

Furman Students Write Novel E-Textbook

By Dr. Brian Goess, Assistant Professor of Chemistry, Furman University

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As part of a campus-wide academic calendar and curriculum revision, I took part in redesigning the chemistry department's introductory organic chemistry sequence. The traditional model, used at virtually every U.S. college and university, presents the canonical material over a two-course sequence. In contrast, the Furman chemistry department now offers a two-course sequence where the first course is an accelerated offering of the canonical material and the second course focuses on bio-organic chemistry. As greater than 75% of Furman's students in organic chemistry plan a career in the health professions, the enhanced biological emphasis in the new course sequence will give students a more relevant organic chemistry experience.

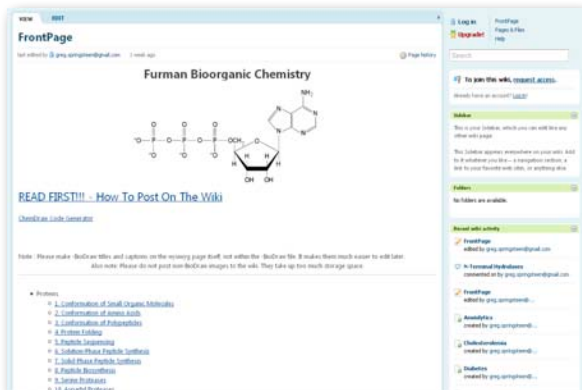


(Still from video: Innovision Awards)

The major challenge facing such an approach is the lack of an appropriate textbook for the bioorganic chemistry course, which testifies to the originality of the course content. I, along with Dr. Greg Springsteen, have used an approach to the construction of this course text that borrows from the successes of wikimedia as exemplified by Wikipedia. In short, students are given the tools necessary to create, referee, and modify a course wiki, thus allowing students themselves to create the "text" for the course based on the content

provided in lectures, literature readings, and a thorough problem set solution guide. Subsequent students in the course now use, augment and edit existing content. In this manner, each subsequent class has the responsibility of improving the online text, with the desired outcome being the most student-friendly text possible, since it will be created entirely by successive generations of students. Though wikimedia has been used successfully for many years in academic settings, to the best of my knowledge the use of wikimedia in the creation of a course text for an original course is unprecedented.

This concept was beta tested in the Fall 2007 sections of organic chemistry, a course which uses an established text as a guide. Students were able to create, edit, and use content of their own creation on the wiki site, and end-of-term surveys indicated that many students enjoyed learning this new technology and found the information content helpful.



Screen-shot of the wiki's entrance page.

The student-created bio-organic wiki text began with the first group of students to take the course in the Fall of 2008. The results were spectacular. Based on these results and the innovative approach used to generate them, Furman entered the project into the SC Innovision Awards competition, and it was awarded first place in the Technology in Education division.

Given the evolving nature of wikimedia, this project is a long-term commitment that will benefit from the contributions of thousands of students. A more immediate goal is the communication of project outcomes to colleagues at other institutions. This platform can be widely applied across any discipline, especially since an appealing feature of this project is that its final outcome, the wiki itself, can be accessed free of charge by anyone with Internet access and costs nothing to develop. Communication of the process through which such a project can be emulated on other campuses will take place on many levels. This strategy will be presented at the Lilly Conference on College and University Teaching in Greensboro, NC. A report on the progress of this project will also be presented at an upcoming national meeting of the American Chemical Society (held twice yearly), which will provide a national stage for dissemination of the results of Furman's bio-organic wiki textbook project.



(Still from video: Innovision Awards)

A video about the Furman Chemistry Department's award can be found at <http://www.innovisionawards.org/winners.php?year=2008>.

MUSC Spin-off Improves Wound Healing

When the body begins to heal wounds, inflammation, proliferation, tissue formation and scar production occurs. In some individuals, scar tissue can be harmful, beyond just the negative cosmetic outcome, reducing functionality of that part of the body. FirstString Research, Inc., an MUSC spin-off, has developed a novel therapeutic gel that improves wound healing and reduces scarring.



Drs. Gautam Ghatnekar and Robert Gourdie, co-founders of FirstString, have developed a novel peptide, that when applied directly to deep wounds, will increase the regeneration of normal, functional skin tissue. “This technology represents a paradigm shift from healing by scarring to healing by regeneration” said Dr. Ghatnekar, FirstString’s President and CEO. The design of the peptide gel is unique because it is engineered to modulate communication between cells. By improving communication, the body’s ability to produce healthy, functional cells increases. The topical gel formulation, currently in clinical development, is easy to use and can be applied directly to the wound site by the patients themselves.

