

Fall 2011

# We Are ... Bridging Medicine and Science Vol. 1, Issue 1, Fall 2011

Marshall University Biomedical Sciences

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# WE ARE...BRIDGING MEDICINE AND SCIENCE

A PUBLICATION FROM MARSHALL UNIVERSITY BIOMEDICAL SCIENCES AND GRADUATE PROGRAM



FROM RESEARCH

TO THE PHYSICIAN





**WE ARE...BRIDGING MEDICINE  
AND SCIENCE**

VOL. 1 | NO. 1 FALL 2011

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. Contact Diana Maue at [mubiomed@marshall.edu](mailto:mubiomed@marshall.edu).

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**WELCOME**

Greeting from the Senior Associate Dean for  
Research and Graduate Education **3**

**FEATURE STORIES**

New Translational Genomic Research Institute  
Opens its Doors **4-5**

BMS Medical Sciences Students **6-7**

Serve in Medical Mission to Honduras

Dr. Donald Primerano: The Heart of the Genomics Core Facility **8-9**

Program Updates **10**

Faculty Update **10**

Grant Funding **11**

Summer Research Internship for Minority Students **11**

Admissions Report **11**

Research Cluster Spotlight **12**

Recent Graduates **13**

Employment of Graduates **13**

Financial Support **14**

About the Program: FAQs **15**

## Greetings from the Senior Associate Dean for Research and Graduate Education

Welcome to the inaugural issue of our Biomedical Sciences magazine, *"We Are... Bridging Medicine and Science."* This magazine will be published annually and will provide both highlights and in-depth feature articles about the Biomedical Sciences (BMS) Graduate Program at Marshall University's Joan C. Edwards School of Medicine.

I would like to thank Miranda Carper, a current Ph.D. candidate, for conceiving of the title for our new magazine as part of a contest among our graduate students. The play on the initials for our "BMS" program conveys the essence of our mission—research and graduate training that will lead to improved treatment of disease. I also want to thank Diana Maue and her student assistant, Tamara Trout, who took the lead on turning this concept into reality. This assignment was loaded onto Diana's already demanding workload of recruiting students for our BMS program and managing the Summer Research Internship for Minority Students program.

The BMS program has significantly increased in size, quality, and scope since I arrived at Marshall in 1992. In speaking to members of the community and even to some clinical and non-medical school faculty, I have found that they are often not aware of our BMS program and its accomplishments. These observations, along with the reasons listed below, are the driving factors for the launch of this new magazine. Our goals for this publication are:

- To inform alumni, members of the Marshall University community, greater Huntington community leaders, and state and federal policymakers about our program and its accomplishments;
- To recognize the achievements of BMS faculty and students; and
- To serve as a recruitment tool.

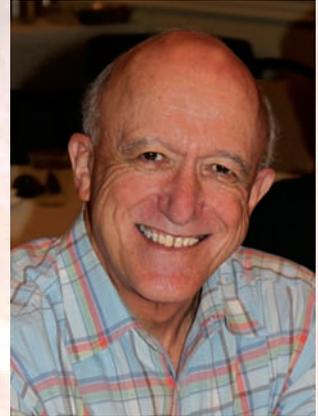
I look forward to sharing our many exciting research projects, and student and infrastructure accomplishments. I also welcome any questions, comments or suggestions related to this magazine or to our BMS program. Please direct them to me at [niles@marshall.edu](mailto:niles@marshall.edu).

Thank you for taking the time to read our new issue!

Best regards,



Richard M. Niles, Ph.D.  
Senior Associate Dean for Research and Graduate Education  
Joan C. Edwards School of Medicine  
Marshall University



Richard M. Niles, Ph.D.



Miranda Carper, Ph.D. candidate

# New Translational Genomic Opens its Doors

by Tamara Trout

**“We Are . . . Bridging Medicine and Science.” How true this is now that the greatly anticipated construction of Marshall’s new Charles H. McKown, Jr., MD Translational Genomic Research Institute (TGRI) at the Edwards Comprehensive Cancer Center is complete. The excitement of building a new facility may be winding down, but the real reward will come with the use of the facility. This new facility, occupying 10,500 square feet on the third floor of the cancer center, supports the medical school’s basic science offerings and clinical researchers by enabling them to rapidly translate genome-based laboratory research into clinical applications that will improve patient care.**

The TGRI shares its origins with the cancer center. In the midst of Joan Edwards’ involvement in the planning of the center, Dr. Charles McKown, who was then dean of the medical school and a good friend of Mrs. Edwards, explained to her the concept of translational medicine. She came to the conclusion that building an institute dedicated to translational research within the center would be a critical addition, as it would focus on applying biomedical research directly to patient care. She allocated additional funds, and an extra floor was consequently added to the building plans.

