

State Funding
Grants awarded for scientific equipment and curriculum

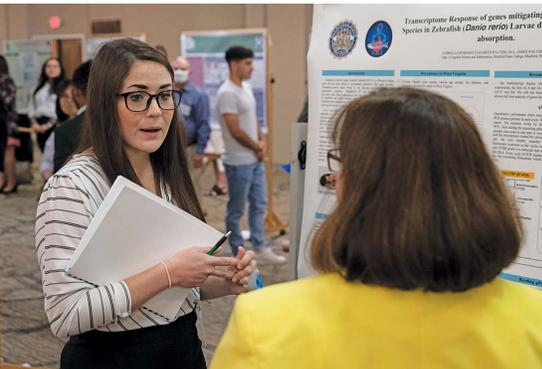
West Virginia State University
Scientists developing energy-dense crops for West Virginia

West Virginia University
FDA approval for clinical trial of drug to treat eye cancer

NEURON

West Virginia's Journal of Science and Research

FALL 2021



Effect of prenatal opioid exposure on astrocyte and synaptic connectivity

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Key experimental approaches to study the effects of NAS on brain development

Cerebral Organoid Model
Regenerating rat Neural Stem Cells + Human Purified Stem Cells (iPSCs) + Neural Induction (Growth Factors, 2019) → Cerebral Organoids + Brain Organoid Treatment (Celestrol)

Figure 3. Experimental approach to identifying molecular mediators via TurbID

Top: Experimental workflow for TurbID (created with BioRender). We hypothesize that POE disrupts the expression of factors that mediate astrocyte development. TurbID *in vivo* proximity labeling is used to pull down factors enriched in astrocytes following prenatal buprenorphine exposure in mice. Bottom: Low and high magnification fluorescence microscopy images of biotin (green) in the mouse cortex. Use of Hepa TurboID ensures that the labeling is selective and targets astrocytes.

CONCLUSIONS/FUTURE DIRECTION

- Our lab has developed a multi-pronged approach (mouse, human-derived cerebral organoids) to study brain development in NAS, focusing on astrocyte-regulated development.
- Co-exposure to opioids and gabapentin during prenatal development leads to synaptic reorganization in addiction/vulnerability-related brain regions in $\alpha 2\delta -1$ mice.
- In progress: Complete synaptic analysis of $\alpha 2\delta -1$ +/- and -/- mouse pups, including buprenorphine only, gabapentin only, and buprenorphine + gabapentin treatment, also includes molecular analysis of reactive astrocytes.
- In progress: TurbID mass spectrometry analysis to determine increased or decreased astrocyte synaptic protein expression after POE.
- In progress: Brain organoid analysis to assess astrocyte and synaptic structure, markers of reactive gliosis.

ACKNOWLEDGMENTS

This work was supported by the WV-INBRE Research Internship for First2HSTA Scholars for WV-INBRE Chronic Disease Research Program, the NARSAD Young Investigator Award (Dr. Behavior Research Foundation 27663) to W.C.R., the John and Betty Spinks Foundation, the Molecular Biological and Imaging Core, Genetics Core, Biostatistics Core, WV-INBRE grant (P20GM105484), CORIE ACCORD grant (P20GM131290), and the West Virginia Clinical and Translational Science Institute (WV-CTSI) grant (2U54GM109482).



Enhancing research experiences through partnerships

WV-INBRE celebrates 20 years of funding biomedical research opportunities for faculty and students at primarily undergraduate institutions





FIRST2 NETWORK



A NATIONAL SCIENCE FOUNDATION PROJECT



The mission of the **First2 Network** is to increase the number of students graduating in science, technology, engineering and math (STEM) by focusing on **rural, first-generation and other underrepresented students** to go to college or are otherwise underrepresented in STEM; and focusing on these students' first two years of college – a critical breaking point in the college and career pathway for many of our brightest and best students. If we can **improve outcomes**, all students and stakeholders will benefit.

For more information, read page 13 of this magazine or visit first2network.org.



FALL 2021

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Marshall University (cover)

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ABOUT

STaR Division: Science, Technology and Research at the West Virginia Higher Education Policy Commission provides strategic leadership for the development of competitive academic research opportunities in science, technology, engineering and mathematics (STEM). The office directs the National Science Foundation's (NSF) Established Program to Stimulate Competitive Research (EPSCoR) in West Virginia, coordinates scientific research grants to academic institutions from federal and state agencies, and conducts outreach activities to broaden the public's understanding of science.

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News briefings



Marshall President Dr. Jerome A. Gilbert (left) and Glenville State President Dr. Mark A. Manchin

Glenville State, Marshall sign agreement to offer nursing bachelor's degree

Marshall University and Glenville State College have reached an agreement that will help the future of nurses in the state.

