VOL 1 | ISSUE 3

WE ARE...BRIDGING MEDICINE AND SCIENCE

A PUBLICATION FROM MARSHALL UNIVERSITY BIOMEDICAL SCIENCES AND GRADUATE PROGRAM
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WE ARE...BRIDGING MEDICINE AND SCIENCE
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A publication of Marshall University Biomedical Sciences, providing news and information for and about faculty members, students, staff, alumni and friends.

Letters and suggestions are welcome at mubiomed@marshall.edu.

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Letter from the Director of Graduate Studies, Biomedical Sciences

Todd L. Green, Ph.D.

WELCOME to the third annual issue of the Biomedical Sciences magazine, "We Are . . . Bridging Medicine and Science."

In this issue, you will learn about the exciting research being performed by two of our faculty, Dr. Maria Serrat in the Department of Anatomy and Pathology, and Dr. Hongwei Yu in the Department of Biochemistry and Microbiology. And you will get to know more about one of our outstanding Ph.D. candidates, Allison Wolf.

It is not easy to earn a Ph.D. degree in Biomedical Sciences. A student has to take two years of advanced courses, pass a series of demanding written and oral comprehensive exams, work for an additional three to four years on an original laboratory research project, and finally write and then defend a dissertation before a committee of faculty.

Ph.D.s have a number of admirable qualities that make them appealing to employers. They have been trained to analyze problems and communicate, both in writing and verbally, to a wide audience. In recognition of the changing employment environment for our students, the BMS program is working with our research students to prepare them for the variety of careers outside of a university setting. In the past academic year Marshall University Career Services presented a series of workshops on such topics as how to write a résumé, how to network, and how to interview. Recently a nationally recognized science policy expert talked to our students about her career. We plan to begin an internship program next year to introduce our students to different careers. More information about this plan (referred to as TIGRE) can be found on page 13.

We hope you enjoy the third annual "We Are . . . Bridging Medicine and Science".

Sincerely,

Todd L. Green

Todd L. Green, Ph.D.
Director of Graduate Studies
Biomedical Sciences Program

Bones Heat Up Research Study: Dr. Maria Serrat examines temperature-based bone growth therapies

By Lisa Shrewsberry

Anthropologist Dr. Maria Serrat understands the secrets bones hold. The Marshall University Assistant Professor of Anatomy and Pathology is determined to discover relevant therapeutic properties from established environmental effects on bone growth — a largely unexplored research area. Applying her graduate-level experience in biological anthropology, Serrat is answering questions today that may change the way growth-related disorders are treated tomorrow.

"Whether from disease or injury, short stature or limb length discrepancy can be problematic in growing children. Even a few centimeters' difference in legs, for instance, can cause a lifetime of chronic back problems," says Serrat, in anticipation of what her findings about heat's effects on encouraging bone growth might mean to medicine.

The options for treating delayed growth are currently systemic drug therapies or external fixators involving invasive surgery. Some of the more common ways to treat growth-limiting conditions are various drug regimens targeting the bone growth plates, which are without a penetrating blood supply. This physiological limitation is what Serrat believes can be manipulated through the application of therapeutic heat to locally elevate temperature of specific bones in the skeleton.

"All the nutrients that get to cartilage have to do so by diffusing from surrounding blood vessels. What we have found using real-time multiphoton imaging is that warming skeletal growth plates just a few degrees can increase their permeability to circulating substances in the bloodstream," Serrat explains. The ability to target medications to where they matter most, potentially using a localized heating device, could make smaller doses more effective and lower the risk of adverse side effects for patients.

The pursuit of a scientific basis for improving therapies to stimulate bone growth originated in Serrat's attraction to ancient human evolution. "I thought I wanted to dig fossils, but my interests were swaying toward the growing skeleton," she recalls. An every day variable within our environment — temperature — had well-documented effects on bone growth and development. This association captured her attention and her imagination as an investigator desiring to also make a difference in the living. She calls it her "light bulb moment."

"I started thinking, why isn't anyone using this as a strategy? I was convinced this would be a way to transform existing treatments."

Having advanced her research first at Kent State University then at Cornell University, Serrat's arrival at Marshall in 2009 presented the need for the same multiphoton microscopy for in vivo analysis of cartilage and bone vasculature she had employed at prior institutions. A group at Marshall seeking a nearly $1 million NSF Major Research Instrumentation Grant focused the request with Serrat's help toward the specialized microscope at the heart of her research. To Serrat's surprise, the request was funded in 2010.

"These microscopes are not something you would find outside of major research institutions," she emphasizes.

Armed with the coveted tool and surrounded by the right multidisciplinary teams, including orthopedic physicians, she has earned the respect of grantors both internal and external, earning significant investments in her scientific sojourn. In addition to the NSF grant, since beginning her research career in graduate school Serrat has secured with the guidance of her mentors a total of over $90,000 in external grants, including the CCTS University of Kentucky Pilot Grant Program award of