The late U.S. Senator Robert C. Byrd made the completion of the institute possible when he obtained \$3.9 million in federal funds to finish its development. Conversations with Dr. McKown and Dr. Donald Primerano (see page 8) led Senator Byrd to recommend that the institute focus on genomic research. The senator supported their belief that the center’s yield for translational research would be found in genomics, including the goal of identifying the specific genes responsible for various cancers. James J. Schneider, Senior Associate Dean of Finance and Administration for the school of medicine, and Dr. Richard Niles, Professor/Chair of Biochemistry & Microbiology and Senior Associate Dean of Research and Graduate Education, were co-investigators in writing the proposal to obtain the funds Senator Byrd had set aside.

Now in operation, the TGRI’s primary goal is to enable Marshall researchers to conduct a greater number of investigator-initiated clinical trials. Allowing basic scientists to work in close proximity to clinicians will encourage them to collaborate, providing new research ideas and clinical applications.

The institute will also provide a new home for the cancer research conducted by several Biomedical Sciences Graduate Program professors. Researchers who work in the institute were selected based on two factors: their work lends itself to clinical applications

and they have actively funded grants. The professors selected include Dr. Pier Paolo Claudio, Dr. W. Elaine Hardman, and Dr. Niles.

Dr. Claudio is a scientist whose research exemplifies the founding vision of the TGRI. He studies the effects of dietary agents on cancer, with emphasis on growth and metastasis, and uses targeted gene therapy to improve the efficacy of cancer treatment. Dr. Claudio has also recently launched a Phase I clinical trial at the TGRI, seeking to determine the effectiveness of existing chemotherapy treatments for patients with small cell lung cancer.

Dr. Hardman, who is widely recognized for her work studying the effects of omega-3 fatty acids on the development of cancer, also exemplifies the type of researcher the TGRI hopes to foster. She has published research that indicates that, in animal models, a diet high in omega-3 fatty acids can prevent the development or slow the growth of multiple cancer types. To extend this research to humans, Dr. Hardman and medical oncologist Dr. Oscar Ballester (Edwards Comprehensive Cancer Center), conducted a human clinical trial, in which patients with early stage chronic lymphocytic leukemia consumed supplemental omega-3 fatty acids.

Dr. Niles also conducts groundbreaking studies in nutrition and cancer. His research focuses on vitamin C and the fact that different tissues in the body and various tumors show altered ability to take up and use the vitamin as a cofactor for enzymatic reactions. Dr. Niles and Dr. Sarah Miles, a postdoctoral fellow in his laboratory, are involved in a translational project with Dr. Jose Pulido, an ophthalmologist at the Mayo Clinic. This research has led to a provisional patent as a diagnostic test and also the use of a treatment, which allows the patient to, at least temporarily, achieve remission of the disease.

These TGRI researchers will also focus on projects that transcend their primary goal of performing and applying translational genomic research.

# Research Institute

Namely, the TGRI will also house the West Virginia Cancer Genomics Network, which includes two members: Marshall University and the Mary Babb Randolph Cancer Center at West Virginia University. The network has been funded by federal stimulus money, with the goal of developing a database of genomic information that will allow researchers to compare the genes of multiple patients suffering from the same types of cancer. The database could help doctors and researchers predict response to targeted therapies, and identify whether patients at risk of developing

a condition express the same mutations as patients with full-blown cancer. Such patients could be targeted to receive more rapid and aggressive treatment to help prevent the cancer from progressing.

Anyone interested in learning more about the TGRI or in contributing to its operations can contact Dr. Niles directly at [niles@marshall.edu](mailto:niles@marshall.edu). Biomedical Sciences graduate students and medical and postdoctoral students who are interested in working at the institute may submit their résumés to [mubiomed@marshall.edu](mailto:mubiomed@marshall.edu).

*Allowing basic scientists to work in close proximity to clinicians will encourage them to collaborate, giving them all sources for new research ideas and clinical applications.*

## Spotlight on the TGRI researchers

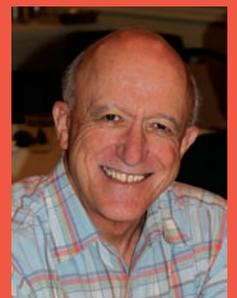


**Dr. Claudio's** studies are bringing about new insights into the mechanisms behind cancer progression. He has invested 20 years in studying the molecular

mechanisms of the transformation of malignant tumors. The result is his development of a new drug delivery system that makes gene therapy safer and more effective by distributing genes directly to diseased tissue via ultrasound.

Phase I of **Dr. Hardman's** human clinical study has yielded promising initial evidence linking omega-3 fatty acids to the halt of cancer progression. She also recently published a study in "Nutrition and Cancer" that showed that, in mice bred to be predisposed to developing breast cancer, including walnuts in their diet lowered their incidence of developing cancer by 50%.

**Dr. Niles'** laboratory studies the mechanism that allows dietary components such as resveratrol (found in red wine), vitamin A, and quercetin (found in apples) to arrest melanoma cell growth and prevent melanocytes from developing into melanoma.