The partnership establishes a nursing program co-op between the two institutions. A memorandum of agreement (MOA) brings the two schools together for an association aimed at providing access to a bachelor's degree in nursing (B.S.N.) at Glenville State College through Marshall's nursing program.

Both presidents signed an agreement in July 2021. The agreement will see prospective students enroll at Glenville and complete general education courses there during their first year. Then, once the students are admitted to the BSN program, they will receive instruction from Marshall faculty members on Glenville's campus.

The B.S.N. program at Glenville is expected to start in fall 2023. Glenville will begin enrolling students in the program in fall 2022.

Two WVSOM students nationally recognized for research presentations

Two students at the West Virginia School of Osteopathic Medicine (WVSOM) received second-place awards for research posters they presented at the world's largest gathering of osteopathic physicians.

Third-year student Sarai Arbus and second-year student Katherine Goh successfully presented their posters at the Osteopathic Medical Education Conference (OMED). Arbus presented, "High Fat Diet and High-Intensity Interval Training on Appetitive Regulation in a Rat Model," while Goh featured "Evaluating the Structure and Function of Cysteine Residues of the Pseudomonas Aeruginosa Nucleotidyl Cyclase Type Three Secreted Effector ExoY."

This year's virtual event showcased 75 student posters.

UC to offer game design minor

The University of Charleston (UC) now offers students the opportunity to minor in game development.

This new minor provides students with focused computer program development. It is intended to be an entry level experience in game design and provides students with many of the fundamentals of computer science.

The minor serves as a foundation in the study of game development with a focus on content and systems design, Unity, and C# programming.



WVU researcher to tackle the mysteries of dark energy and the universe beyond

Though it makes up roughly 70 percent of the universe, dark energy is one of the greatest cosmological discoveries that is the least understood among scientists. A new project led by West Virginia University researcher Kevin Bandura will help scientists understand the nature of dark energy by mapping out the distribution of matter throughout the universe.

The three-year project for \$242,000 funded by the National Science Foundation will lead to a better understanding of how our universe is evolving over time by using precise observations to study the expansion itself.

Using a revolutionary new telescope, the Canadian Hydrogen Intensity Mapping Experiment, to measure distant galaxies through the emission of neutral hydrogen gas, Bandura will be able to take a measurement of dark energy.

Photos courtesy of Glenville State College and West Virginia University

FROM THE DIRECTOR: Juliana Serafin



A common theme in this issue is undergraduate research opportunities at colleges and universities across the state. Why is hands-on experience in science, technology, engineering and mathematics (STEM) so important? There are several reasons, all of which benefit students and state citizens.

First, a research experience is a critical milestone in the path to an undergraduate STEM degree. The ability to carry out research is a key skill that innovation economy employers are looking for in graduates with a bachelor's degree and it is a requirement for those with higher level degrees.

Second, undergraduate STEM majors are more likely to finish a degree if they are confident in their ability to carry out research and develop an identity as a scientist. The one-on-one and small group interactions that are an integral

part of research introduce students to important role models and peer mentors.

Third, undergraduate research contributes to science. We hear a lot about research conducted by professors and graduate students, but undergraduates are making significant contributions as well, especially at primarily undergraduate institutions. Science and technology cannot move society forward without individuals capable of working together to expand our collective knowledge. These projects not only foster innovation, but also bring federal agency funding to the state.

In this issue, four programs are highlighted: the WV INBRE program funded by the National Institutes of Health IDeA program, First2 Network funded by the National Science Foundation INCLUDES Alliance, the SURE program funded by the state's Research Challenge Fund, and the NASA EPSCoR Program. We hope that you enjoy reading about these programs and partner with us to help West Virginia students achieve their full potential.

Julie

Juliana Serafin, Ph.D.

Senior Director of Science & Research, West Virginia Higher Education Policy Commission, and Project Director, WV EPSCoR

The Science & Research Council was established by the West Virginia Legislature in 2009. The goal of the Science and Research Council is to increase the capacity of the state and its colleges and universities to attract, implement and use cutting-edge, competitive research funds and infrastructure. Members provide expertise and policy guidance regarding federal and state programs including EPSCoR, the Research Challenge Fund, and the former Research Trust Fund. Representatives of government, industry, business and academia make up the council.

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Enhancing research experiences through partnerships

WV-INBRE celebrates 20 years of funding biomedical research opportunities for faculty and students at primarily undergraduate institutions

By **Angela Sundstrom**

West Virginia has historically been less successful than other states when competing for grant funding on the national level. Federal agencies have addressed this issue in recent decades by creating specific programs, such as the National Science Foundation's Established Program to Stimulate Competitive Research (EPSCoR), to target such issues. The National Institutes of Health (NIH) started a similar program called the Institutional Development Award (IDeA) for colleges and universities in IDeA-eligible states. West Virginia is one of those states and one of those programs, IDeA Networks of Biomedical Research Excellence (INBRE), hit a milestone this year.