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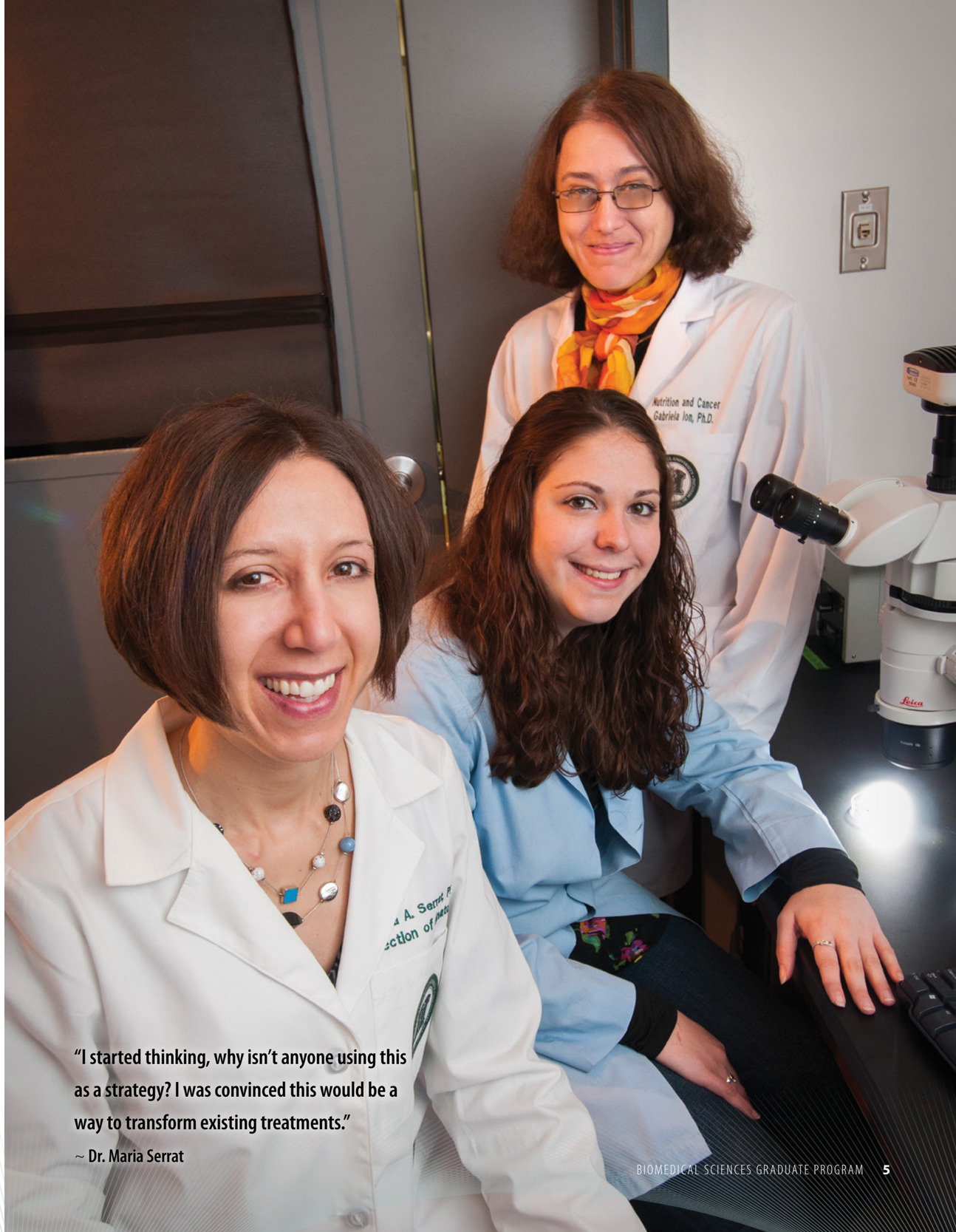

"I started thinking, why isn't anyone using this as a strategy? I was convinced this would be a way to transform existing treatments."

~ Dr. Maria Serrat

Bones Heat Up Research Study, continued from page 4

$25,000 toward her imaging studies of bone growth plates. Her internal grant total at Marshall, including a 2010 – 2012 MU Advance Faculty Fellowship, is nearly $80,000.

NASA West Virginia Space Grant Consortium most recently funded student undergraduate assistant Jenna Vance's research stipend to assist Serrat in innovating a model of limb heating to increase limb growth on one side of the body. "The purpose of this model is to test whether heat can be used as a targeting strategy to enhance delivery of therapeutic drugs to specific bones and/or if local heating alone can improve growth deficiencies," explains Serrat.

A NASA-WV Research Initiation Grant also afforded Serrat support for undergraduate student assistants who are at present developing protocols and baseline imaging data.

The team's lab experimentation is demonstrating return on investment, proving a link between temperature, molecular transport and bone growth. Serrat's mission now is to translate these findings to the medical community.

"We have to establish a baseline with the science and identify what variables are involved in facilitating the entry of therapeutic drugs. From there, we will be moving toward a clinical trial in children. I really do see this as being a viable, non-invasive clinical strategy to offset many types of linear growth impediments."

Dr. Maria Serrat: Quick Facts

- 2007 - Attained her Ph.D. in Biological Anthropology from Kent State University, Kent, Ohio
- 2008 – 2009 - Completed two years post-doctoral studies at Cornell University College of Veterinary Medicine, Ithaca, New York
- Dr. Serrat spends half of her time in research and the other half teaching anatomy to first year Marshall University medical students.

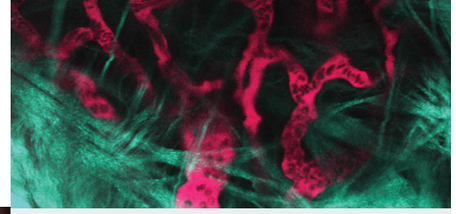

Image of blood vessels in the plexus surrounding the tibial growth plate of a live, anesthetized 5-week old mouse

NEUROSCIENCE AND DEVELOPMENTAL BIOLOGY

Coordinator
Richard D. Egleton, Ph.D.

Research
Marshall's Neuroscience and Developmental Biology research cluster explores various developmental and neuroscience topics with both cellular and animal models, ranging from fruit flies to humans. These topics presently include: experience-induced neural modulation and neuroethology; genetic control of cell polarity in development and disease; nicotine receptors in retinal angiogenesis and cancer; brain barrier systems in health and disease; hippocampus and memory; sulforaphane-induced epigenetic modifications in prostate cancer; and the facilitating role of environmental variables in bone elongation.