Melanoma is notoriously hard to treat and has a five year survival rate of 2-3%, and Dr. Niles is committed to making discoveries that improve patient prognosis.



Dr. Elaine Hardman, one of the faculty now based at the TGRI.

Aaron Dom holds a young boy in Honduras. Aaron is a graduate of the BMS Medical Sciences program who is now a first year student at Marshall University School of Medicine.

# BMS Medical Sciences Students Serve in Medical Mission to Honduras

by Tamara Trout

In a darkened room in the small town of Coyolito in Valle, Honduras, Dr. Gerald Soltis shines a light into the eyes of an elderly man. The man's grandson, appearing to be no more than five years old, sits apprehensively at his side and holds his hand.

"Can you see the light?" asks Dr. Soltis gently.

As the man speaks in cracked and hushed tones, a translator confirms that the man is unable to see anything, even light. Dr. Soltis discovers during his exam that a failed prior surgery, meant to save the man's eyes after a head injury, robbed him of whatever sight remained. The doctor's only recourse is to refer him to a surgeon in the capital, Tegucigalpa, who can hopefully relieve the pressure that is causing him great pain.

Such moments are frequently experienced on medical brigades. Each year, the Joan C. Edwards School of Medicine sends a team of doctors and students to serve a medically underserved community in Honduras, an impoverished country in Central America. Although a brigade cannot cure all conditions it encounters, such a team can alleviate much suffering and help ensure treatable conditions do not lead to permanent injury or death.

The trip is organized under the umbrella of the Global Medical Brigades, a student-led global health and sustainable development organization that sends more than 3,000 volunteers and medical professionals each year to help organize mobile medical clinics in communities lacking access to basic medical resources.

Most participants of the medical brigade are medical students, but graduate students in the medical sciences program also are encouraged to participate. The program not only furthers students' classroom experience, but also commonly exposes them to relevant, hands-on

experiences in the medical field. The medical school's annual mission trip to Honduras is a prime example. In the past two years, six medical sciences students have chosen to participate.

When students travel to Honduras, they are departing from a country that provides most of its residents with ready access to medical care. A quick search for the term "doctor" in Huntington, W.Va., on Superpages.com, for example, returns about 500 listings. According to the University of California Atlas on Global Inequality, however, the Republic of Honduras provides only a few dozen doctors for a city of comparable size. For some people, this means living more than 20 miles from a doctor—a journey that can take hours due to the mountainous landscape. The cost of such a trip plus medical care and medications is prohibitive, as most families subsist on less than two dollars per day.

Consequently, according to the Global Medical Brigades, the most common causes of death in

Honduras are easily preventable and curable illnesses such as diarrhea, parasitic infections, and even the common cold. Honduras is one of the four poorest countries in the Americas, and the Pan American Health Organization is seeking to fill in the health gaps within the country. Each year, the Marshall medical brigade plays a role in helping to reach for this goal.

In the past two years, the brigades from Marshall have seen more than 2,400 patients and distributed more than \$26,000 worth of medical supplies and medications. During both brigades, Dr. Charles Clements, a Marshall medical school professor, has accompanied the students as the lead physician. Each day of the trip, the members of the brigade set up a triage, pharmacy, dental station, and eye exam room. A typical day on a brigade consists of traveling early in the morning to a distant village, setting up a mobile clinic by 10 a.m., and working tirelessly until the last patient is seen. Many patients walk for hours on foot to be seen in the clinics, having no other access to medical care.

Medical sciences program graduate students, though not yet medical professionals, have been able to serve many critical roles in the brigade. They are able to complete triage questionnaires with patients, take patient vital signs, distribute medications at the pharmacy and explain their proper use, assist the ophthalmologist with eye exams, and serve as translators.

According to Aaron Dom, a 2010 participant, this trip not only provided him valuable medical experience and assisted him in his medical school applications, but also underscored his desire to become a physician.

"It really reinforced why I want to help take care of people," Dom said.

***In the past two years, the brigades from Marshall have treated more than 2,400 patients and distributed more than \$26,000 worth of medical supplies and medications.***



Rotem Elitsur, a former medical sciences student and current medical student, poses with one of her youngest patients.

Another medical sciences student and brigade participant, Amy Young, said the most valuable lesson she learned on the trip was teamwork. Amy's experiences showed her that "in the field of medicine, teamwork is essential. When good teamwork is involved, patient satisfaction and the quality of care that a patient receives is tremendous."

She discovered that every pair of hands available was critical to meeting the needs of the patients who had come seeking care.

In addition to providing medical care, medical sciences students have the opportunity to provide further assistance to the communities they visit. This includes spending time with children in schools and orphanages and participating in public health projects.

Medical health brigades are dramatically improving the health of the people of

Natalie Weaver, an undergraduate student at Marshall, tends to a patient in triage.

Honduras. Students who participate in such a volunteer project display great empathy, and what they experience while on the trip further engages their desire to impact the lives of patients. These students can only become better physicians as a result, and Marshall looks forward to sending many more graduate and medical students in the future.

