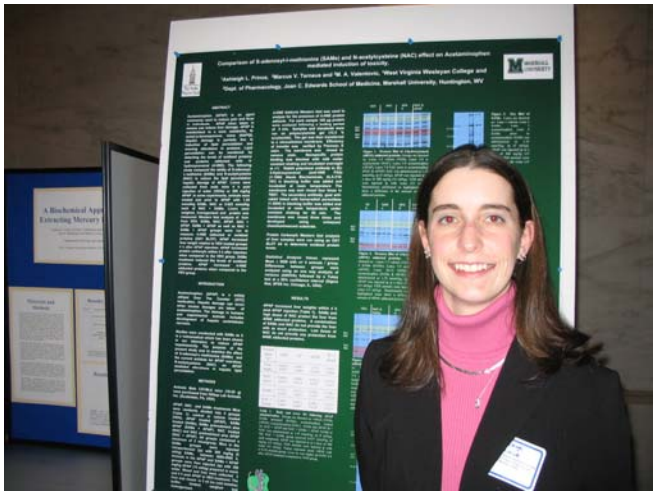
Undergraduate Research Day at the Capitol

The following 2005 WV-INBRE Summer Interns were selected to make presentations at the 3rd Annual Undergraduate Research Day at the Capitol in Charleston, WV, on February 1, 2006.



"Comparison of S-adenosyl-L-methionine (SAMe) and N-acetylcysteine (NAC) Effect on Acetaminophen Mediated Induction of Toxicity"

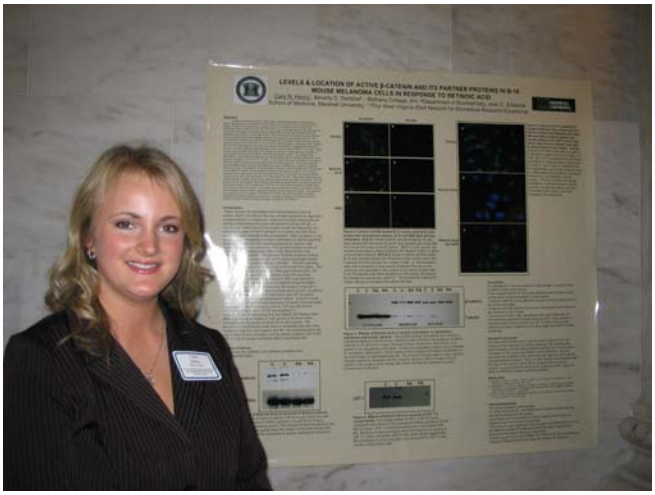
Ashleigh Prince
West Virginia Wesleyan College

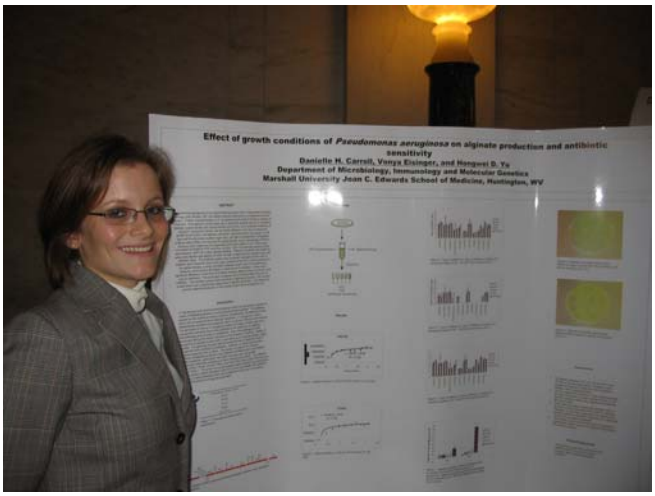
Mentor: Dr. Monica Valentovic
Marshall University

"Effects of Retinoic Acid on Mouse Melanoma Cells"

Cara Henry
Bethany College

Mentor: Dr. Beverly Delidow
Marshall University





"Effect of Growth Conditions of Pseudomonas Aeruginosa on Alginate Production and Antibiotic Sensitivity"