WV-INBRE celebrated its 20th anniversary in 2021. First established as the Biomedical Research Infrastructure Network (BRIN), the program adopted its current name in 2004 as well as a new, now longtime principal investigator: **Gary O. Rankin, Ph.D.**



Rankin

“It’s a program that can have impact well beyond the lead institutions.”

- Gary O. Rankin, Ph.D.

“When INBRE programs were started, NIH wanted experienced principal investigators (PIs),” Rankin said. “At that time, I had many years of NIH funding experience, over 17 years. So, in 2004, we were awarded the first INBRE for this program, and I was the principal investigator (PI). I’ve been the PI ever since.”

Rankin, professor and chair of the department of biomedical sciences and vice dean for basic science at Marshall University, explained the motivation behind this program was to take states that only receive a fraction of federal funding and help make them more competitive. This is accomplished by establishing statewide infrastructure programs that enhance the capacity for educating and training faculty and students in biomedical research. To date, the WV-INBRE program has been awarded about \$75 million to build biomedical research infrastructure and train students across West Virginia. Marshall University (Marshall) is the lead institution on the project with West Virginia University (WVU) serving as a partner lead institution. However, the focus is on primarily undergraduate institutions (PUIs).

“Most faculty at Marshall and WVU were hired to do research, teaching and service,” Rankin said. “A lot of these undergraduate schools are mainly focusing on teaching. They don’t have a lot of funds or resources available to help their faculty do research.”

WV-INBRE funds multiple awards ranging from \$30,000 for two-year projects up to \$125,000 for three-year

Photos courtesy of Rebecca Kiger and Marshall University

projects, known as Major Awards. Currently, there are four Major Awards in the state: one at the University of Charleston related to cancer research; one at West Liberty University for infectious disease; one at the West Virginia School of Osteopathic Medicine also related to infectious disease as well as immunity; and one at Bluefield State College on lipid metabolism and possible contributions to cardiovascular disease. The award money helps fund the research and necessary improvements to campus infrastructure so research can begin. Rankin highlights the geographic diversity of participating institutions with nearly every corner of the state involved. Collaboration is key for WV-INBRE-funded projects.

Joseph Horzempa, Ph.D., associate professor of biology and chair of the Department of Biomedical Sciences at West Liberty University, says support from WV-INBRE was a game changer for his institution.

“A lot of our equipment in our department was purchased through INBRE funds,” Horzempa said. “We’ve gotten microscopes, an autoclave, water purification system, and more. Just all kinds of great equipment that we would never have been able to purchase on our own with our small budget that we have at our institution.”

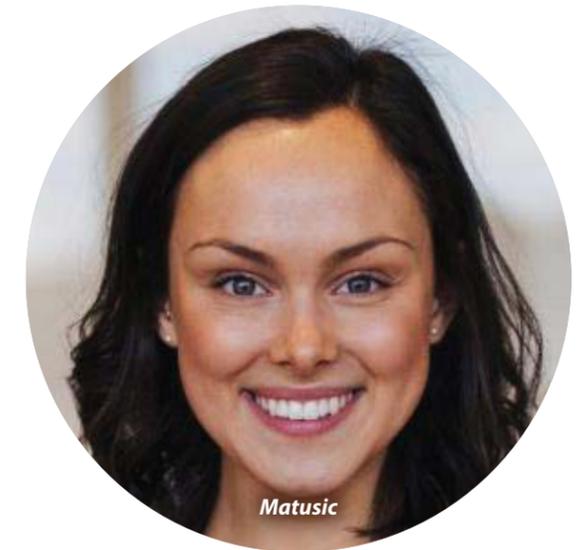
Horzempa has worked with WV-INBRE since 2012. In that time, he received multiple Major Awards that catapulted him into competition for larger NIH grants. It also supported a pilot project that led to a patent application for a compound discovered to have novel antimicrobial activity. Funding for that project came from an arm of WV-INBRE known as the Center for Natural Products Research, an awarding initiative that explores the research potential of medicinal properties from natural sources such as plants and fungi rather than synthetic chemistry. Horzempa now serves as the Center’s director.

These investments also significantly influence students. Horzempa states that biology is now the most popular major on West Liberty’s campus. The school even introduced a master’s degree program in biology. Research experiences seem to impact retention as well, with students who have had a research experience more likely to stick with the program until graduation, says Horzempa.