Members of the local medical community are welcome to contact the medical school regarding participation in or donation to future brigades. Eye doctors and dentists are especially sought after for this trip; if just one more of each joined the next brigade, nearly double the number of patients could be seen. For more information about participating in the brigade in the summer of 2012, contact Jacob Kilgore at [kilgore14@marshall.edu](mailto:kilgore14@marshall.edu).





Donald Primerano, Ph.D.

# Dr. Donald Primerano: The Heart of the Genomics Core Facility

*Next-generation sequencer takes lab to next level*

by Tamara Trout

As Dr. Donald Primerano recalls joining the Marshall University Biomedical Sciences (BMS) Graduate Program, his eyes light up and he says with a smile, “There’s so much good fortune mixed up in it all.”

While Dr. Primerano counts himself fortunate to be teaching and researching at Marshall, his colleagues are thankful for his presence on the faculty. The Biomedical Sciences Graduate Program welcomes the opportunity of this inaugural issue to highlight Dr. Primerano’s accomplishments in establishing the Genomics Core Facility.

This is the story of Dr. Primerano and his service to the program, including the development of the core facility and its most recent acquisition, an Illumina HiSeq1000 Next-Generation Sequencer. The sequencer is a cutting-edge piece of equipment that has great scientific and medical significance, and is a superior achievement for the program.

Dr. Primerano came to Marshall University in 1988 as an Assistant Professor in the Joan C. Edwards School of Medicine. When he arrived, he intended to continue his research on the regulation of spore formation in baker’s yeast. However, Dr. Albert Moat (chair of Microbiology at the time) encouraged him to begin focusing on projects relating to human health, a recommendation that led him to begin collaborating on human genetics projects. His field of expertise has grown to encompass the genetic susceptibility of patients to cardiovascular disease.

In 1990, he established the Genomics Core Facility to provide access to instruments to aid in the analysis of gene expression. The establishment of the facility was made possible by a grant from the National Science Foundation and the West Virginia Experimental Program to Stimulate Competitive Research.

The grant enabled the purchase of several pieces of equipment—two DNA synthesizers, a peptide synthesizer, and a protein sequencer—that were used until 2005. Since that time, the facility has developed a reputation for providing superior service to its research clients.

Dr. Primerano’s next funding breakthrough came in 2000, when he received a grant from the West Virginia IDeA Network of Biomedical Research Excellence program to establish the Microarray Core Facility, a subset of the Genomics Core Facility. Researchers in the Microarray Core Facility conduct gene expression, protein, and chromatin studies. DNA microarray experiments allow a researcher to assess the expression status of all genes in the human genome in a single experiment, markedly accelerating the pace of research. The grant funded the acquisition of critical equipment, including an Agilent microarray scanner, and several real-time thermal cyclers. These machines are still available in the facility. During this period, Jan Sikorski, a BMS graduate student, Dr. Terry Fenger, Dr. Jim Denvir, and Dr. Primerano used these instruments to develop a new method for quantifying damage to DNA.

To further enhance the Genomics Core Facility’s offerings, Dr. Primerano then set his sights on obtaining the next-generation sequencer. The Illumina HiSeq 1000 was acquired in April, and Marshall University is the only university in West Virginia that has one. This machine, funded by the National Institutes of Health, allows scientists to conduct DNA sequencing on many types of biological material including patient tumor samples. In addition, the machine can quantify known mRNA molecules and discover new mRNAs.

This powerful tool holds great benefit to the Marshall research and patient communities alike. The power to sequence a genome quickly—one of the benefits of the next-generation sequencer—can help doctors identify mutations that cause inherited diseases and based on that information tailor medical interventions to their patients’ unique characteristics. For example, a patient with a mutation that leads to a highly aggressive form of cancer could be identified early and receive intensive medical intervention to prevent that cancer from progressing to a more deadly state.

The data obtained using the sequencer will be cataloged and stored in the recently established West Virginia Cancer Genomics

Network, which supports a sophisticated database of patient information. Sequencing, storing, and analyzing the genetic code of patients who have suffered from various conditions will yield information critical to understanding, preventing, and treating cancer in future patients.

The database will provide valuable information about genetic changes in tumors, allow doctors to distinguish between cancers, and help researchers find the precise ways in which pharmaceuticals affect cancer cells.

Dr. Primerano's own research directly impacts the health of patients in our region. He is primarily interested in discovering the ways in which patients' genetics render them susceptible to complex diseases such as obesity, stroke, diabetes, and cardiovascular disease. Also, Dr. Primerano plans to use the next-generation sequencer to identify genetic variants that lead to an inherited lipid disease

called Familial Combined Hyperlipidemia. His interest in these conditions and his expertise have led him to assume the role of director of the Appalachian Cardiovascular Research Network (ACoRN).