Danielle Carroll
West Virginia Wesleyan College

Mentor: Dr. Hongwei Yu
Marshall University

"Oxidative Stress and Antioxidant Treatment in Tibialis Anterior Muscle of Aged Rats"

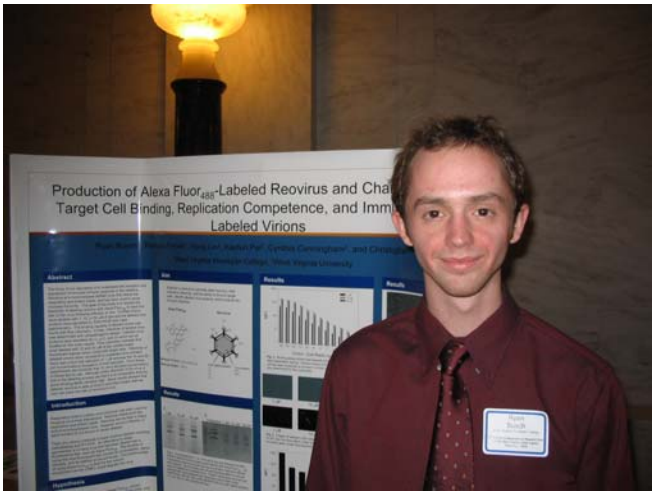
Holly Dudash
Wheeling Jesuit University

Mentor: Dr. Stephen Alway
West Virginia University

"Characterization of Reovirus Labeled with a Fluorescent Dye"

Ryan Busch
West Virginia Wesleyan College

Mentor: Dr. Christopher Cuff
West Virginia University



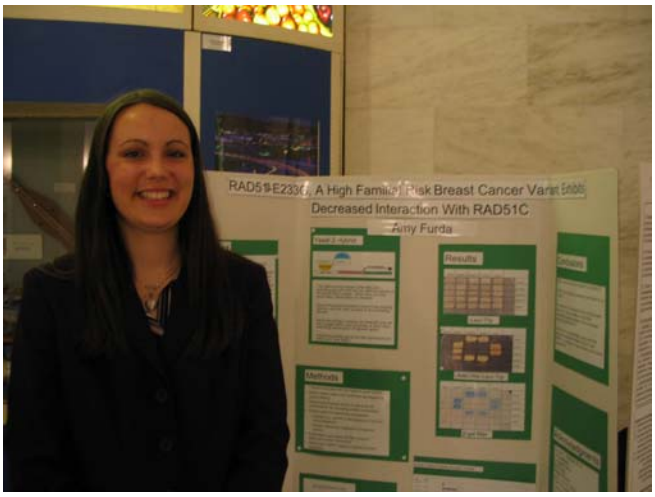
"Development of Autoimmune Disease in NZB/W F1 Mice Exposed to Propanil"

Stacey Velkovich
Wheeling Jesuit University

Mentor: Dr. Rosana Schafer
West Virginia University

Research Day at the Capitol Continued:

In addition to the previous summer interns, Amy Furda's travel expenses were also paid for by WV-INBRE in support of her poster being displayed at the Undergraduate Research Day at the Capitol in Charleston on February 1, 2006. Ms. Furda is a student at Bethany College, a WV-INBRE Extended Outreach Institution (EOI). Her project is titled *"A High Familial Risk Breast Cancer Variant, RAD51D-E233G, Exhibits Decreased Protein Interaction With RAD51C."*.



PUI Student Activities

Research conducted by Mary E. Prescott, an undergraduate student at Fairmont State University and a 2005 WV-INBRE Summer Intern is being presented at the 2006 Experimental Biology Meeting in San Francisco, CA in April.

The citation for the abstract is: Carl Shrader, Mary Prescott, Jia Luo, Eugene Cilento, and Frank Reilly; *"Acute Stretch Enhances Expression Of Akt And VEGF In Healing Mouse Skin"*.

