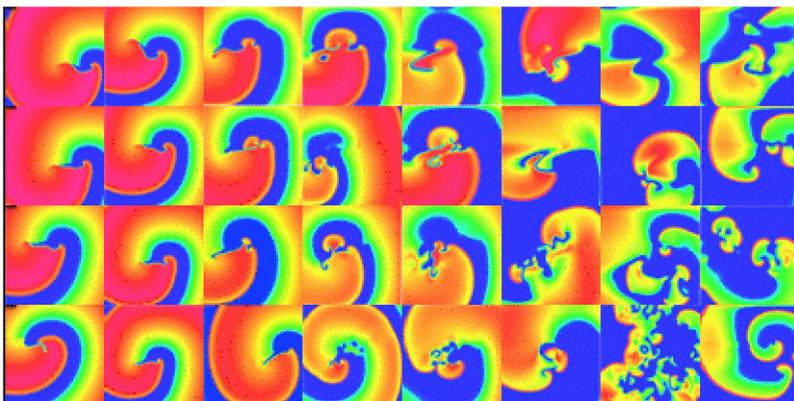




College News

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From chaos to cures



Some people thrive in chaos. Others run from it. But, say Cornell researchers, understanding chaos may be the key to solving issues that have immediate and significant societal, economic, and scientific benefits, issues like the unexpected and sometimes devastating onset of cardiac fibrillation and the ability to detect the phenomenon before it occurs. In a recent workshop, 15 students were challenged to embrace, understand, and leverage chaos.

The 2011 Minority-Focused Intersession Workshop for Undergraduates on Understanding and Analyzing Complex Embedded and Biological Systems introduced tomorrow's biologists, computer scientists, and mathematicians to powerful new tools for studying and understanding models of physical phenomena and the uses to which such deeper knowledge can be put. The three-week program was organized by Workshop Director Nancy Griffith, Professor of Computer Science at Lehman College. The workshop readings, materials, and activities can be found at the [home page for the workshop](#).

The workshop was inspired by the work of Dr. Flavio H. Fenton, Cornell University research associate at the College of Veterinary Medicine. The first week was presented by Dr. Fenton, with help from doctoral candidates Rupinder Singh and Fred von Stein, and the second week included presentations by Ezio Bartocci, a Research Scientist at Stony Brook University, Professor Griffith, and doctoral candidates Terri Grosso-Applewhite and Kai Zhao of the City University of New York. There were also presentations from several distinguished visitors during the three-week workshop: James Glimm of Stony Brook University, Robert Gilmour of Cornell University, and Scott Smolka of Stony Brook University.

In the third week, the students worked in three-person teams on a capstone project to test a variety of parameters in cardiac cells, recording the effects of the change on spiral waves, indication that there is abnormal electrical activity in the heart. They were actively supported in their projects by Dr. Fenton, Dr. Bartocci, and Lehman graduate students Joshua Rogers and Aron Wolinetz. The workshop is an annual component of a \$10 million, multi-disciplinary, multi-institutional, four-year National Science Foundation grant on Computational Modeling and Analysis for Complex Systems

“The grant has opened a tremendous number of doors for us,” said Fenton. “At the core, it supports work that will address four major issues, including cardiac disease, which is a global concern. Beyond that, it has provided the means for us to attract young researchers to the cause. Our work is exciting and will make a meaningful impact on the quality of life. The chance to share the issues, the theories, the excitement, and the tools with future collaborators is a win/win situation for everyone and inspires hope for the future.”



The participants learned about the concepts of complex and excitable systems, with particular emphasis on the heart. To gain experience on the behaviors of complex and excitable systems, as well as how they produce chaos, participants conducted lab experiments using a saline oscillator. In addition, the program explored the physiology of the heart, how to model mathematically the electrical signal of cardiac tissue, how arrhythmias such as tachycardia and fibrillation appear, and how they are terminated clinically. In addition to learning about excitable systems and the physiology of the heart, the students were introduced to various mathematical and computational techniques for modeling, analyzing, and simulating biological systems.

The participating students were selected from a pool of 20 applicants based on their grades and faculty recommendations. The undergraduates represented several colleges in the City University of New York: Lehman College, Hunter College, Brooklyn College, and Queens College.

“Our intent is to present a summary of the workshop and the results the students obtained through the capstone experiments in a paper that we will submit to the journal *Advances in Physiology Education* with everyone who participated as authors,” said Fenton.