Now the head of the Division of Microbiology, Dr. Primerano has lectured in medical microbiology, human genetics, nucleic acids/protein synthesis, and molecular and cell biology. He has served as a professor of distinction and has received multiple awards during his service at Marshall, including Professor of the Year and the Certificate of Teaching Excellence.

The BMS Graduate Program is thankful to Dr. Primerano for his years of service to Marshall University and for considerably growing its research infrastructure. For more information about the Genomics Core Facility, please visit [http://bms.marshall.edu/core\\_facilities](http://bms.marshall.edu/core_facilities).

***The next-generation sequencer can sequence genomes quickly, which can help doctors to identify mutations that cause inherited diseases, and tailor medical interpretations to their patients' unique characteristics.***



# SPOTLIGHT ON THE NEXT-GENERATION SEQUENCER

## HIGHLIGHTS:

- Maximum output: 300GB
- Maximum reads: 750 million total, 94 million per lane
- Maximum paired-end reads: 1.5 billion, 188 million per lane
- Required input: 100 ng
- Read length: 2x150 bp
- Percentage of bases > QD 30: >85% (2x50 bp); >80% (2x100bp)

## WHAT DOES THIS MEAN TO THE LAY PERSON?

- The Illumina HiSeq 1000 allows individual labs to process more DNA samples at once and to study genomes that are larger and more complex at a lower cost. It also offers the ability to upgrade, should future sequencing needs of the lab increase.
- The next-generation sequencer can examine an entire genome and identify all of the mRNAs expressed in a cell line and query specific mRNAs.
- At its maximum capacity, the sequencer can generate 10GB data in a 10-day period. Since the human genome consists of 3 billion bases, theoretically, 33 genomes could be analyzed at once in 10 days. However, scientific testing always requires taking potential error into account. To ensure the accuracy of results, testing usually includes using only one person's genome and testing it 30 to 40 times simultaneously.

## TO PUT THE SCALE OF GENOME PROCESSING INTO PERSPECTIVE:

- One person's genome consists of 20-25,000 genes that encode for proteins, in addition to DNA that does not code for proteins.
- The genome contains about 3 billion base pairs, the equivalent of enough information to fill 200 volumes of books the size of Manhattan city phone books (about 1,000 pages in length each).
- Sequencing an entire human genome the first time cost many millions of dollars and took nearly 13 years. With instruments such as this, whole genome sequencing now costs around \$10,000 to \$20,000 and is completed in a matter of days.
- Scientists like Dr. Primerano seek to make the cost of sequencing a patient's genome \$1,000 or less, making whole genome sequencing possible for everyone who needs it.

This past year has marked the beginning of a transition period for the Biomedical Sciences (BMS) Graduate Program.

The “baby-boomer” generation is approaching retirement, and the program is starting to see this transition in its faculty. Dr. Vern Reichenbecher and Dr. Mike Moore retired at the end of this past academic year. While the program will lose the expertise and

experience of these faculty members, this presents the opportunity for younger faculty to move into leadership roles.

The second major transition was the new requirement for faculty to assume

responsibility for 50 percent of the graduate assistantship stipend of Ph.D. students beginning their third year. As a result of this policy, which was implemented July 1, the number of predoctoral fellowship grant applications obtained this current academic year has increased by a little more than two-fold over last year. A number of these applications have already been funded. This outcome benefits not only the BMS program, but also its students, who can now list this honor on their CVs.

The BMS program has made significant improvements over the past five years in the number, quality, and accomplishments of its graduate students, as well as the teaching and research accomplishments of its faculty. The challenge for the next several years is to maintain and enhance these improvements.



Dr. Mike Moore

# faculty update

**Dr. Ernest M. “Ernie” Walker, Jr.**, passed away in June 2010. Dr. Walker joined the faculty at Marshall University in 1992 from the University of Arkansas for Medical Sciences, continuing a career devoted to academic medicine.

His field of specialty was heavy metal toxicity and iron overload research, and he taught as a Professor of Pathology, with five years of service as the Department Chair.



**Dr. Todd L. Green** completed his first year as Biomedical Sciences Director of Graduate Studies. He is also the advisor to the first-year medical sciences students.

**Dr. Wei-ping Zeng** joined Marshall from the University of Rochester last fall.

Dr. Zeng researches within the Infectious and Immunological Diseases research cluster. His area of expertise is cellular immunology and the involvement of the immune system in chronic diseases.

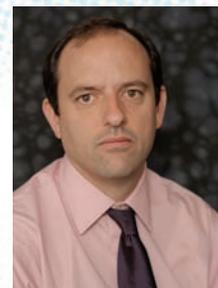


**Dr. Maria Serrat** is new to the Department of Anatomy and Pathology, joining Marshall from Cornell University. She researches the effects of temperature and exercise on bone physiology and serves within both the Neuroscience and Developmental Biology, and Toxicology and Environmental Health Sciences clusters.