Sara Lilly, a 2005 WV-INBRE Summer Intern from the University of Charleston, was awarded second place for her summer research presentation at the 2005 Chi Beta Phi National Convention held at the University of Charleston, October 8, 2005. Chi Beta Phi is a national science honorary fraternity whose purpose is to aid in the dissemination of scientific information, promote interest in the sciences, and recognize scholarly achievement and outstanding contributions in the fields of science.

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What is it about summer research that makes a student want to enter graduate training in the biomedical sciences? There is probably no single reason; however, an important factor that encourages students to go on to graduate school is when a student experiences the thrill of discovery. After much hard work and many attempts, one day the experiment just "works". This is a key turning point; after the initial success, students generally find that most of the experiments are suddenly "working". The student has learned to do research, and more often than not, finds it an enjoyable experience.

Unfortunately, there is neither a set amount of time nor a requisite number of experiments that must be performed before the thrill of discovery is experienced. It happens relatively early with some students, and takes a little longer with others. One thing is certain, the more lab time that a student experiences, the more likely he or she is to experience the thrill of discovery. Students who conduct summer research work a 40-hour week for 10 weeks, and have a more sustained laboratory experience than most students conducting research during the school year. These students spend less time in the lab, usually less than 10 hours a week over two semesters. Thus, students have more continuous lab time over the summer and a greater chance of experiencing the thrill of discovery.

The summer research programs offered by the WV-INBRE are important in providing a summer research opportunity for Wheeling Jesuit students. Twenty-seven WJU biology students had a summer research experience between the years 2001 and 2005. [This number includes our current sophomores and juniors, and is therefore different from the 22 student researchers mentioned for biology graduates.] Fifteen of these students have had research projects in laboratories funded by the WV-INBRE. Figure 5 shows the number of undergraduates who have done summer research and the fraction who have worked in INBRE-funded laboratories. The WV-INBRE is the major provider of summer research for biology students at WJU. The WV-INBRE grant that was awarded to Wheeling Jesuit University and the WV-INBRE Summer Research Program will allow this trend to continue.

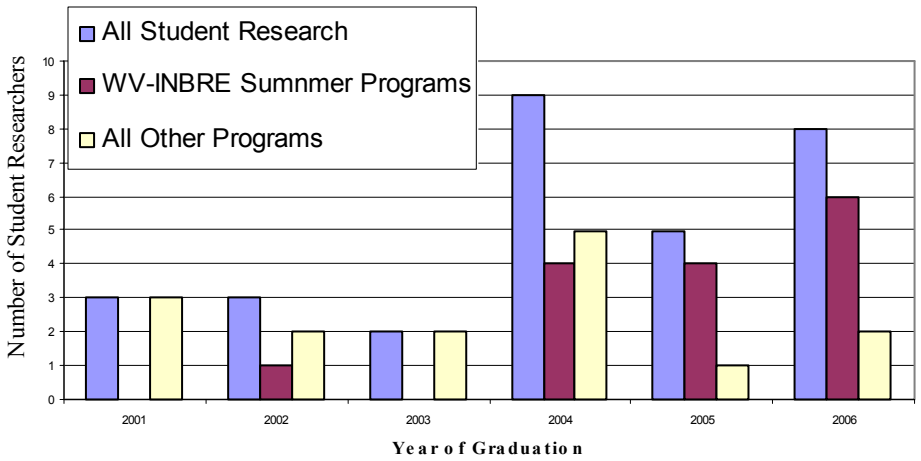


Figure 5. WV-INBRE Provides Research Opportunities for Wheeling Jesuit Biology Majors

The goals of the WV-INBRE include providing research opportunities to: 1) serve as a "pipeline" for undergraduate students to continue in health research careers, 2) provide outreach activities to students at undergraduate institutions, and 3) to enhance science and technology knowledge of West Virginia's workforce. Wheeling Jesuit University now has years of data that provide solid evidence that the objectives of the WV-INBRE are being accomplished. If this trend continues, then the WV-INBRE may serve as a national model for biomedical research and education among undergraduate institutions.

