

A Look Inside:

- **Winthrop INBRE Students Accepted to Top Programs**
- **South Carolina State Sets Up Modern Manufacturing Lab**

MUSC Scientist Receives CAREER Award from NSF

Dr. Mirko Hennig, an Assistant Professor of Biochemistry and Molecular Biology at the Medical University of South Carolina, has recently received an EPSCoR co-funded \$400,000 NSF CAREER Award entitled “Structural Requirements for miRNA Processing and Export.” The objective of Dr. Hennig’s project will be to understand the principles of miRNA processing at the molecular

level. Knowledge of the structure of miRNAs is central to understanding gene regulation. While performing the research necessary for such a project, Dr. Hennig has made it a priority to focus on the broader impacts of his project by interfacing structural biology, biochemistry, and genetics to provide collaborative opportunities to undergraduate and graduate students, as well as postdoctoral fellows. Outreach will involve students at predominately undergraduate institutions through the continuation of a nuclear magnetic resonance (NMR) summer camp.

The first NMR summer camp was held in May 2008 and partially supported by SC EPSCoR/IDeA. The camp gave NMR research experience to 20 students and faculty from Allen University, Benedict College, Claflin University, Charleston Southern University, Newberry College, Winthrop University, and Wofford College. The summer camp included lectures, hands-on use of an NMR spectrometer and workshop time devoted to analysis of a structurally complex compound to demonstrate the process of NMR-based structure elucidation. The attendees reported gaining valuable insight into NMR techniques and important knowledge that will help them with research projects at their home institution. Through the summer camp and the establishment of a NMR-based Structural and Functional Biology training program, Dr. Hennig will give students exposure to important NMR-based research occurring at the MUSC Center for Structural Biology.



Dr. Mirko Hennig (right) with a student during one of the NMR summer camp assignment sessions. (Image Courtesy: Dr. Mirko Hennig)

Researchers Create Transatlantic Network to Model Heart Defects

Drs. Tain-Yen Hsia and Richard Figliola are teaming with researchers across two continents to create a “Transatlantic Network of Excellence in Multi-Scale Modeling” to study heart defects in children. Children born with only a single heart ventricle begin life with a barrage of surgeries to correct the problem. The modern method to treat this defect includes a three-stage operative strategy, with multiple operations required at each stage. The corrective process depends on several factors, including the heart’s development as the child grows, making it difficult for doctors to monitor progress and predict the next stage of treatment.

Drs. Hsia and Figliola were awarded a Competitive Centers Development/Major Research Initiatives grant from SC EPSCoR/IDeA to initiate collaborations around the world. Since then, Dr. Hsia and his team of researchers from the United Kingdom, Italy, France, and the United States have been awarded a \$6 million award from the Leducq Foundation. Through collaboration, the team will develop “an integrated software algorithm of multi-scale models of each of the three surgical stages of single ventricle physiology.” By creating this model, the researchers will be able to create a patient-specific model of a single-ventricle heart resulting in better treatment of the defect and better results from accurately-timed operations.

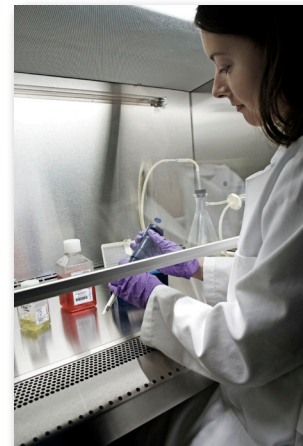
Dr. Hsia is a congenital heart surgeon and bioengineer. He holds appointments as an Assistant Professor at the Medical University of South Carolina and Clemson University in the Departments of Surgery and Mechanical Engineering, respectively. Dr. Figliola is a Professor of Mechanical Engineering and Bioengineering at Clemson University and an authority on fluid mechanical measurements and control devices. Under separate funding from the National Institutes of Health, Drs. Hsia and Figliola have collaborated for the past two years on the development and testing of a novel valve design specifically for congenital heart disease.