**Dr. James “Jim” Denvir** joined Marshall’s Biomedical Sciences faculty from West Virginia University in the

summer of 2011 as the Bioinformatics and Statistical Analyst. Dr. Denvir will conduct some research, but will apply most of his expertise to the Genomics Core Facility and teaching the Biostatistics class, which is designed



specifically for Biomedical Sciences research students.

**Dr. Emine Koc** joined the Department of Biochemistry and Microbiology from The Pennsylvania State University in summer 2011. Her research will be within two BMS clusters: Cancer Biology and Cardiovascular Disease, Obesity and Diabetes.



[www.bms.marshall.edu](http://www.bms.marshall.edu)

# Summer Research Internship for Minority Students

The BMS Graduate Program has a commitment to diversify its student body and is pleased to announce the Summer Research Internship for Minority Students (SRIMS). It is hoped this program will not only help establish a pipeline of minority students entering health-related research fields, but also enrich our current biomedical sciences research offerings through an added diversity of ideas, perspectives, and cultures.

SRIMS is a nine-week internship that gives underrepresented minorities the opportunity to conduct graduate-level biomedical research. Participants receive formal research training while expanding their learning experience through workshops, seminars, and mentoring. Each participant receives travel assistance, free room and board, and a \$3,000 stipend. During the last week of the program, all students present their research at the West Virginia Summer Research Symposium.

This summer was the program's third year, and participants came from New Hudson, Michigan; Charles Town, West Virginia; Carbondale, Illinois; and Ravenna, Ohio. For more information, visit <http://bms.marshall.edu/srims> or send inquiries to [srims@marshall.edu](mailto:srims@marshall.edu).



Amber Mills,  
2011 SRIMS participant

*SRIMS is a nine-week internship that gives underrepresented minorities the opportunity to conduct graduate-level biomedical research.*

## Grant Funding for the 2010 - 2011 Academic Year

### Admissions Report

The number of applications to the BMS M.S., Medical Sciences, program doubled between 2007-08 and 2009-10. The acceptance of the medical sciences students into allopathic or osteopathic medical schools remains between 71 and 90 percent, depending on the class year.

Although approximately the same number of students applied to the Ph.D. program as compared to the previous year, the applications were impressive, and all five of the admission committee's top choices accepted offers of admission and matriculated in the fall of 2009.

**NUMBER OF COMPETITIVE GRANT APPLICATIONS | 35**

**AMOUNT OF FUNDS REQUESTED | \$25,830,024**

**NUMBER OF COMPETITIVE GRANTS FUNDED | 24**

**AMOUNT OF FUNDING | \$1,575,841**

**The total amount of funding for AY 2010-11 (competitive + non-competitive) = \$9,969,077.**

A major success this past academic year was our partnering with the University of Kentucky for its Clinical and Translational Sciences Award (CTSA) application. The submission received an excellent score and the NIH announced that it would be funded in June 2011. The timing ties in nicely with the imminent occupancy of the Charles H. McKown, Jr., MD Translational Genomic Research Institute located in the top floor of the Edwards Cancer Center. This partnership will allow our faculty to compete for pilot grant funding available through the CTSA and for training opportunities in clinical and translational research.

Recognizing that science today is increasingly crossing traditional departmental boundaries, Marshall University's Biomedical Sciences (BMS) Graduate Program takes an interdisciplinary approach and organizes its faculty into the following research groups, also referred to as "research clusters." Toxicology and Environmental Health Sciences; Neuroscience and Developmental Biology; Infectious and Immunological Diseases; Cardiovascular Disease, Obesity and Diabetes; and Cancer Biology.

The research clusters were organized according to the key areas of faculty research expertise and are available to students pursuing the M.S. or Ph.D. degree.



Monica Valentovic, Ph.D.

**Toxicology and Environmental Health Sciences** has eight faculty members, six graduate students, and a number of medical students and undergraduates. Of recent note was Dr. Piyali Dasgupta's invitation to speak at a Nicotine Replacement

Therapy Meeting, organized by the Food and Drug Administration. She was also honored with the Marshall University John and Frances Rucker Graduate Advisory Award for 2011. Additionally, Mike Brown, a Ph.D. candidate in Dr. Monica Valentovic's lab, won the BMS Award for Best Overall Performance, which funded his recent trip to present at the Lipid Biology and Lipotoxicity Symposium in Kerry, Ireland.



Simon Collier, Ph.D.

**Neuroscience and Developmental Biology** has seven primary and nine secondary faculty members, three Ph.D. students, three BMS Master's research students, nine Biological Sciences Master's students, and several undergraduate students. This year, faculty had two book chapters, two review papers and seven primary peer-reviewed articles published. Two new extramural grants were awarded, added to five already ongoing NIH-, NASA-, and NSF-funded grants. Dr. Sasha Zill gave seminars at Case Western Reserve University and in Bielefeld and Cologne Germany. Additionally, Dr. Maria Serrat was selected as a participant in the United States Bone and Joint Decade Young Investigator Initiative.