An additional focus of the cluster is to increase collaborative projects and to partner with clinicians who have an interest in research.

Grants
Several awards, including grants from the National Science Foundation, Flight Attendant Medical Research Institute, NASA and the NIH, are funding investigations in the following areas: nicotine/acetylcholine signaling in lung cancer; male meiosis and spermatogenesis; buprenorphine metabolism in opiate-addicted mothers and prenatal tissue as a predictor of neonatal abstinence syndrome in rural Appalachia; effects on breast cancer in offspring of mothers consuming omega-3 fatty acids; DNA and stem cell studies; and unilateral heating in relation to differential extremity growth in mice.

Allison Wolf:
Oh, the places she goes!

By Lisa Shrewsberry

Allison Wolf, a Marshall University Ph.D. candidate with the Biomedical Sciences Graduate Program, is not only nearing the end of her academic journey, she is adding an impressive bullet-point to her *curriculum vitae*: "international presenter."

The new mother and scientist completed two research internships at Marshall University through WV-INBRE before acceptance into the Ph.D. program. The first was with Dr. Michael Moore and the second with Dr. Hongwei Yu. Once accepted into the Ph.D. program, she began working with principal investigator Dr. Pier Paolo Claudio, M.D., Ph.D. As her aptitude at research developed, Wolf realized sharing the fruits of her labor with other scientists was a part of the process she found strongly appealing. "I liked participating in different conferences during my time at Marshall University; I enjoyed being able to present what I was investigating to other people."

Wolf studies natural dietary compounds and their potential to maximize the effectiveness of chemotherapy in cancer patients. Her work earned notice at the 4th World Congress of the International Academy of Oral Oncology in Rhodes, Greece, where she discussed her findings in a May 2013 session. As the winner of 2012 Best Overall Performance as a Graduate Student award, Wolf earned $3,500 helping to defray her travel expenses as a featured presenter.

Ph.D. candidates, Allison Wolf, Miranda Carper, and Kristeena Ray taking in a Boston Red Sox game while visiting Boston, MA for the Experimental Biology conference

Allison and her husband, Chris, enjoying captivating scenery in Rhodes, Greece

There, she shared her research and was afforded opportunity to observe peer response to her work. "This conference was specific to oral oncology. There were groups of radiologists and oncologists from all over the world there. It was nice to be able to communicate across the different disciplines and share new ideas."

When renowned scientists and physicians convene to learn about your work, it can be exhilarating, enlightening and nerve-wracking, especially to a young researcher, but Wolf met the challenge head-on, taking suggestions as opportunities to refine her research from this once-in-a-lifetime meeting of the minds. "Some suggestions can really open doors and guide your project into something bigger than it was."

Her academic pursuits led her to studying head and neck cancers and to evaluating the concept of food as medicine. Wolf is studying how the natural compound benzyl

continued on page 8

Allison Wolf, continued from page 7

isothiocyanate (present in cruciferous vegetables like watercress) enhances the effectiveness of chemotherapy and prevents processes linked to metastasis. The idea that certain healthy foods can have relevant impact on chemotherapy's effectiveness, potentially reducing the toxicity of cancer treatments overall, is significant. That they may also prevent cancer from spreading is an important weapon in the arsenal against cancer progression.

"In research, one of the benefits of using natural compounds instead of drugs is you have a better chance of getting your work to the clinical trial stage," Wolf states. No matter the assumed safety of the compound studied, however, getting from Point A (discovery) to Point B (clinical application) can take many years. "That's not necessarily a bad thing. We want to make sure any new treatment we are developing is safe and effective."

In addition to sharing her work, Wolf was introduced to important clinical trials from around the world in Greece and couldn't ignore that she was learning in one of the most beautiful places on earth, considered the birthplace of modern medicine. "Greece was definitely a unique setting for a research conference," she states. "The rich culture and history there only enhanced the experience."

Back home, Wolf actively promotes Marshall as an ideal place for student researchers. "I tell students it's a smaller institution which allows it to be close knit between clusters and disciplines." This, she explains, facilitates collaborations that otherwise wouldn't happen so easily, if at all. "We all work very closely together on campus, across disciplines. At larger universities, labs might not even be on the same side of town."

Marshall allows a cancer researcher like Wolf to pursue avenues unrelated

to cancer but still relevant to her line of research. "I might have a new idea because I talked with someone here in neurology or in the cardiovascular field. This really helps students to see the big picture."

Wolf credits Marshall's Biomedical Science Graduate Program with providing consistent support for student researchers to participate in conferences, to collaborate with professionals across disciplines and to establish confidence in one's own research and leadership abilities.

"They've made it financially possible for me to go to many conferences and to relay my work to other people."

Allison Wolf: Quick Facts

- Allison, originally from Parkersburg, W.Va., was able to have a few graduate-level classes with her husband, Internal Medicine Resident Chris Wolf. The two met in high school and welcomed their first child, a girl, this November.
- Wolf expects to graduate in May 2014 after completion of her work under a WV-NASA grant for her investigation of benzyl isothiocyanate's potential benefits to cancer patients.

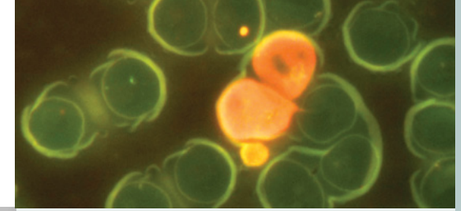

Image of micronucleus in white blood cells

CANCER BIOLOGY

Coordinator
Beverly Delidow, Ph. D.