Winthrop INBRE Graduates Accepted to Top Research Programs

Written by Cassandra Faye, Winthrop University Graduate, 2009 • Images by Justin Rose, Winthrop University

Eight Winthrop chemistry and biology seniors have accepted admission offers from top PhD programs, including Harvard, Duke and Notre Dame. Though their diverse extracurricular activities range from golf to writing, all students owe their graduate school admissions' success to the NIH INBRE grant.

As a freshman, Bethany Bush, biology and chemistry double-major, secured a place in the biochemical lab of INBRE target faculty Dr. Takita Sumter. Bush spent two years immersed in NIH INBRE research, in love with molecular exploration. "Research provided another means of creative expression," she said. "I wanted to know why and how things worked." Last summer, Bush accepted a position at Harvard University as a summer research student. At Harvard, Bush studied autophagy and its implications for cancer and Alzheimer's disease. After returning to Winthrop to complete her final year, she began applying to PhD programs, interested specifically in cancer research. Bush considered graduate programs at Yale, Duke, the University of Virginia, Vanderbilt and Purdue, but eventually chose Harvard's PhD program in biomedical science because of her interest in chemical biology. Bush said she wants to continue conducting research, an interest sparked by the Winthrop NIH INBRE program. "A lot of people are surprised and impressed with the type of research at Winthrop," Bush said. "When I present at conferences, people think I'm a grad student." In the undergraduate research poster competition held at the 2009 American Society of Biochemistry and Molecular Biology meeting in New Orleans, Bethany's research poster was the winner in the cell signaling category. Ms. Bush said that her NIH INBRE research gave her ample presentation experience and an edge when applying to graduate school, noting that top universities look for independent laboratory research experience in their applicants.



Bethany Bush works with human colon cancer cell line HT29 APC designed for Zn-induced removal of APC-min mutations involved in 80% of colon cancers.

Christopher Bennett, senior biology major, also thinks his NIH INBRE research geared him towards graduate school. In his freshman year, Bennett joined the lab of Dr. Dwight Dimaculangan and thus began biomedical cardiac cell research that he has continued throughout his four years at Winthrop. In fact, Bennett will attend Duke in the fall and continue cardiovascular research in its PhD program in cell and molecular biology. Bennett, who hopes to be a lifelong researcher and teacher, said his NIH INBRE experience solidified his initial desire to conduct biological research.

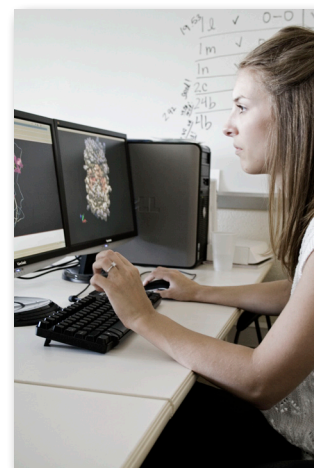
Winthrop alumna Jenny Johnson, also of Dr. Dimaculangan's lab, focused on cardiac cell responses to injury while at Winthrop. In fact, it was because of her NIH INBRE work that Johnson chose to continue biological sciences graduate studies. "Prior to my lab experience, I was interested in a career that spent limited, if any, time in a lab," she said. "Being surrounded by research and throwing myself into the experience made me realize that the lab is where I am supposed to be."



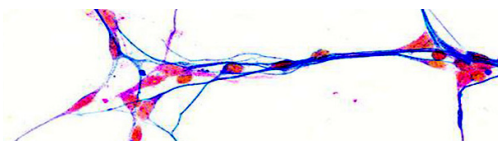
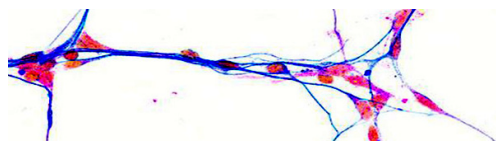
Cassie Rodenberg aligns Ar/Kr laser for amyloid- β single-molecule spectroscopy experiment funded by INBRE.