“I think the overall benefit to the state is something like I’ve never seen before,” Horzempa said. “It’s really unprecedented. It brings in money, revenue to the state. Even more importantly, I think, is that it brings a



Horzempa



Matusic

higher level of education and experience to West Virginia students. It allows them to learn about science by doing science. I think that the experiential learning they get by being involved in research is just so valuable. It solidifies some of the lessons that we try to teach them in the classroom and makes them more real.”

Student benefit does not stop at their home institution’s classrooms. Participants also conduct research at Marshall and WVU for nine weeks over the summer.

Kelsey Matusic, a former WV-INBRE student participant and West Virginia native, says her experience with the

FEATURE

program solidified the desire to pursue a career in medicine.

“Doing research that summer really just proved to me that I want a career full of learning and I want a career full of always finding new possibilities and investigating,” Matusic said.

Matusic graduated from the University of Charleston in 2019 with a degree in biology. As a student athlete, her schedule offered limited flexibility for experiential learning. She credits WV-INBRE’s summer research program for exposing her to that.

“When you’re a college student, school is your full-time job,” Matusic said. “I was a student athlete, so I had little work experience within my time at undergrad. This research program in the summer was the best opportunity that I had to expose myself to learning, to research, to higher education, to being a young professional that is going to have something to do with research in their career. So, this experience was absolutely necessary. I tell everybody about INBRE all the time, of how much it’s impacted me and my choices for my future and who I’ve met through INBRE and the relationships that I’ve made.”

Currently a second-year medical student at Marshall University, Matusic also believes this program made her a more competitive applicant without feeling the need to explore further opportunities across state lines. While she is not certain whether her career in medicine will include research, she is proud of herself for trying.

“My advice to any younger student that’s going to read this is just to give it a shot. Put yourself out there. You never know if you’re going to like it or not until you throw yourself into it. I loved INBRE. It was a great experience. Would highly recommend to everybody,” Matusic said.

Faculty like Horzempa and students like Matusic thrive

in part from the funding and connections provided by WV-INBRE. Rankin emphasizes that there is no substitute for hands-on experience.

One of the highlights of the program is the annual Summer Symposium where students from PUIs present their research. The enthusiasm is apparent, even for students exploring scientific specialties many knew little about just weeks before. It’s always a special moment for Rankin.

“All the faculty are there from around the state. All the students are there. I kind of walk through there like a proud parent. These are my children that are doing well, and I am so pleased for their successes. I hope this program continues so those successes can continue,” Rankin said.

Many WV-INBRE students continue their education in graduate school, medical school, pharmacy school, and more.

WV-INBRE also has a long history with the Health Sciences and Technology Academy, a mentoring program for underrepresented high schoolers in West Virginia wanting to pursue a degree in science, technology, engineering or mathematics (STEM). There is also a budding partnership with the First2 Network,

an initiative working to get more first-generation and underrepresented minority college students into research experiences. Rankin hopes the cooperative nature of WV-INBRE serves as a model for the state. Cultivating the potential of all faculty and students in West Virginia is how he believes the legacy continues to build.

“It’s not an isolated program,” Rankin said. “It’s a very widespread program that can have impact well beyond the borders of the lead institutions.”

Above image, left to right: Heidi Richter, Olamide Adegbamigbe, and Jean-Emmanuel Kouadio of Shepherd University



Top row, left to right: Stuart Cantlay, Adriana Falco, Mark Flood, Mohammadreza Ghahremani. Bottom, left to right: Nabil Nasser, Alexander Rupprecht, Shalika Silva, Heng Wu

STaR Division awards grants for scientific equipment and curriculum improvements

By **Angela Sundstrom**

STaR Division: Science, Technology & Research at the West Virginia Higher Education Policy Commission awarded seven Instrumentation Grants and one Innovation Grant to eligible instructors and researchers across the state.

These grants invest in primarily undergraduate institutions so students have modern resources to further science, technology, engineering and mathematics (STEM) research. They are supported by the Research Challenge Fund, established by the West Virginia Legislature in 2004 to further build research capacity and competitiveness.

Stuart Cantlay, Ph.D., assistant professor of biology at West Liberty University, received \$19,661 for an Illumina iSeq 100 benchtop sequencer.

Adriana Falco, Ph.D., associate professor of psychology at Concord University, received \$19,541 for a Noldus EthoVision XT system.

Mark Flood, Ph.D., professor of forensic science at Fairmont State University, received \$15,000 for an AXIOM 20 Dual Direct Drive 3D Printer.

Mohammadreza Ghahremani, Ph.D., associate professor of computer and information sciences at Shepherd University, received \$20,000 for sixteen NVIDIA GeForce graphic cards and their interface hardware.

Nabil Nasser, Ph.D., assistant professor of natural resource management at Glenville State College, received \$12,329 for radio telemetry equipment.