Research
According to data compiled by the Centers for Disease Control and Prevention (CDC), West Virginia is in the highest interval (183.6 to 207.4 per 100,000) for cancer mortality in the nation. The members of the Cancer Biology research cluster are engaged in finding ways to understand the behaviors of the most prevalent types of cancer in order to be able to detect and treat them more effectively. The ten reporting faculty are distributed across four departments and two colleges, and encompass research areas as diverse as atomic force microscopy and clinical translational research. One of the areas of particular emphasis in the cluster is the investigation of the role of dietary factors in the prevention and treatment of cancer.

Grants
There were 17 competitive research, education and training grants awarded to faculty and Ph.D. students in the Cancer Biology cluster this past academic year, as well as 26 peer-reviewed publications and 36 presentations at regional or national meetings.

Dr. Hongwei Yu:
Passing the Test of Significance

By Lisa Shrewsberry

Many unsung heroes exist in science and medicine. Among them are the behind-the-scenes researchers actively seeking solutions to the most problematic medical conditions. They are on a different kind of frontline— that of discovery, where significance is measured in terms of real contribution to humanity.

Dr. Hongwei Yu is one such researcher.

Dr. Yu arrived at Marshall University in 1999. The microbiologist and geneticist is a respected member of the Infectious and Immunological Diseases Research Cluster of the Biomedical Sciences Graduate Program. His drive to understand the pathophysiology behind cystic fibrosis (CF) stands to positively impact medicine, and the lives of children and adults alike. His expertise is specific to the process underlying excess mucous formation in the airways of those with CF. Biofilm production by bacteria Pseudomonas aeruginosa is the leading cause of mortality in CF patients.

According to data from the Cystic Fibrosis Foundation, CF affects 30,000 children and adults in the U.S. and 70,000 worldwide. The predicted mean age of survival for an individual with CF is the late 30s. In light of the life-and-death importance of his research, when Yu isn't teaching microbiology to Marshall's second year medical students, his mission is inside his lab, studying the genes that regulate biofilm formation.

"Identifying the players can lead us to developing therapeutic agents to target production," he explains. Since his presence at Marshall University, Yu has published 22 peer-reviewed papers on the subject, lending credibility to his endeavors.

As social historian Daniel Boorstin once noted, "The greatest obstacle to discovery is not ignorance — it is the illusion of knowledge." To guard against anomaly and promote true significance within research, publication in peer-reviewed journals is a necessary achievement, validating the importance of a scientist's work. Extensive publication lends researchers credence as experts in their fields, and their ability to share their findings upon such prestigious platforms invites beneficial feedback.

At an international meeting of scientists in Japan, Yu was paid the highest compliment a researcher can receive when he met a group who

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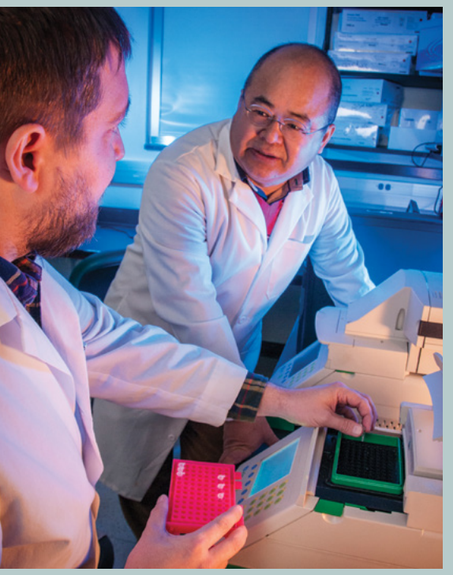
Dr. Hongwei Yu, continued from page 9



had repeated his published research methodology and reproduced his findings exactly.

"Publication is a very long process. Peers point out all potential problems within the research." To take findings and organize them in an understandable and replicable format takes six to eight months of continuous work following the research phase. "Then, on many occasions, papers are rejected."

In 2007, Yu published a paper on his Pseudomonas aeruginosa research in the Proceedings of the National Academy of Sciences (PNAS), considered one of the most prestigious peer-reviewed journals in science, chief among an extensive list of his acceptances in print.

Another important facet of Dr. Yu's work has been the identification of a type of segmented filamentous bacteria (SFB)—a non-culturable component to the beneficial microbiota of the human gut. He plans to present his findings in 2014.

"The bacteria we observed are very interesting because they are only present in young children." Yu explains how he first discovered the presence of the bacteria in Chinese children under three years of age. "These bacteria clearly are important for the immunity of the host, the human." Now, there are two questions necessary to furthering the research— how can SFB be cultured and are the bacteria also present within the digestive systems of American children? "Since they are beneficial bacteria, the potential implication is that they may be used as probiotics, just as the beneficial bacteria in yogurt can improve digestion."

Discovery is oftentimes one part lab work and two parts paperwork. In order to fund his important and prolific investigations, Yu explains, "I'm constantly applying for grants — and requests are sometimes rejected." Luckily, his experience is vast at getting grantors to realize the potential of his findings and what they may ultimately mean to lives. Since beginning at Marshall, Yu has acquired $3.45 million in grant support.

Perhaps the most rewarding aspect of his career has been the opportunity to mentor students into becoming mature researchers. "I look at the two Ph.D. students I have graduated. One is working for the U.S. Government and the other is a postdoctoral fellow at the University of Virginia. I remember how they came to my lab as naive undergraduates. They are now publishing their own research." Dr. Yu is presently mentoring another Ph.D. candidate, Ryan Withers, who like many of his former assistants has become so adept at working with his mentor that he can finish his sentences. In all, 20 undergraduate students have trained in Yu's lab since 1999.