Molecular Mechanisms of Pathogenesis changed its name in 2011 to **Infectious and Immunological Diseases** to better reflect the research activities of its members.

The cluster currently includes five faculty members and two Ph.D. students, who collectively held nine funded grants and released seven peer-reviewed publications. Melinda "Mindy" Varney, a Ph.D. candidate in Dr. Vincent Sollar's lab who recently earned her Ph.D., was the first-place winner for the statewide graduate student research competition at the 2010 STaR Symposium.

**Cardiovascular Disease, Obesity and Diabetes Research Cluster (CODRC)**

has 14 faculty members, four Ph.D. students, one M.S. student, two postdoctoral fellows, three clinical fellows, and a number of undergraduate and medical students. CODRC faculty and their students



Nalini Santanam, Ph.D.

gave 31 poster and oral presentations at a variety of scientific meetings this year, and the faculty holds 12 extramurally funded grants. Of additional note, Dr. Nalini Santanam was invited to present her research in the area of endometriosis at several special seminar presentations, to speak at an international conference on free radicals, and to speak about obesity at the Appalachian Health Summit.

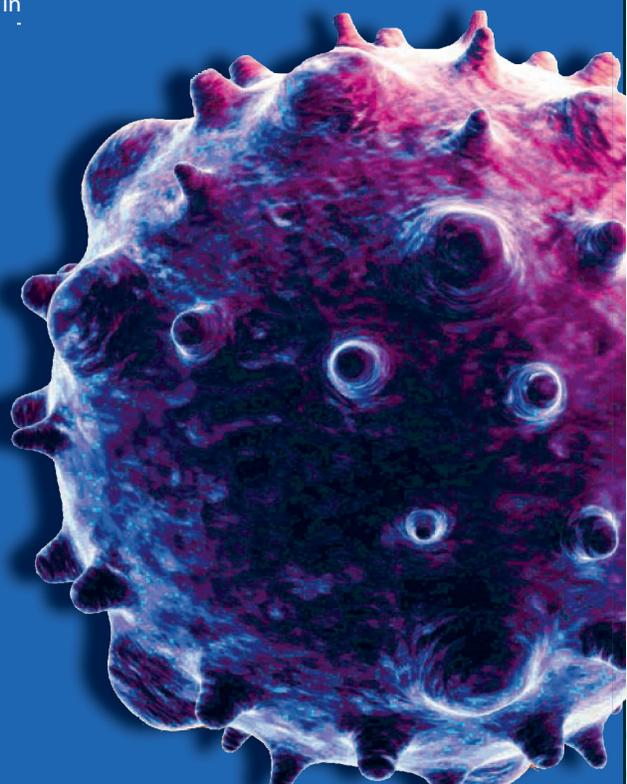
**The Cancer Biology Research Cluster**

includes three postdoctoral fellows and nine faculty members who mentored 13 Ph.D. students, four of whom received their degrees this past year. Also, faculty mentored 10 M.S. research, 10 undergraduate, and three medical



Beverly Delidow, Ph.D.

students. Faculty members authored 27 papers and three book chapters and presented at 10 meetings. One West Virginia State (pilot) grant, one foundation grant, and nine federal grants were awarded to cluster faculty. Of particular note is the research of Dr. W. Elaine Hardman and Dr. Philippe Georgel on omega-3 fatty acids, epigenetics, and breast cancer, funded by the Department of Defense. Their work was recently presented at the "Era of Hope" meeting in Orlando and was selected for special press coverage. To learn more about Cancer Biology faculty and their research, read the article "New Translational Genomic Research Institute Opens its Doors."



# Ph.D. Alumni

## RECENT GRADUATES



**Sandeep Joshi, Ph.D.** – Dr. Joshi earned his Ph.D. in May 2010 under the mentorship of Dr. Richard M. Niles. He is working as a Postdoctoral Fellow in the Dermatology Branch, National Cancer Institute, National Institutes of

Health in Bethesda, Maryland. His research area is pigment cell biology and melanoma.



**Melinda Varney, Ph.D.** – Dr. Varney earned her Ph.D. in December 2010 under the mentorship of Dr. Vincent E. Sollars. She is working in the Division of Experimental Hematology and Cancer Biology at

Cincinnati Children's Hospital Medical Center in Cincinnati, Ohio. Her research focuses on modifiers of TRAF6 and their contributions to Myelodysplastic Syndromes (MDS).



**Lauren Richards-Waugh, Ph.D.** – Dr. Richards-Waugh earned her Ph.D. in May 2010 under the mentorship of Dr. Gary O. Rankin. She is working as Forensic Toxicologist at The West Virginia Office of the Chief Medical Examiner

in Charleston, and lectures for the Drug Enforcement Administration in their Pharmaceutical Overdose Death Investigation seminar series.