Alexander Rupprecht, Ph.D., assistant professor of chemistry at Concord University, received \$19,962 for the acquisition of a Shimadzu UV-2600i UV-Vis Spectrophotometer with a T2X2 Dual Temp Controlled Cuvette Holder.

Shalika Silva, Ph.D., assistant professor of biology at Glenville State College, received \$20,000 a Molecular Devices Spectramax ID3 multi-mode plate reader.

Heng Wu, Ph.D., assistant professor of computer science at West Virginia State University, received \$19,548 for the equipment to enable innovative teaching in artificial intelligence.

Photo courtesy of Marshall University

Photos courtesy of West Liberty University, Concord University, Fairmont State University, Shepherd University, West Virginia State University, and Glenville State College

WVSU scientists developing energy-dense crops for West Virginia

By **Matt Browning**

As the human population increases, so does the demand for food and fuel. However, suitable land for growing crops is already severely limited, and there is an urgent need to protect wilderness areas from being converted into cropland. To address this issue, **Dr. Sanju Sanjaya** and his team at West Virginia State University's (WVSU) Energy and Environmental Science Institute are developing ways to increase the oil content of plants – a major source of biodiesel production – using advanced genetic technology. “Currently, the majority of the oils used in biodiesel production come from the seeds of plants,” Sanjaya said. Biodiesel is a form of diesel fuel derived from plants or animals. “By increasing the energy provided by plants, the land required to grow both biodiesel and food crops could be significantly reduced.”

Plants accumulate oils within the tissue of the seeds to help with the energy-intensive process of germination and growth of new seedlings. By harnessing the mechanism used by the plant to send and store these oils within the seeds, Sanjaya and his team aim to create new breeds of plants that accumulate higher amounts of oils within the rest of the plant's vegetative tissue – the leaves, stems and roots.

To increase the amount of oils stored in the vegetative tissue of plants, Sanjaya and his colleagues have taken a two-pronged approach. Plants can only capture a finite amount of carbon in any period, so increasing the amount of oils created and stored requires a reduction in the amount of starch being produced.

First, the researchers used advanced molecular techniques to manipulate the genes involved in producing and accumulating oils called triglycerides, using the model plant *Arabidopsis thaliana*, a flowering plant related to mustard, cabbage and radishes. Its small size and short generation times make it ideal for testing and refining genetic techniques, Sanjaya said.

By increasing the activity of a gene controlling seed oil production, Sanjaya's team created a version of the plant



Sanjaya

that tends to store these oils within the vegetative tissue.

Following this, the team focused on a gene involved in starch production. They found that when this gene was edited to exhibit decreased activity, more carbon was left available to be routed into the production of oils. The resulting plant that possesses both of the edited genes divides more of the carbon captured during photosynthesis into oils than into starch.

So what does all this work mean for the people of West Virginia? Sanjaya sums it up nicely.

“Our long-term goal is to develop energy-dense bioenergy crops that can grow on vast areas of reclaimed coal mine lands of West Virginia and the Appalachian coal basin,” he said.

Ultimately, he said, this work could bring sustainable agriculture and sustainable energy-related industry to the state.

Three students and their faculty mentors built on the activities funded in the previous SURE program in molecular biology and machine learning at **Shepherd University** as part of the Shepherd Opportunities to Attract Research Students (SOARS) program. Two students completed their project as a team and are refining their poster to present it at the West Virginia Academy of Sciences in April 2022.

A recent success is evidenced by two student co-authors on a paper in the journal *Comparative Biochemistry and Physiology* based on research from the summer of 2019.

All ten undergraduates at **West Virginia State University** completed a science ethics certificate program and were trained on modern laboratory instrumentation including the 400 MHz Agilent NMR, HPLC-MS, ion-exchange chromatography, ICP-MS, PCR, and IR spectroscopy. They also attended a weekly brown bag lunch on statewide graduate schools and professional resources. Dr. Roger Hanshaw, Speaker of the West Virginia House of Delegates who also holds a Ph.D. in chemistry, was keynote speaker at the Summer Research Symposium.

Due to unspent funds from the prior summer combined with generous institutional support, **West Virginia University** was able to support 68 undergraduates in their 2021 SURE program. Majors for these students included animal and nutritional sciences, biochemistry, biology, chemistry, engineering, environmental, exercise physiology, forensic chemistry, forest resource management, horticulture, immunology and medical microbiology, mathematics, neuroscience, physics, soil science, and wildlife and fisheries. Students participated in networking and career-focused workshops while collaborating with fellow WVU SURE students. They also received mentorship through a one-credit research course. The pinnacle of the student experience was the Virtual Summer Undergraduate Research Symposium, a collaborative event that gave SURE participants the opportunity to publicize their findings in oral or poster form.