He says, "I get satisfaction out of watching them go through this process of learning. Eventually, these students will replace all of us."

Dr. Hongwei Yu: Quick Facts

- Dr. Yu received his Ph.D. in Molecular Pathogenesis from the University of Calgary, Alberta, Canada, in 1994
- The Cystic Fibrosis Foundation's most recent award of support to Dr. Yu's research was a $180,000 grant in 2013
- Yu receives many invitations to speak regarding his research at national and international scientific symposia; his last presentation abroad was in December 2012 at Zhejiang University, Hangzhou, China

An Introduction to Marshall University's Biomedical Sciences (BMS) Graduate Degree Options

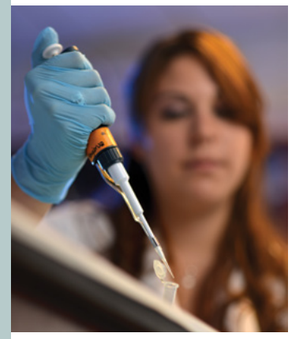
Marshall University has a diverse group of degrees within the Biomedical Sciences Graduate Program characterized by a commitment to support through mentoring, interdisciplinary research clusters, student funding, and a caring environment.

Doctor of Philosophy in Biomedical Science (Ph.D.)

For students interested in **Research**

Doctoral students perform research in one of five clusters:

- Cancer Biology
- Cardiovascular Disease, Obesity, and Diabetes
- Infectious and Immunological Diseases
- Neuroscience and Developmental Biology
- Toxicology and Environmental Health Sciences



These clusters reflect an advanced approach to working across disciplines in a team-based structure to conduct scientific investigation. This methodology can also be seen in the required three 40 hour rotations through different laboratories to learn numerous research techniques and collaborate with a variety of diverse, world-class professors and peers.

In the 5-6 years that is typically needed to graduate, Marshall's BMS Ph.D. students will attend Preparation for Graduate Academics (PGA) Boot Camp to enhance scientific and academic skills; focus on presentation skills to better showcase research findings; complete comprehensive exams; and research, write and defend their dissertation. They will work one-on-one with faculty and be guided and supported by mentors in their disciplines as well as members of their advisory committee. There also will be opportunities to participate in internships to set them apart from their peers in other programs.

Notes:
Application deadline is January 15th
Ph.D. students receive a tuition waiver, an annual stipend of $25,000, and a portion of their medical insurance paid by the program.

Master of Science (M.S.)

Biomedical Sciences Research (3 years)
For students interested in an **Academic** or **non-Academic Research Focus**

As with the Ph.D. students, the Research M.S. students follow the interdisciplinary approach to research, and they work through lab rotations. The opportunity to experience not just one area but various fields in biomedical science, alongside peers and mentors, can be invaluable to educational and career paths.

Many of these students plan to pursue a Ph.D. Completing program course work can also improve competitiveness for doctoral programs and potential employment.

Master of Science (M.S.)

Biomedical Sciences (non-thesis) with focus on Medical Sciences (2 years or less)
For students interested in preparation for **Medical School** or **other health professions, Allied Health Care Employment,** or **a Non-Research Orientation**

For many BMS students, the goal is to give themselves a more competitive edge for medical school or other professional medical education such as veterinary, dental or physician assistant school. This program allows participants to take many courses with medical students in the same state-of-the-art facilities and with the same faculty.

Notes:
On average, 83% of our students who applied to medical school or other health-related professional school were accepted after completing at least one semester of Marshall's medical sciences program.

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Biomedical Sciences (BMS) Graduate Degree Options, continued from page 11

M.D./Ph.D. Combined Program

For students interested in **bridging Clinical Patient Care and Biomedical Research**

Students in this challenging program are typically committed to coursework, research and clinical experiences through the full calendar year. In the seven to eight year program, successful students complete courses and research studies within the same interdisciplinary clusters as the M.S. and Ph.D. students. During this time they will benefit from great support from faculty, mentors, peer collaboration, and their advisory committee.

Notes:
Successful students will receive a tuition waiver for the length of the program, and a yearly stipend equal to that of the Ph.D. student stipend (currently $25,000).

www.marshall.edu/bms

Make a Gift to the Biomedical Sciences Graduate Program

The BMS Graduate Program continues to thrive, but is always seeking ways to make improvements for its students. Your financial contribution will support BMS Ph.D. students via scholarships/stipends or fund students' travel to biomedical meetings. Financial support can also be given to strengthen and expand the Biomedical Sciences Summer Research Internship for Minority Students (SRIMS).

Contribution of any amount is both helpful and appreciated!

Please contribute to the BMS Graduate Program Fund (213078) or the SRIMS Program Fund (213073) online at http://www.marshall.edu/foundation/givenow.php, or by mailing a check payable to:

The Marshall University Foundation, Inc.
519 John Marshall Drive
Huntington, West Virginia 25705

THANK YOU!

Image of *Pseudomonas aeruginosa*, which turns into a mucoid, slimy form (right) during chronic lung infections in patients with Cystic Fibrosis (CF)

INFECTIOUS AND IMMUNOLOGICAL DISEASES

Coordinator
Hongwei Yu, Ph.D.

Research
The Infectious and Immunological Diseases cluster investigates the cellular and molecular mechanisms of diseases. The faculty's current research includes mitochondrial function/dysfunction in metabolic diseases, cancer and aging; cardiovascular and cancer susceptibility genes; Streptococcus infections; regulation of gene expression; mapping and cloning of human disease genes; the pathogenesis of leukemia; and controlling Pseudomonas aeruginosa biofilms in cystic fibrosis.