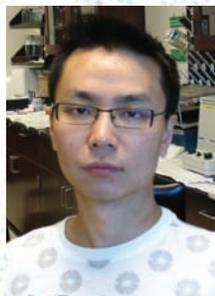
**Jasjeet Bhullar, Ph.D.** – Dr. Bhullar earned her Ph.D. in May 2011 under the mentorship of Dr. Vincent E. Sollars. She is caring for her new son and living in Bethesda, Maryland.



**Yue Huang, Ph.D.** – Dr. Huang earned his Ph.D. in May 2011 under the mentorship of Dr. Guo-Zhang Zhu. He is working as Postdoctoral Fellow in the Department of Oncological Sciences at Mount Sinai School of Medicine in New York, New York. His

research project is to study epigenetic regulation in hematopoietic stem cells and leukemia.

**Jennifer Napper, Ph.D.** – Dr. Napper earned her Ph.D. in August 2010 under the mentorship of Dr. Vincent E. Sollars. She is working as Biology Instructor at Ashland Community and Technical College, and teaches Anatomy and Physiology in Ashland, Kentucky.



## Other Employers of our Alumni

Applied Biosystems

East Ohio Regional Hospital

Federal Bureau of Investigation

Kent University

L'Oréal

Long Island Jewish Medical Center

Morehead State University

Progenis Technologies, LLC

Rite Aid Pharmacy

Syntonix Pharmaceuticals, a subsidiary of Biogen Idec

University of Alabama at Birmingham

University of Charleston School of Pharmacy

University of Hawaii at Manoa

University of Kentucky Graduate Center for Toxicology

University of North Carolina at Wilmington

University of Virginia

Wheeling Jesuit University

Wil Research Laboratories

Zymed Laboratories

*"They care about their students, and this really comes across. The individual attention to students is extraordinary and much different than what you would find in other programs. I think this sets up BMS graduates well for success."*

*— George Kamphaus, Ph.D., Senior Scientist for Syntonix Pharmaceuticals and an alumnus of the BMS, Ph.D. program*

# FINANCIAL SUPPORT

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.

Contributions of any amount are both helpful and appreciated!

**To contribute to the BMS Graduate Program Fund or the SRIMS Program Fund, visit: <http://www.marshall.edu/foundation/givenow.php> or complete and submit the form below.**

**YES! I will support the Marshall University BMS Graduate Program.**

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Huntington, West Virginia 25705

**You can also make contributions at: <http://www.marshall.edu/foundation/givenow.php>.**

Thank You!

**Q: What is the purpose of the Biomedical Sciences (BMS) graduate education fund?**

A: To award competitive scholarships to BMS Ph.D. students and fund travel to regional and national biomedical meetings where students can present their research.

**Q: What is the purpose of the SRIMS program fund?**

A: To enrich the students' research and overall internship experiences.

**Q: What degree programs are currently offered by the Biomedical Sciences (BMS) Graduate Program?**

A: There are currently three degree programs: the Ph.D. in Biomedical Sciences, the Master of Science in Biomedical Sciences (research-based, thesis requirement), and the Master of Science in Biomedical Sciences with an area of emphasis in medical sciences (non-research, no thesis requirement). The medical sciences program is geared toward students who intend to apply to medical school or pursue a career in health professions such as the allied health sciences, or in non-research positions.

**Q: What areas of emphasis are available in the BMS Ph.D. and M.S. (thesis) programs?**

A: There are five (5) research clusters: Cancer Biology; Cardiovascular Disease, Obesity and Diabetes; Infectious and Immunological Diseases; Neuroscience and Developmental Biology; and Toxicology and Environmental Health Sciences.

**Q: What is the enrollment size of the Ph.D. program?**

A: The current total enrollment is approximately 30, but enrollment depends on the funding available and the number of students graduating in a particular year. Please contact the Graduate Recruitment and Communication Coordinator Diana Maue (maue1@marshall.edu) for more information about admissions.

**Q: How are Ph.D. students funded?**

A: Ph.D. students are funded by the BMS program for their first two years. Beginning the third year, the program provides 50 percent of the funding and students work with their advisors and granting agencies to fund the other half of the stipend.

**Q: What is the current stipend for a Ph.D. student? Are any other benefits provided?**

A: The current stipend for a Ph.D. student is \$23,000/year in addition to tuition remission. Students have access to Marshall University's Student Health Service, which provides healthcare services to students in the case of acute illness, including diagnosis, laboratory and radiographic procedures.

**Q: Are graduate assistantships available to research master's students?**

A: The BMS Program does not provide graduate assistantships for its Master's students.

**Q: What is the enrollment size of the medical sciences area of emphasis program?**

A: The program is limited to about 15 students who enter each fall. The class can fill up quickly, so get your application in early!

**Q: How do students pursuing a research master's degree or Ph.D. choose their lab?**

A: During the first year of the M.S. (thesis) and Ph.D. programs, students are required to complete rotations through a minimum of three different laboratories. Each rotation consists of about 40 hours. Students should select a laboratory and form an advisory committee no later than the end of the first year of graduate education.



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