SURE Summer Undergraduate Research Experiences

The Summer Undergraduate Research Experiences (SURE) Grant Program helps colleges and universities fund student research in science, technology, engineering and mathematics (STEM). The current three-year cycle started in 2020, but all six participating schools received an extension to 2024 due to the pandemic. In 2021, 107 undergraduates statewide benefitted. STaR Division: Science, Technology & Research at the West Virginia Higher Education Policy Commission is home to the program.

Marshall University's program included eight students spanning the fields of pharmacology, physics, biology, chemistry, bioengineering, and cybersecurity. Students presented their research findings at conferences including: The 33rd Annual Marshall University Health Science Research Day; Exploring Innovation in Appalachia: An Undergraduate Research Symposium at West Virginia University; Appalachian Section of the American Association of Physics Teachers Meeting at Frostburg State University; Meeting of the Eastern Great Lakes Section of the American Physical Society; American Physical Society Meeting in Chicago; Biomedical Engineering Society Annual Meeting in Orlando; and 20th International Conference on Pervasive Computing and Communications in Pisa, Italy. One student project has already been submitted for publication in the journal *Scientific Reports*.

West Liberty University supported ten undergraduate researchers. These student projects were from the fields of microbiology, herpetology, physiology, forest and stream ecology, mammalogy, and molecular biology. Students presented their work at conferences including the WV-INBRE Summer Research Symposium, the Southeast Regional IDeA Conference in Puerto Rico, NASA WV

Space Grant Consortium annual meeting, and the TOPPER-SURE Summer Symposium at West Liberty.

Eight students spanning the fields of biology, chemistry, physics, and engineering were supported for summer research at **West Virginia Wesleyan College**. Two students already presented their research at the WV-INBRE Summer Research Symposium. The remaining students all plan on presenting their SURE supported research at the WV Academy of Science meeting in Spring 2022.

Photo courtesy of West Virginia State University



McLaughlin



Hazlehurst



Above: Osama Elzamzamy—a graduate research assistant in the WVU Cancer Institute—conducts work in Lori Hazlehurst’s laboratory. Hazlehurst is the Cancer Institute’s associate director of basic research and a professor in the School of Pharmacy. She and her colleague Mark McLaughlin—a researcher with the Cancer Institute and School of Pharmacy professor—co-founded the company Modulation Therapeutics Inc., which recently received its first investigational new drug application from the Food and Drug Administration.

WVU gets FDA approval for clinical trial of drug to treat eye cancer ‘from the inside out’

Courtesy of **WVU School of Pharmacy**

In the past, doctors would treat tumors with chemotherapy, but they couldn’t avoid hitting healthy cells, too. Today cancer treatments have grown more accurate, and scientists at West Virginia University are working to up their accuracy.

Mark McLaughlin—a researcher with the WVU Cancer Institute and Modulation Therapeutics Inc.—and his colleagues are developing a cancer treatment that zeroes in on the diseased cells with more precision. Based on extensive preclinical research, they have received approval from the Food and Drug Administration to begin human trials of a new drug to treat eye-cancer.

The team designed the drug—called MTI-201—to treat uveal melanoma after cancer travels to another part of the body.

Uveal melanoma is the most common form of eye cancer, but it’s a rare disease overall.

“About 2,500 people in the United States get uveal melanoma per year, and only half of those people get the metastatic disease,” said McLaughlin, a professor in the School of Pharmacy and researcher supported by the West Virginia Clinical and Translational Science Institute. “Unfortunately, they all die. There’s no available treatment that significantly extends life.”

MTI-201 achieves its precision by homing in on a specific biomarker. This biomarker is a protein—or “receptor”—that is overabundant in uveal melanoma cells. Because the receptor isn’t as plentiful in healthy cells, the drug doesn’t destroy them.

“The invention, really, is a targeting ligand that seeks out and interacts with that overexpressed receptor,” said School

Photo courtesy of West Virginia University

of Pharmacy professor Lori Hazlehurst.

Hazlehurst is the associate director of basic research for the Cancer Institute, a WVCTSI-supported researcher and, along with McLaughlin, a cofounder of Modulation Therapeutics. They founded Modulation Therapeutics—a WVU-based startup company—in 2011. Modulation Therapeutics is housed in the Cancer Institute and received funding from the National Cancer Institute’s Small Business Innovation Research and Small Business Technology Transfer Program. This is the first investigational new drug application that the FDA has awarded Modulation Therapeutics.

It’s possible that MTI-201 could be used to treat localized cases of uveal melanoma.

“The current therapy for primary uveal melanoma is irradiation of the eye,” McLaughlin said. “Because the radiation is coming from the outside, it causes all sorts of collateral damage while it’s going into the site where the tumor actually is. Our drug could be injected right into the eye at a very, very low dose. It would reach the target immediately. And—years and years in the future—it could even potentially save that person’s sight in that eye.”