Grants
West Virginia IDeA Networks of Biomedical Research Excellence and the Cystic Fibrosis Foundation are two grantors helping to fund the development of a repository of cancer tissues relevant to West Virginians and for evaluating the control of P. aeruginosa biofilms in cystic fibrosis.

TIGRE
Transforming Interdisciplinary Graduate Research and Education

Faculty and students come together for the first PGA boot camp

Phyllis Frosst, Ph.D., was the inaugural speaker to kick off Marshall's Biomedical Sciences Career Exploration Speaker Series. Dr. Frosst is senior policy fellow at the Personalized Medicine Coalition in Washington, D.C. and former senior advisor for the National Center for Advancing Translational Sciences, National Institutes of Health.

For many years, Ph.D. graduates were expected to work as faculty at academic institutions like their mentors. But actually less than a third of Ph.D.s have tenure-track faculty positions; most work in non-academic environments.

The new Transforming Interdisciplinary Graduate Research and Education (TIGRE) plan has been created to further prepare Marshall's Biomedical Ph.D. students to thrive in their education and meet the changing need of the biomedical workforce. The main components are:

Preparation for Graduate Academics (PGA) Boot Camp – One week intensive preparation for doctoral academics including:
- Biochemistry, cell and molecular biology, and physiology
- Critical thinking and teambuilding exercises

Career Exploration – Speaker Series and workshops
- Invited speakers from non-academic biomedical research career fields share their career paths and introduce a variety of career opportunities to BMS Graduate Students
- MU Career Counselors help students investigate job types, develop curriculum vitae and resumes, and hone interview skills

Experience – Internships (coming next year)
- After completing qualifying exams, students are encouraged to participate in internship opportunities, some of which are in research administration and technology transfer, science policy, pharmaceutical research and management, and biotechnology patent law.

This innovative approach for Ph.D. scholars will be a significant value to Marshall Biomedical Sciences Graduate students to strengthen academic skills, provide further hands-on experiences, and broaden the range of possible career options.

Marshall BMS Ph.D. Alumni – Career Paths and Places of Employment

- Amgen Inc., Senior Manager Global Regulatory Writing
- Applied Biosystems, Product Manager
- Brown University, Adjunct Assistant Professor of Molecular Microbiology and Immunology
- FBI, Weapons of Mass Destruction Directorate
- Indiana University-Purdue University Indianapolis, Department of Medical and Molecular Genetics
- Kent State University, Exercise Science/ Physiology, Assistant Professor
- L'Oreal, Global Manager for Product Safety and Efficacy
- Medical School
- Mount Sinai School of Medicine, Department of Oncological Sciences
- Mylan, Senior Manager, Global EHS Occupational Toxicology
- National Cancer Institute, NIH
- National Institute of Child Health and Human Development
- Shawnee State University, Biological Sciences, Assistant Professor
- University of Alabama, Birmingham, Research Integrity Specialist
- University of Cincinnati Children's Hospital, Division of Experimental Hematology and Cancer Biology
- West Virginia Office of the Chief Medical Examiner, Forensic Toxicologist

Marcus Terneus, Ph.D.
Senior Manager, Global Environmental, Health and Safety Occupational Toxicology
Mylan Pharmaceuticals
2006 Graduate of Marshall's Biomedical Sciences Ph.D. Program

"The Marshall Biomedical Sciences Ph.D. Program was a truly rewarding endeavor. The exceptional professors and students, innovative research, as well as the opportunities to present and publish provided me with some amazing experiences and the tools necessary to excel in my professional career."

Ph.D. Alumni

RECENT GRADUATES

J. Michael Brown, Ph.D. – Dr. Brown earned his Ph.D. in Biomedical Sciences in August 2012 under the mentorship of Monica Valentovic, Ph.D. His dissertation was titled "A Mechanistic Study of S-Adenosyl-L-methionine Protection Against Acetaminophen Hepatotoxicity." Dr. Brown is a student at University of Charleston's School of Pharmacy.

Winter Commencement 2012 of BMS Ph.D. alumni with their mentors.
From left: Drs. Egleton, Marcelo, Valentovic, Brown, Hardman, and Silvis.

Madhukar Kolli, Ph.D. – Dr. Kolli earned his Ph.D. in Biomedical Sciences in August 2012 under the mentorship of Dr. Eric Blough. His dissertation was titled "The Use of Cerium Oxide and Curcumin Nanoparticles as Therapeutic Agents for the Treatment of Ventricular Hypertrophy Following Pulmonary Arterial Hypertension." Dr. Kolli is working as Associate Veterinarian at Banfield Pet Hospital.

Aileen Marcelo, Ph.D. – Dr. Marcelo earned her Ph.D. in Biomedical Sciences in December 2012 under the mentorship of Richard D. Egleton, Ph.D. Her dissertation was titled "The Role of Vascular Endothelial Growth Factor at the Blood-Brain Barrier in Diabetes." Dr. Marcelo is working as Postdoctoral Scholar in the Sanders-Brown Center on Aging at University of Kentucky.

Anne Silvis, Ph.D. – Dr. Silvis earned her Ph.D. in Biomedical Sciences in December 2012 under the mentorship of W. Elaine Hardman, Ph.D. Her dissertation was titled "Redox Regulation of Differentiation in Neuroblastoma." She is working as Research Assistant Professor within Marshall's Department of Obstetrics and Gynecology.