"The summer research programs offered by the WV-INBRE are important in providing a summer research opportunity for WJU students"

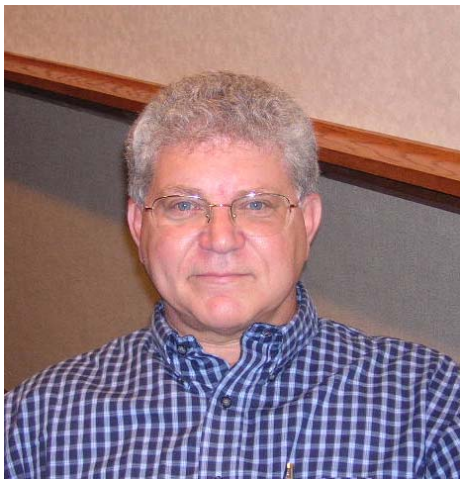
Message from the Principal Investigator
Gary O. Rankin, Ph.D

As we come to the end of the second year of the WV-INBRE award, I am pleased to report that we are continuing to develop all aspects of the network. We have experienced several changes in our program and research network this year. First of all, the end date for all INBREs was changed from June 30, 2006 to April 30, 2006. This change will reduce many of the problems of handling funds for our Summer Research Program, but it has also reduced the time for productivity during this second year of funding. Nonetheless, all aspects of WV-INBRE have been active during the past year with some exciting results.

For our research network, the departure of Dr. Ethel Gordon from Bluefield State College led to a network-wide competition for a new Project Investigator at the Network Research Institution (NRI) level. From the many high quality applications, Dr. Charlie Chen, Alderson-Broaddus College, was selected as the new NRI Project Investigator. His project is entitled, "Signaling Pathways in Apigenin-inhibiting Tumor Growth". As a result of Dr. Chen's selection, Alderson-Broaddus College will become an NRI at the beginning of the Y06 grant year in May, 2006. In addition, Concord University was promoted from Extended Outreach Institution status to Network Outreach Institution. We also applied for and were awarded an administrative supplement to our overall budget to enhance the internet connectivity and videoconferencing capabilities at Marshall University, Fairmont State University and West Liberty State College. These new upgrades/facilities will enhance communication among the Appalachian Cardiovascular Research Network (ACoRN) investigators at these three institutions, and they will also provide videoconferencing upgrades for four of the current NRI projects.

Our Summer Research Program and symposium were big successes again this year. Thirty-six students from the predominately undergraduate institutions in West Virginia conducted summer research at Marshall University and West Virginia University. The program concluded on August 4, 2005 with a Research Symposium held at Marshall University. Dr. Rick Kittles, Ohio State University, was the keynote speaker and gave a presentation entitled, "Race, Genetic Ancestry and Health Disparities: Real or Imagined Differences". Students and faculty from the Summer Program, PIs holding NRI grants, and those supported by Pilot Grants made six oral and forty-five poster presentations. These activities were highlighted in the Fall, 2005 WV-INBRE newsletter. We are well underway toward planning for the 2006 Summer Research Program with student and faculty participant selection being finalized at this time.

Other activities during the past year include an Accelrys



workshop at Marshall University that was coordinated by the Bioinformatics Core. The Bioinformatics Core is also working on a two-day bioinformatics workshop to be presented this summer. The details are still being developed and complete plans will be announced in the near future. In addition, WV-INBRE faculty and students presented eight papers at National meetings and published six manuscripts during the past year.

So, after almost two years, we are well on our way to making WV-INBRE a successful program in West Virginia. I expect next year to be even better than this year. I hope that you all have an enjoyable and productive summer.

"After almost two years, we are well on our way to making WV-INBRE a successful program in West Virginia."

Evaluation Program

By: Larry Harris, Ph.D.