Photo courtesy of First2 Network



First2 Network members at West Virginia University Institute of Technology (WVU Tech)

First2 Network reflects on third year of funding as a National Science Foundation collaboration

First2 Network, an expanding group of people and organizations across West Virginia seeking to improve science, technology, engineering and mathematics (STEM) persistence among rural, first-generation, and other underrepresented college students, completed its third year of funding from the National Science Foundation INCLUDES program. First2’s goal is to give these students the tools necessary to contribute to an innovation economy in West Virginia. Across the state, working groups made of students, faculty, K-12 teachers, college and university staff and administrators met monthly to plan and implement ways to change the system these students operate in.

The Faculty-Student Engagement working group facilitated a Rock Your STEM Major math bootcamp to help incoming students improve their math and study skills. This was intended to address a barrier to STEM persistence that the network observed due to lack of higher-level math courses or lack of

certified teachers in high school.

First2 Network members partnered with the WVU Physics Frontier Center and five community colleges to submit an NSF Improving Undergraduate STEM Education proposal to collaboratively engage more students.

Members developed a West Virginia STEM assets map to document pathways available for students and to identify service gaps.

An Industry Advisory Board was also created to identify clearer pathways from STEM education to STEM careers.

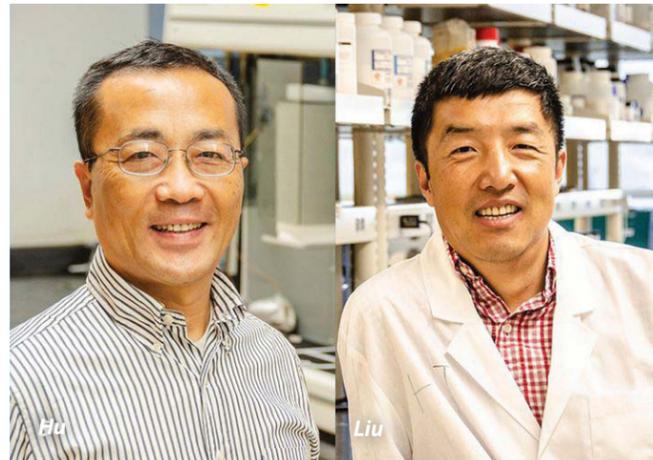
The First2 Network continues to build integrative relationships with other state STEM collaboratives and industry including Solvay Corporation, WV-INBRE, and the Education Alliance. Through these partnerships, First2 hopes to jointly plan and coordinate STEM education efforts in West Virginia for the betterment of these rural, first-generation, and other underrepresented students striving to graduate from college.



Candice Brown (left) with former student Sneha Gupta

WVU to receive \$2.7 million to study how the brain heals from stroke and aging

Candice Brown, Ph.D., a researcher with the WVU School of Medicine and Rockefeller Neuroscience Institute, is exploring the role that a specific enzyme plays in protecting the brain from stroke and the effects of aging. The National Institute on Aging is awarding WVU \$2,687,415 for the five-year project.



Hu

Liu

WVU engineers receive \$3 million DOE award to capture emissions

A \$3 million cooperative agreement awarded by the U.S. Department of Energy to West Virginia University engineers **John Hu, Ph.D.**, and **Xingbo Liu, Ph.D.**, aims to mitigate the emissions of carbon dioxide in the atmosphere caused by natural gas flaring and harness the gas into high-value solid carbon and hydrogen for fuel.



Pierre

Marshall University researcher receives \$1.36 million for kidney research

Sandrine V. Pierre, Ph.D., associate professor of biomedical sciences at the Marshall University School of Medicine, was awarded a National Institutes of Health Research Project Grant (R01) to study the regulatory mechanism of salt handling by the kidney and malfunction of this mechanism that compromises the body's ability to remove salt.



Marshall University launches new Institute for Cyber Security

The **Institute for Cyber Security (ICS)** will bring together hardware and software engineers, forensic scientists, cyber security practitioners, and policy experts to address emerging needs in cybersecurity through multidisciplinary, cutting-edge research, education and outreach programs.

Photos courtesy of Marshall University and West Virginia University

PROGRAM HIGHLIGHT: Melanie C. Page

The NASA EPSCoR program is directed to jurisdictions that have not in the past participated equitably in competitive aerospace and aerospace-related research activities. Five federal agencies conduct EPSCoR programs, including NASA. EPSCoR builds partnerships between government, higher education, and industry designed to effect lasting improvements in a state's research infrastructure, R&D capacity and hence, its national R&D competitiveness. In addition to the research and technology development, this program enables faculty development and provides support for higher education students.