Faculty Update

Goran Dragan Boskovic, Ph.D. passed away suddenly in July 2013. Goran came to Marshall in 1996, and in 2004 joined the Genomic Core facility, where he served as the manager of both the Microarray and Next Generation Sequencing Core Facilities. Goran was very much the "go to" guy for designing and executing gene expression profiling, whole genome and whole exome studies and ChIP-Seq analyses. He is greatly missed.

A number of new faculty were recruited to Marshall and the BMS Graduate Program this past year. We welcome: **Dr. Nader Abraham**, appointed Vice-Dean for Research and Professor of Pharmacology, Physiology and Toxicology; **Dr. Jiang Liu**, appointed Associate Professor of Pharmacology, Physiology and Toxicology; and **Dr. Uma Sundaram**, appointed Director of the Edwards Comprehensive Cancer Center, Vice-Dean for Clinical and Translational Research, and Chair of the Department of Oncology.

We also welcome **Ms. Kelly Carothers** to the Biomedical Sciences Family. Kelly came to Marshall this fall as Assistant Graduate Recruiter and will focus on overseeing the Summer Research Internship for Minority Students (SRIMS) Program. Kelly spent the last three years working in college recruiting and advising in Pittsburgh until she moved to Teays Valley, WV, this summer.

Recognizing Excellence

Each year Biomedical Sciences Graduate Program faculty, staff, and research students gather to share their research, enjoy a speech by an alumni guest, and present awards for research and service.

ANNUAL BMS RESEARCH RETREAT: ACADEMIC YEAR OF 2012-2013

Benjamin Owen

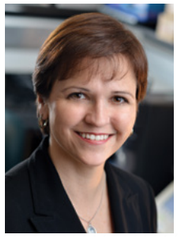
T. Ryan Withers

Adam Fischer

Oksana Bailiff

Brad Gillon

Monica Valentovic



Diana Maue

Kristeena Ray

Bill Rollyson

The Best Overall Performance as a Graduate Student was awarded to Benjamin Owen! He received a plaque and will receive a paid trip to an international meeting (up to $3500). Ben is a Ph.D. Candidate working in the lab of neuroscientist Larry Grover, Ph.D., and is Vice President of the BMS Graduate Student Organization (GSO).

The **Best Research Performance** was awarded to T. Ryan Withers! He received a plaque and will receive a paid trip to a national meeting (up to $2,000). Ryan worked in the laboratory of microbiologist Hongwei Yu, Ph.D., and is slated to graduate in December 2013.

Ryan was called to the front more than once, as he received the **Dr. Frederick J. Lotspeich Scholarship** in the amount of $1,000. Dr. Lotspeich was the first chair of Marshall University School of Medicine's Department of Biochemistry. This scholarship is made possible by his wife, Mrs. Kay Lotspeich, and is awarded to an upstanding student from West Virginia.

Adam Fischer, with a 4.0, was recognized as having the **Highest GPA for a First Year Research Student**! Oksana Bailiff and Brad Gillon were recognized as having the **Highest GPA for a First Year Medical Sciences Student**! They both tied with an impressive 4.0 GPA. Though no monetary awards were given, Adam, Oksana, and Brad were recognized among faculty and peers, and received a plaque to mark their accomplishments.

Also at the retreat, the graduate students presented awards to show appreciation to both a BMS staff and faculty member. This year's **Faculty Appreciation Award** was presented to Monica Valentovic, Ph.D. who is the chair of the Toxicology and Environmental Health Sciences Research Cluster. And, the **Staff Appreciation Award** was presented to Mrs. Diana Maue who is Recruitment and Communication Coordinator for the Biomedical Sciences Graduate Program.

Finally, the BMS Graduate Student Organization awarded two **GSO Scholarships** to Ph.D. candidate Kristeena Ray and, M.S. Medical Sciences student, Bill Rollyson. Awards were based on leadership, community service, research, letters of recommendation, a written statement, and GSO involvement. The scholarships were for $500 each.

Summer Research: Nine Weeks to Success

Manny Rosas

Nine weeks can build confidence; establish networks of friendship, mentors and peers; provide opportunity for more qualified candidates to move forward in their research education and careers; and afford new and diverse contributions to research. To summarize – it can lead to a stronger foundation for success.

All of this was experienced by the 2013 cohort for the Summer Research Internship for Minority Students (SRIMS) Program. Three students were able to participate, attending instructive seminars, performing research in one of five interdisciplinary biomedical research clusters under the guidance of a mentor, and enjoying fun activities with those attending the WV-INBRE summer internship program. The differing backgrounds and skill sets of these participants support Marshall's Vision for the SRIMS Program:

1. To establish a pipeline of minority students into health-related research
2. To enrich the current biomedical sciences research through an added diversity of ideas, perspectives and cultures

These students, as well as past and future SRIMS attendees, can help provide a pool of well-trained and talented biomedical research scientists.

Ashlea Hendrickson from Oakwood University in Alabama was excited to work with mentor, Hongwei Yu, Ph.D. in the Infectious and Immunological Diseases Research Cluster. She developed a great relationship with fellow SRIMS attendee, Annesha King.

Annesha's research focused in the Neuroscience and Developmental Biology Research Cluster under the guidance of Dr. Emine Koc. She'll take this experience back to her program at the University of the Virgin Islands where she will share some of what she learned during SRIMS.

"I thoroughly enjoyed the SRIMS Program! The people are friendly, the labs are state-of-the-art, and the overall experience was just great! I would definitely recommend this program to anyone interested in gaining research experience while having a great time!"

~ Ashlea Hendrickson, 2013 SRIMS Intern

Emmanuel "Manny" Rosas made the trip to Marshall from the University of Texas, Brownsville. He performed research in the Cardiovascular Disease, Obesity, and Diabetes Research Cluster with Richard D. Egleton as his mentor. Manny's positive experience with the research and people he met during the program has given him the confidence to recommend it to many other students.