The goal of WV-INBRE, is to increase the level of biomedical research and training at the undergraduate institutions in the State of West Virginia. What evidence has accumulated thus far that indicates this goal is meeting with success? As a result of the Evaluation Survey we conducted last fall, the following observations of progress across the WV-INBRE network were noted:

- Increased number of faculty and student research presentations
- Research publications are increased
- Institutions are providing release time to faculty for research
- Institutions are providing research space
- Institutions are hiring research support staff and investing in infrastructure
- Cost sharing for instruments is occurring on some campuses
- Some institutions have hired new research faculty

These observations demonstrate that biomedical research is taking hold at the undergraduate institutions of this state. The investment of NIH funds is having a definite effect in changing the culture of the undergraduate institutions, making room for and giving credence to research activities. The beneficiaries of this cultural change are no less than the students, faculty, and the citizens of the State of West Virginia.

"The investment of NIH funds is having a definite effect in changing the culture of the undergraduate institutions, making room for and giving credence to research activities"

WV-INBRE Grant Permits Expansion of Bluefield State College's Biomedical Research Capacity

Dr. Tesfaye Belay has spent an active and productive first year as a member of Bluefield State College's faculty. Recently, he received notification that grant applications he had submitted to the West Virginia Idea Network for Biomedical Research Excellence (WV-INBRE) have been awarded, helping Bluefield State College (BSC) to augment its biomedical research capabilities.

"These WV-INBRE grants permit BSC to purchase fundamental equipment necessary to conduct basic medical research," Belay observed. Significantly, the grants will underwrite purchase of the first fluorescence microscope ever obtained by the college, and additional equipment will permit DNA and RNA analysis, he added.

"The equipment will be utilized to conduct research that focuses upon health problems that occur in disproportionately high levels among individuals in low socioeconomic groups and minority," the BSC professor said. The grant will also provide funding so that two students can be hired for part-time employment to participate in this research initiative.

Belay was hired through the Minority Health Institute at BSC. He joined the faculty last semester, after conducting post-doctoral research and teaching at Georgia State University and Clark Atlanta University Systems. In addition to basic research on Chlamydia, community-based research at BSC will be established to increase public awareness and knowledge of sexually-transmitted diseases, along with factors that contribute to the transmission of sexually transmitted diseases (STDs) and strategies to prevent the spread of STDs.

"The West Virginia IDeA Network for Biomedical Research Excellence recognizes the importance of medical research at Bluefield State College," he summarized. "As a participant in this statewide higher education research network, we are grateful for this opportunity to expand our College's biomedical research capacity."

2006 Summer Research Program Interns and Fellow

STUDENT INTERNS

Alderson-Broaddus College

Casey McCrosky
Mentor: **Dr. Judy Delp**, Department of Physiology and Pharmacology, Robert C. Byrd Health Sciences Center of West Virginia University

Jessica Morris
Mentor: **Dr. Gary Rankin**, Department of Pharmacology, Physiology & Toxicology, Joan C. Edwards School of Medicine, Marshall University

Bethany College

Joseph McLane
Mentor: **Dr. Richard Dey**, Department of Neurobiology and Anatomy, Robert C. Byrd Health Sciences Center of West Virginia University

Kendra Policz
Mentor: **Dr. Tim Vincent,** Department of Microbiology, Immunology and Cell Biology, Robert C. Byrd Health Sciences Center of West Virginia University

Melanie Ward
Mentor: **Dr. Larry Grover,** Department of Pharmacology, Physiology & Toxicology, Joan C. Edwards School of Medicine, Marshall University

Davis and Elkins College

Sunam Gurung
Mentor: **Dr. Scott Weed**, Department of Neurobiology and Anatomy & The Mary Babb Randolph Cancer Center, Robert C. Byrd Health Sciences Center of West Virginia University

Kathleen MacGregor
Mentor: **Dr. James O'Donnell**, Professor of Pyschiatry and Behavioral Medicine and Assistant Dean for Research and Graduate Studies, Robert C. Byrd Health Sciences Center of West Virginia University

Jenny Sisler
Mentor: **Dr. Mike Gunther**, Department of Biochemistry and Molecular Pharmacology, Robert C. Byrd Health Sciences Center of West Virginia University