The goal of NASA EPSCoR is to provide seed funding that will enable jurisdictions to develop an academic research enterprise directed toward long-term, self-sustaining, nationally competitive capabilities in aerospace and aerospace-related research. The NASA WV EPSCoR Program is directed by Dr. Melanie C. Page and Assistant Director Candy Cordwell. Dr. Majid Jaridi, now director emeritus, retired July 31, 2021 and directed the program for more than two decades. The program is located in the Benjamin M. Statler College of Engineering at West Virginia University,

“The goal of NASA EPSCoR is to provide seed funding that will enable jurisdictions to develop an academic research enterprise directed toward long-term, self-sustaining, nationally competitive capabilities in aerospace and aerospace-related research.” - Melanie C. Page, Ph.D.

which is the lead institution for the state. The directors are supported by a Board, which is comprised of a dedicated and highly competent group of individuals with a broad range of expertise from 12 affiliates all over the state, representing academic affiliate partners, as well as, for profit and non-profit industry, who are committed to bringing the fruits of NASA's research and outreach to all the citizens of West Virginia.

The program goals are to contribute to and advance NASA's vision and mission, specifically in terms of STEM research and workforce development; to contribute to the state of West Virginia's efforts at research infrastructure

Photos courtesy of Melanie Page



Above, left to right: Jaridi, Page, and Cordwell

development particularly in the high-technology sector, and improved level of STEM education; and to increase the participation of underrepresented groups in STEM.

NASA WV EPSCoR supports a variety of activities related to strengthening the research capabilities of faculty in STEM disciplines including research seed grants, travel grants, and capacity building programs like grant writing workshops.

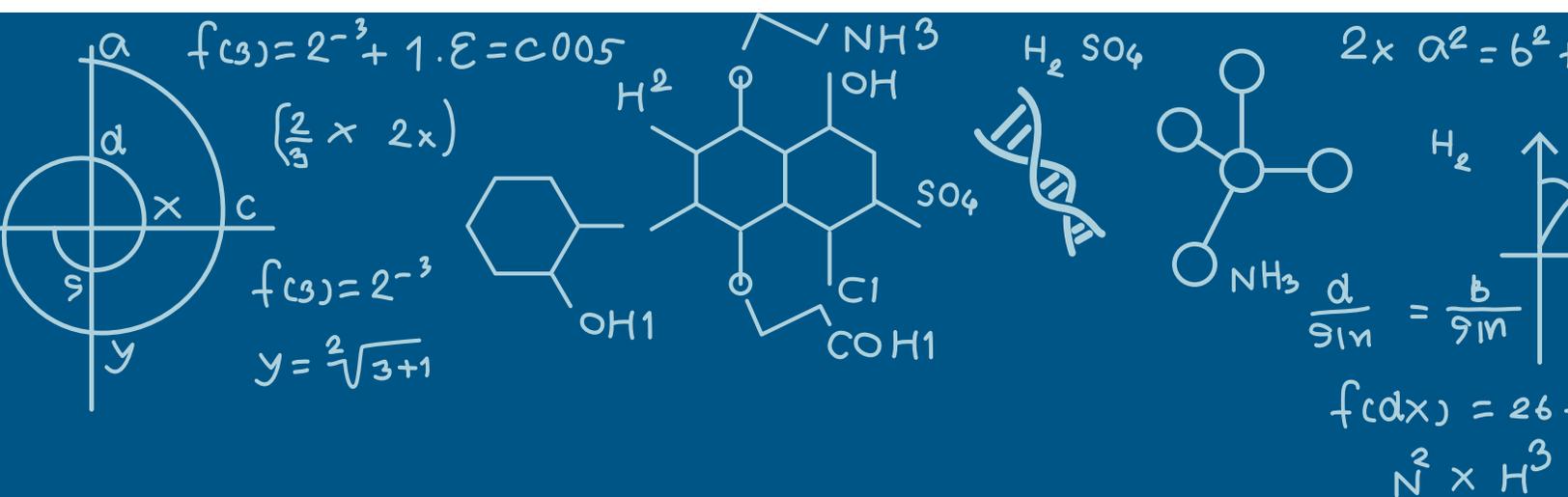
Our programs have been effective in building research capability at West Virginia's institutions of higher education. In the past five years, over 84 publications and presentations have been generated by our researchers, seven new or revised courses have been created, collaboration with three NASA Centers and over \$3.4 million has been secured by our researchers after the completion of their Seed Grant for NASA EPSCoR.



Page

Melanie C. Page, Ph.D., is the director of NASA West Virginia Space Grant Consortium and NASA WV EPSCoR. She is also Associate Vice President for Creative and Scholarly Activities at West Virginia University.

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