Request for Funds: The intent of the Marshall School of Medicine Biomedical Graduate Program is to expand the number of students that can be accepted into SRIMS. A larger group would benefit both the students and the program. Your financial contribution would be appreciated! **www.marshall.edu/foundation/givenow.php** - The SRIMS Program Fund number is 213073. Or, you can write a check payable to Marshall University with the SRIMS Program Fund number in the memo line.

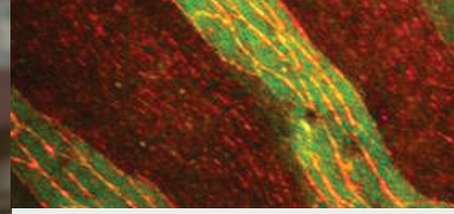
For additional information on the SRIMS program, mentors, research opportunities and more, please see **www.marshall.edu/bms/future-students/summer-research-internship** or contact Ms. Kelly Carothers at SRIMS@marshalll.edu.

Ashlea Hendrickson

Annesha King

Biomedical Sciences Grant Funding for the 2012-2013 Academic Year

NUMBER OF COMPETITIVE GRANT APPLICATIONS	78
AMOUNT OF FUNDS REQUESTED	$58,469,250
NUMBER OF COMPETITIVE GRANTS FUNDED	7
AMOUNT OF FUNDING	$1,267,422



Confocal image of a *Drosophila* embryo

TOXICOLOGY AND ENVIRONMENTAL HEALTH SCIENCES

Coordinator
Dr. Monica Valentovic

Research
Toxicology and Environmental Health Sciences examines the effect of agents including pesticides, drugs and environmental chemicals on cells, organs and the body. A sampling of present MU research is the investigation of exposure to certain environmental chemicals and their impact on kidney function and the development of newborns.

Grants
National Institutes of Health and Pharmaceutical Research and Manufacturers of America (PhRMA) are among those funding toxicology research at Marshall University on: the anticancer effects of capsaicin (a compound in chili peppers); the proliferation of breast cancer cells; and heavy metal, vitamin D and thyroid levels in rural and urban-residing newborn infants.

Incoming Biomedical Sciences Ph.D. Students for Summer 2013

Adam P. Fischer
Glenville State University

Laura Kutz
Ohio University

Mani Maheshwari
University of Toledo

Rachel Murphy
Benedictine College

Niraj Nepal
WV State University

Will O'Toole
Marshall University

Incoming Biomedical Sciences Research M.S. Students for Fall 2013

Jacaline Parkman
Washington State University

Incoming Biomedical Sciences M.S., Medical Sciences Students for Fall 2013

Deborah Amos
University of Charleston

Joe Barbera
Marshall University

Kevin Clark
West Virginia University

Daniel Desiderio
Penn State, University Park

Randi Dillon
University of Charleston

Mohit Harsh
Washington University

Benja Lamyaithong
Wheeling Jesuit University

Mats Lemberger
Dartmouth College

Andrew Pisters
Marshall University

Jordan Preston
Marshall University

Preeya Shah
Oberlin College (OH)

Incoming M.D./Ph.D. Students for Summer 2013

Diane T. Dawley
University of Akron

Yuto Nakafuku
University of Chicago

Mohammad A. Halaibeh
State University of New York, Stony Book

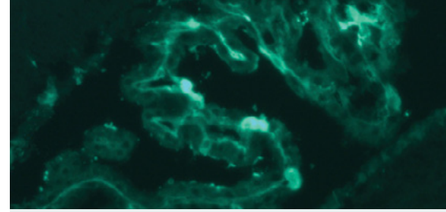


Image of Flk-1 expression in the rat choroid plexus. Flk-1 is a receptor for vascular endothelial growth factor (VEGF), an important regulator of vascular function and development in health and disease.

CARDIOVASCULAR DISEASE, OBESITY, AND DIABETES

Coordinator
Nalini Santanam, Ph.D.

Research
The mission of this cluster is to understand the causes and consequences of cardiovascular disease, diabetes and obesity and to identify potential preventive and therapeutic strategies to lower their impact in the Appalachian region and in the U.S. Research within this cluster is dependent on the interdisciplinary collaboration of scientists, clinicians, educators and students.

Grants
Support from the U.S. Department of Energy, NASA-EPSCoR, WV-INBRE and the National Institutes of Health's National Institute of Diabetes and Digestive and Kidney Diseases is funding research in the following areas: the Center for Diagnostic Nanosystems; muscle and bone loss associated with space travel; the efficacy of trichostatin A in improving bone quality and function; the regulation of brain endothelial phenotype and function by diabetic plasma; the impact of technology-based intervention in patients with Type 2 diabetes; the genetics of diet-induced obesity; the Appalachian Cardiovascular Research Network; adipose tissue and body fat-related studies; and novel therapeutics for renal/cardiac disease.

Ph.D. APPLICATION CHECKLIST

DEADLINE: On or by January 15th for Biomedical Sciences Ph.D. applicants - Applications completed very soon after the stated deadline may be considered at the discretion of the BMS Graduate Studies Committee.

- ❑ **Completed application online, application fee, official transcript(s) and official GRE scores to the Graduate Admissions Office**
- ❑ **Three letters of recommendation and personal statements to mubiomed@marshall.edu. Letters must be signed, on official letterhead, and come directly from the writer. Questions? Contact Diana R. Maue at (304) 696-3365 or mubiomed@marshall.edu.**

www.marshall.edu/bms

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R.C.B. Biotechnology Science Center
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