While some students worked with the heart, others found love in the lab. Erin White and Matt Wilson, senior chemistry majors, met their freshman year on Winthrop's golf team and will be married this June before starting their PhDs in organic chemistry at Notre Dame. The two began NIH INBRE research last year with INBRE target faculty mentor Dr. Christian Grattan in medicinal chemistry, something that they feel is crucial to their future goals. "Research is essential for graduate schools," Wilson said.

In actuality, research experience is vital for more than science students, says Cassie Rodenberg, senior science communication major. Under NIH INBRE, in target faculty Robin Lammi's lab, Rodenberg conducted single molecule spectroscopy research on the amyloid- β peptide, which rooted her love for science and inspired her passion for writing about it. "Seeing the actual mechanism of science made me realize its fundamental place in society and the importance of relaying accurate scientific information," she said. "Without NIH INBRE research, I wouldn't see science as I do today – the essence of all of us." This fall, Rodenberg begins New York University's graduate Science, Health and



Erin White uses molecular docking software to examine candidate sphingosine kinase 1 inhibitor structures on INBRE-funded 16-CPU Linux cluster.



Sarah Spell loads SPE water extract samples onto HPLC triple quadrupole mass spectrometer for trace MRM analysis.

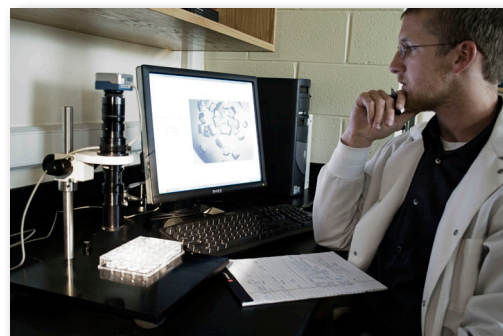
Winthrop Students (continued)

Environmental Reporting Program, one of the oldest and most prestigious science journalism training programs in the country.

Though at first hesitant to begin research, Sarah Spell, senior chemistry major, now endorses it. "I would recommend research for everybody," Spell said. "You learn how to think." Under the NIH INBRE grant, Spell conducted research in analytical chemistry with chemistry mentors Drs. Pat Owens and Cliff Calloway. Spell worked to develop methodology to detect low levels of pharmaceuticals in surface waters. Spell said that her experience at Winthrop has uniquely prepared her for a PhD program in chemistry at Virginia Commonwealth University. "At a lot of other schools, you don't get to do [research]," she said.

Brad Angel, senior chemistry major, has done his fair share of science research - first in organic chemistry, followed by a more recent interest in biochemistry. Last summer, Angel conducted NIH INBRE research with James Hanna.

Angel's focus spanned from crystallography to isolating and purifying enzymes, readying a new curriculum for biochemistry courses. In the end, Angel turned down offers from Johns Hopkins University, Dartmouth College, and the University of California at San Diego in favor of the biochemistry PhD program at Notre Dame.



Brad Angel examines cloned protein crystals formed under various screening conditions from purified protein solutions collected in Winthrop's new INBRE-match funded cold room.

South Carolina State University Establishes Rapid Prototyping Lab

South Carolina State University has established a Laboratory for Modern Manufacturing to instruct students on computer-aided design and rapid prototyping. SC State has purchased this rapid prototyping equipment from 3D Systems Inc., a leading company in rapid prototyping located in Rock Hill, SC. The major part of this laboratory has been installed and trained faculty are currently utilizing the equipment. A second, smaller machine is scheduled to be delivered in July. This laboratory was established with supplemental funds from the 2004 NSF Research Infrastructure Improvement award (EPS-0447660).

The creation of this laboratory will augment undergraduate courses and enhance training and skills, thus allowing graduates to compete successfully for high-paid, high-tech jobs in a growing field. One of the university's goals is to have every student taking a computer-aided design class to have use of the machines to fabricate a prototype, adding an important hands-on aspect to the existing curriculum. Regarding the impact on the students, Dr. Kenneth Lewis, Dean of the College of Science, Mathematics and Engineering Technology, states, "The machines will better prepare all our Engineering/Technology majors because they introduce modern manufacturing techniques. Gone are the days when first prototypes are made from steel with lathes, milling machines, and drill presses. With this knowledge, SC State engineering students will enter the workforce ready to contribute more quickly." Furthermore, a diverse, well-trained workforce will allow South Carolina to attract emerging biofabrication companies and help to transform the state by creating a biofabrication industry cluster.