So far, in laboratory tests, the peptide has proven extremely effective. Following regulatory approval in Switzerland, the company has begun human clinical trials to successfully establish that the peptide will be safe and effective for wound healing in humans. Four different doses will be administered to participants in the clinical trials and the wounds will be monitored periodically to determine the gel’s ability to reduce scarring and improve healing. By performing such clinical trials, the company will move closer to FDA approval and eventually market distribution of the product.

FirstString has been the recipient of multiple SC EPSCoR/IDeA Phase-0 awards which have contributed to the success of a Phase I STTR award and the competitiveness of a pending Phase II STTR from the National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS/NIH). A major aspect of the Phase II STTR project will be the development of a safe, efficacious and mechanistically predictable approach to scar reduction following skin wounding in humans. The company has also utilized the Phase-0 program to be competitive for a Phase I SBIR from the National Institutes of Neurological Disorders and Stroke (NINDS/NIH) to explore the possibility of using the peptide for the healing of spinal cord injuries by protecting the neurons and axons, and reducing scar tissue on the spinal cord. Additionally, FirstString is collaborating with MUSC on a National Institute of Diabetic Digestive Kidney Diseases (NIDDK/NIH) grant to study the peptide in treating diabetic wounds. The Office of Naval Research has also expressed interest in FirstString’s technology, which may be used to develop projects that will look at how the peptides could be used to treat injured soldiers on the battlefield.

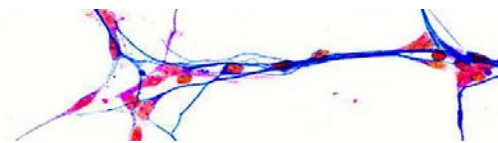
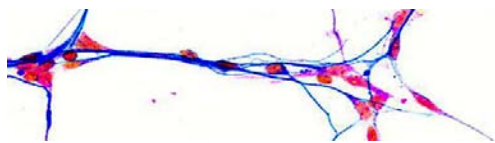
Congratulations

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

Apparao Rao (Clemson University) – Dr. Rao was recently named a Fellow of the American Physical Society. Fellows are elected by their peers for outstanding contributions to physics. Dr. Rao was recognized for developing methods of synthesizing carbon nanotubes and for elucidating the properties of carbon nanotubes through Raman spectroscopy, a technique used in condensed-matter physics and chemistry to study vibrational, rotational and other low-frequency modes in a system. Dr. Rao is a Co-PI on a DOE EPSCoR Partnership Award (DE-FG02-04ER46139).

Laura Glasscock (Winthrop University) – Dr. Glasscock was awarded a research grant from the Hemby Cancer Research Foundation to support ongoing research on the molecular causes of prostate cancer metastasis. Her project entitled “Role of the Thrombomodulin-Protein C System in Prostate Cancer Metastasis” will allow her to purchase tissue culture reagents and prostate cancer cell lines. Dr. Glasscock is an INBRE Target Faculty in the Winthrop Department of Biology.

Timothy Mousseau and Catherine Murphy (University of South Carolina) – Drs. Mousseau and Murphy have been named fellows of the American Association for the Advancement of Science. The AAAS is one of the world’s largest general science societies and individuals recognized as fellows have displayed efforts in advancing science applications that are deemed distinguished. Dr. Mousseau is the Associate Dean for Research in the College of Arts and Sciences and was hired under the 1992 NSF EPSCoR Advanced Development Program (ESR-9108772), and Dr. Murphy is the Guy F. Lipscomb Professor of Chemistry and an EPSCoR New Hire under the 1990 NSF EPSCoR Phase-II (RII-8922165).



Clemson Researchers Design and Test a Lunar Wheel

NASA has proposed to construct a base on the surface of the moon by 2020 in order to explore and gradually perform missions to Mars. New technologies must be developed to accommodate the varied terrain that lunar rovers will encounter in future missions. Dr. Joshua Summers, Associate Professor of Mechanical Engineering at Clemson University, has led a team of researchers in association with Michelin Corporation and Milliken & Company, for the development of a lunar wheel that will be employed on the next generation of lunar rovers.

Dr. Summers and his team have worked closely with developers at Michelin, Milliken and the NASA Jet Propulsion Laboratory to design and test a useful and efficient lunar wheel for use on the Small Pressurized Rover that will enable astronauts to explore the moon, the Scarab Rover that is designed to search for hydrogen and oxygen for the creation of water, and the All-Terrain Hex-Legged Extra-Terrestrial Explorer (ATHLETE). These new rovers will use lunar wheels to provide traction and sustainability required for travel across rough terrain, and all three rovers will utilize the wheels of the same size for efficiency. The proposed lunar wheel is comprised of spokes made with high-strength material and a replaceable outer tread that provides uniform pressure across the surface to prevent sinking in softer terrain and to allow for greater traction.