Fairmont State University

Stephanie Boblett
Mentor: **Dr. Slawomir Lukomski**, Department of Microbiology, Immunology and Cell Biology, Robert C. Byrd Health Sciences Center of West Virginia University

Masako Shimamoto
Mentor: **Dr. Elaine Hardman**, Department of Biochemistry and Microbiology, Joan C. Edwards School of Medicine, Marshall University

Glenville State College

Gina Cottrill
Mentor: **Dr. Rosana Schafer**, Department of Microbiology, Immunology and Cell Biology, Robert C. Byrd Health Sciences Center of West Virginia University

Salem International University

Rajeev Tajhya
Mentor: **Dr. Patrick Callery**, Department of Basic Pharmaceutical Sciences, Robert C. Byrd Health Sciences Center of West Virginia University

Shepherd University

Sarah Morgan
Mentor: **Dr. Stan Hileman,** Department of Physiology and Pharmacology, Robert C. Byrd Health Sciences Center of West Virginia University

Jill Rotruck
Mentor: **Dr. Yon Rojanasaskul**, Department of Basic Pharmaceutical Sciences, Robert C. Byrd Health Sciences Center of West Virginia University

University of Charleston

Jessica Hammons
Mentor: **Dr. Rajesh Naz**, Departments of Microbiology, Immunology and Cell Biology, Physiology and Pharmacology, & Obstetrics and Gynecology, Robert C. Byrd Health Sciences Center of West Virginia University

Sara Lilly
Mentor: **Dr. Richard Niles**, Department of Biochemistry and Molecular Biology, Joan C. Edwards School of Medicine, Marshall University

James Reed
Mentor: **Dr. William Wonderlin**, Department of Biochemistry and Molecular Pharmacology, Robert C. Byrd Health Sciences Center of West Virginia University

West Liberty State College

James Garland
Mentor: **Dr. Kathy Brundage**, Department of Microbiology, Immunology and Cell Biology, Robert C. Byrd Health Sciences Center of West Virginia University

West Virginia State University

Jennifer Thompson
Mentor: **Dr. Vincent Sollars,** Department of Microbiology, Immunology and Molecular Genetics, Joan C. Edwards School of Medicine, Marshall University

Renee West
Mentor: **Dr. Beverly Delidow**, Department of Biochemistry and Molecular Biology, Joan C. Edwards School of Medicine, Marshall University

West Virginia Wesleyan College

Ryan Busch
Mentor: **Dr. Chris Cuff**, Department of Microbiology, Immunology and Cell Biology, Robert C. Byrd Health Sciences Center of West Virginia University

Danielle Carroll
Mentor: **Dr. Hongwei Yu**, Department of Microbiology, Immunology and Molecular Genetics, Joan C. Edwards School of Medicine, Marshall University

Megan Docherty
Mentor: **Dr. Steve Alway**, Department of Exercise Physiology, Robert C. Byrd Health Sciences Center of West Virginia University

Chris Garton
Mentor: **Dr. Slawomir Lukomski,** Department of Microbiology, Immunology and Cell Biology, Robert C. Byrd Health Sciences Center of West Virginia University

Dana Tiberio
Mentor: **Dr. Linda Vona-Davis**, Department of Surgery, Robert C. Byrd Health Sciences Center of West Virginia University

Wheeling Jesuit University

Kristina Bacon
Mentor: **Dr. William Petros**, Mary Babb Randolph Cancer Center, Robert C. Byrd Health Sciences Center of West Virginia University

Jonathan Proto
Mentor: **Dr. Peter Gannett**, Department of Basic Pharmaceutical Sciences, Robert C. Byrd Health Sciences Center of West Virginia University

FACULTY FELLOW

West Virginia Wesleyan College

Dr. Luke Huggins
Mentor: **Dr. Scott Weed**, Department of Neurobiology and Anatomy & The Mary Babb Randolph Cancer Center, Robert C. Byrd Health Sciences Center of West Virginia University

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