Congratulations

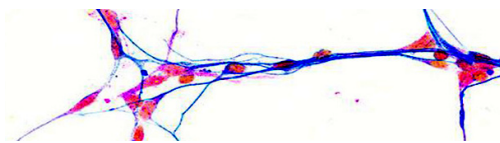
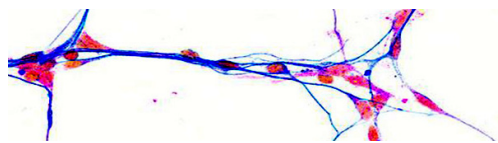
The South Carolina EPSCoR/IDeA Office would like to express congratulations to the following faculty members:

Martine LaBerge (Clemson University) – Dr. LaBerge has recently been awarded the 2009 Governor's Award for Scientific Awareness. The Governor's Award was established to honor individuals for contributions to science and promote wider awareness of the quality and extent of scientific activities around the state. Dr. LaBerge is a Professor and Chair of Bioengineering. She serves as a Co-PI for the SC INBRE program (P20 RR-016461) at Clemson.

Robin Lammi (Winthrop University) – Dr. Lammi has recently been awarded an EPSCoR co-funded, \$251,274 NSF Research in Undergraduate Institutions (RUI) grant entitled "Probing Early Events in Amyloid- β Association by Single-Pair Forster Resonance Energy Transfer." The RUI will provide materials, summer and academic year student stipends and funds for conference presentations over the next three years. Dr. Lammi is an Associate Professor of Chemistry and a designated target faculty in Winthrop University's SC INBRE program (P20 RR-016461).

Do you have significant research achievements and opportunities? Send ideas to be considered for use in upcoming newsletters to the editor at lee.snelgrove@scra.org.

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Congratulations (continued)

Jeff Petty (Furman University) – Dr. Petty was recently awarded a \$204,713 grant from the NSF for a project entitled “DNA Directed Synthesis of Fluorescent Silver Clusters.” This project is a collaboration with Dr. Rob Dickson at the Georgia Institute of Technology and will provide research opportunities for undergraduates and training for a postdoctoral fellow. Dr. Petty is a Professor of Chemistry and a designated target faculty in Furman University’s SC INBRE program (P20 RR-106461).

Dennis Smith (Clemson University) – Dr. Smith has recently been awarded the American Chemical Society 2008 Charles H. Stone award and the 2009 Governor’s Award for Excellence in Scientific Research. The Charles H. Stone award is given to the most outstanding chemist in the Southeast for contributions to the field through research, education, and public outreach. The Governor’s Award for Excellence in Scientific Research was established to honor individuals for contributions to science and promote the quality of scientific activity in South Carolina. Dr. Smith is a Professor of Chemistry and was hired as part of the 1997 NSF EPSCoR Cooperative Agreement (EPS-9630167). He is also the PI on a recent DOE EPSCoR Partnership award.

Takita Sumter (Winthrop University) – Dr. Sumter received a \$235,200 NIH Academic Research Enhancement Award (AREA) for her research project entitled “Structure Function Studies of the HMGA1 Functional Domains Involved in Malignant Transformation.” This is the first NIH AREA grant ever awarded to a Winthrop faculty member. Dr. Sumter is an Associate Professor of Chemistry and a designated target faculty in Winthrop University’s SC INBRE program (P20 RR-016461).

2009 Southeast IDeA Regional Meeting

South Carolina will be hosting the 2009 Southeast IDeA Regional Meeting in Charleston, South Carolina. Faculty and students from all INBREs and COBREs from across the Southeast will be in attendance. The meeting will offer scientific sessions in many biomedical disciplines, as well as updates from NCRR program officers. It will be held **November 10-11, 2009** at the **Francis Marion Hotel, Charleston, SC**. An agenda, registration, and updates will be posted to the web as they come available. For more information, check <http://www.scepscoridaea.org/SoutheastIDeAMeeting>.