Science Collaboration: immersion inquiry innovation Sc:iii

PAEC

Seminars in Emerging Science
Panhandle Area Educational Consortium
Chipley, Florida
Friday, October 26, 2007
Summary of Presentations

David G. Gallo, Ph.D.
Director of Special Projects
Woods Hole Oceanographic Institution

David Gallo received BS and MS degrees in geological science from the State University of New York at Albany and a Ph.D. in oceanography from the University of Rhode Island. In 1987 he was invited by Dr. Robert Ballard (discoverer of the wreck of RMS Titanic) to join his team at the Woods Hole Oceanographic Institution as the Assistant Director of the Center for Marine Exploration.

In his present role, David works closely with scientists and engineers at the forefront of global exploration and discovery. He has participated in numerous expeditions to the Atlantic, Pacific and Indian oceans, and to the Mediterranean Sea. He was one of the first oceanographers to use a combination of submarines and robots to map the undersea world. He was co-expedition leader during an exploration of RMS Titanic and the German battleship Bismarck using the Russian MIR submarines.

In addition to ocean exploration, he is currently interested in understanding the relationship between humanity and the sea. He was closely involved in the formulation and development of the Liquid Jungle Laboratory of Panama, a venture designed to better understand the interaction between people, tropical forests and coastal marine habitats.

David is passionate about exploration and discovery and dedicated to communicating the importance of science and engineering to the public-at-large. He maintains close working relationships with scientists, film-makers, and media broadcasters (Discovery Channel, History Channel, and National Geographic/PBS). He was instrumental in the development of The JASON Project and is presently involved with FIRST Lego League's Ocean Odyssey.

Presentation Topic

The Secrets of the Sea: Exploring Neptune's Realm

No matter where you live on planet earth, the oceans influence your everyday life. Despite these facts the oceans remain largely unexplored and poorly understood. In fact, to date we've explored less than 3% of the world beneath the waves. In that 3% we have found the world's greatest mountains and valleys, immense underwater rivers and lakes, and some of the most spectacular waterfalls on earth. In the perpetual darkness of the deepest oceans we find communities of life that rival the tropical rain forests. This presentation will review some of the most recent oceanographic discoveries and will introduce the audience to the next generation of technologies that will lead us into the future of ocean exploration.

Mr. Matthew C. Jewell
Researcher and Graduate Student
Florida State University and National High Magnetic Field Laboratory

Matthew Jewell is a researcher and graduate student in the Applied Superconductivity Center at the National High Magnetic Field Laboratory in Tallahassee, FL. Matt's work focuses on improving the mechanical properties of Nb_3Sn, a material used to make superconducting wire for some of the world's most powerful magnets, including particle accelerators and nuclear fusion reactors. Matt has extensive experience interacting with K-12 educators, including a year spent teaching middle school science and math through a fellowship from the National Science Foundation's K-through-infinity program. At the NHFML, Matt has also helped develop resources for the superconductivity I-Wall and has trained teachers to use superconductivity experiments in their classrooms under the Project Superconductivity grant.

Presentation Topic

Superconductivity in the Real World

Whether in a magnet or an overhead power line, passing electricity through a wire always results in some resistive loss of energy. In the very high voltage lines that carry electricity from the power plant to your home, this loss is reasonably small – less than 10% of what is delivered. However, in the low voltage, high current systems that make up powerful magnets found in MRI machines, particle accelerators, nuclear fusion reactors, and research magnets, this loss is enormous, and is a significant limitation on the size and power of the magnet. Fortunately, there is one class of materials – superconductors – that can conduct electricity without any resistance or loss of energy whatsoever. In this talk we'll discuss the various materials systems that can be used as superconductors, look at examples of superconductors in real-world applications, and probe some of the challenges that scientists are working to overcome to make superconducting magnets more attractive to the hospitals, researchers, and engineers that rely on large magnetic fields.

Samuel C. Grant, Ph.D.
Assistant Professor, Chemical and Biomedical Engineering
Florida State University and National High Magnetic Field Laboratory

Dr. Samuel Grant is the product of a military family. Having been born in Omaha, Nebraska, he traveled extensively during childhood, including stops in Boston, MA, Washington, D.C., Incirlik, Turkey and St. Louis, MO. Dr. Grant earned his bachelor's (with honors) and master's degrees in Electrical & Computer Engineering from the University of Illinois at Urbana-Champaign. He continued his studies at the University of Illinois at Chicago, earning his doctoral degree in Bioengineering in 2001 with dissertation work on the application of radio frequency microcoils to the analysis of single cells via magnetic resonance imaging (MRI). That same year, Dr. Grant joined the laboratory of Dr. Stephen Blackband at the Department of Neuroscience, University of Florida, Gainesville, FL. While in Gainesville, Dr. Grant worked on several projects that utilized high field MRI techniques to interrogate models of stroke, diabetes and neurodegeneration.

In 2006, Dr. Grant joined the faculty of The Florida State University and The National High Magnetic Field Laboratory, Tallahassee, FL. As an assistant professor in Chemical & Biomedical Engineering, Dr. Grant is using the high magnetic fields of the MagLab, including the world's only 21.1-Tesla MRI system, to investigate novel imaging contrast agents and biomaterial, neurodegenerative progression in ALS (Lou Gehrig's disease) and Alzheimer's disease, and mechanisms of drug addiction. This work has been presented at numerous international conferences and has been published in several peer-reviewed journals, including *Neuroscience, NeuroImage, Neuromolecular Medicine* and *Magnetic Resonance in Medicine*. At present, Dr. Grant has over 100 journal articles and conference proceedings in press. Additionally, Dr. Grant is a consultant for the biomedical industry, with collaborations with Covidien (formerly Tyco Healthcare) and Neurodyn.

Presentation Topic

Magnetic Resonance Applications at High Magnetic Fields:
Single Neurons to Neurological Disease

The evolution of magnetic resonance instruments to higher field strengths mandates continued improvement in techniques and technologies. Using the premier high field MR instruments of the National High Magnetic Field Laboratory, a variety of biological samples has been examined using magnetic resonance microscopy and spectroscopy. This presentation will detail the fundamental principles of magnetic resonance imaging (MRI), with a particular focus on the application of MR physics to biological systems. The challenges and benefits of utilizing high magnetic fields to evaluate samples ranging from single neurons to models of neurodegenerative disease will be discussed.