Dr. Joshua Summers and undergraduate Samantha Thoe inspecting the metallic prototype. (Image: Clemson University)



Cryogenic testing equipment developed to test the manufactured lunar wheels. (Image: Dr. Joshua Summers and Clemson University)

The research for this project spun out of a senior design class project, for which Clemson mechanical engineering students developed new ideas for creating metallic replacements for rubber wheels. Through a \$1.4 million award as part of the NASA EPSCoR program (NNX07AT57A), Drs. Joshua Summers, Paul Joseph, Vincent Blouin and Christine Cole have designed testing equipment and computational models to learn more about the endurance limits of the Michelin-manufactured lunar wheels. This research could lead to improved tread materials, able to withstand abrasive terrain. “We now have the challenge of developing high-traction and high wear-resistance solutions that will last for 50,000 miles in temperatures ranging from minus 380 to 260 degrees Fahrenheit,” states Dr. Summers. “Moreover, the lunar sand is highly abrasive like shattered glass because there is no wind on the moon to erode and smoothen the corners. We have a daunting challenge ahead.”

Four faculty members, two postdoctoral fellows, eight graduate students, 12 undergraduate students, and five high school students at Clemson have worked or are currently working on projects related to the lunar wheel research.

Student Spotlight - Donna Darlington

While a student at South Carolina State University, Ms. Donna Darlington participated in Dr. Stevo Bozinovski’s Brain Computer Interface workshops, supported by the 2004 South Carolina NSF EPSCoR Research Infrastructure Improvement grant (EPS-0447660). During that time, she studied stimulus-feedback wave patterns and electroencephalograph outputs. The research she performed in Dr. Bozinovski’s lab instilled an interest in the central nervous system and computer technology related to neuroscience research.

Ms. Darlington complemented her work at South Carolina State with three consecutive summer research experiences at Furman University under the mentorship of Dr. Victoria Turgeon, an INBRE Target Faculty. Ms. Darlington’s research contributed to the investigation of the expression of protease-activated receptors, their serine protease ligands, and serine protease inhibitors in motor neuron axon formation. By understanding the mechanisms which regulate these processes, researchers may improve the treatment and prevention of neuromuscular junction deterioration, which occurs in several degenerative diseases of the central nervous system.

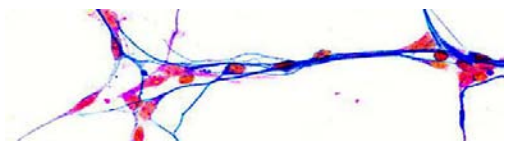
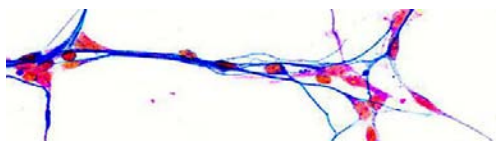


(Image: Ms. Donna Darlington)

Following completion of a B.S. degree in biology from South Carolina State, Ms. Darlington has continued her studies in the College of Medicine at the University of South Florida, where she plans to earn an MD/PhD degree. Her interests lie in Alzheimer’s disease research. Undergraduate research played an important role in Ms. Darlington’s career path, and as she states, “Completing projects in undergraduate research not only prepared me for the rigorous demands of graduate life in a college of medicine, it also helped me to practice perseverance.”

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.

This publication was made possible by the following awards: NSF EPSCoR EPS-0447660 and NIH/NCRR P20 RR016461.



Upcoming EPSCoR/IDeA Sponsored Events

Furman Summer Research Program

The Departments of Biology, Chemistry and Psychology at Furman University are pleased to invite current sophomore and junior undergraduates to apply for participation in Furman's NIH-INBRE Summer Research Program for 2009. Furman University will provide research salaries of \$3,800 over 10 weeks (plus free housing in on-campus apartments) to students from other SC institutions participating in full-time research on the Furman campus beginning June 1 and ending August 7. Participants will have the opportunity to work directly with Furman faculty members in exciting areas of biological, biochemical, psychological or neuroscience research based on the area of the student's background and interest. A primary goal for all participants will be presentation at a regional or national meeting in the months following the award (travel funding provided), with the additional possibility of co-authorship on refereed publications. For an application or additional information, please contact Dr. John Wheeler at Furman University, john.wheeler@furman.edu



(Image: Furman University)

2009 Ernest E. Just Symposium

February 27, 2009
Charleston, South Carolina

Symposium for Young Neuroscientists and Professors of the Southeast (SYNAPSE) 2009: *Human Disease Research in the 21st Century*

March 28, 2009
Charleston, South Carolina

South Carolina Statewide Science, Technology, and Health Conference & Annual Meeting of the South Carolina Academy of Science

April 14-16, 2009
Columbia, South Carolina