CAM

Graduate students at the Center for Applied Mathematics (CAM) have undertaken a very exciting educational initiative called the Summer Math Institute (SMI). SMI is a seven-week residential summer program, which began in summer 2006, that prepares students for graduate work in the mathematical sciences. The mission is to increase diversity in these fields by providing undergraduate women and minority students an opportunity to study advanced mathematics at Cornell while working on interdisciplinary research projects. SMI has a pure math component consisting of a core course in real analysis and an applied component with research topics in dynamical systems and neurobiology, and random graphs and algorithms. Graduate students in CAM, Joseph Tien, Emilia Huerta-Sanchez, Yannet Interian-Fernandez, Sharad Goel, John Guzman, and Erik Sherwood helped to organize and develop the institute. SMI is funded by the Sloan Foundation, National Science Foundation, and Cornell University.
www.cam.cornell.edu

CCMR

In December 2005, the Cornell Center for Materials Research (CCMR) piloted its first microscopy image contest designed to showcase the spectacular images taken in the center's shared microscopy facilities on campus. Graduate students and postdoctoral associates submitted a wide range of images from the center's electron and optical microscopes. One of three first-place winners, shown below, depicts a ruptured, hollow silica microcapsule made by interfacial condensation in a microfluidic device. The image was taken by Jeremy Steinbacher, using the scanning electron microscope in Bard Hall. This research is part of ongoing studies in D. Tyler McQuade's group in Chemistry and Chemical Biology.

All winners and entries in the December CCMR microscopy image contest may be viewed at www.ccmr.cornell.edu/facilities/imagecontest. The center plans to repeat the contest three times per year, with a gallery of images displayed on the website.
www.ccmr.cornell.edu

CNF

Is it possible to learn the concepts of nanofabrication in only three days? The Cornell Nanoscale Facility (CNF) conducts a three-day, noncredit course during the summer and winter breaks entitled Technology and Characterization at the Nanoscale (TCN). The course is designed to provide a comprehensive introduction to nanotechnology, as well as to the techniques used to characterize nanoscale devices. Lectures focus on topics such as nanoscale device design, photolithography, e-beam lithography, etching, characterization, and process integration. The morning lectures are complemented by laboratory demonstrations in the afternoon. Attendees have the opportunity to interact with members of the CNF staff, who are available to discuss general questions and specific ones pertaining to existing or potential projects.

CNF especially invites researchers to the TCN who plan to conduct nanotechnology research in areas not traditionally associated with the technology.
www.cnf.cornell.edu

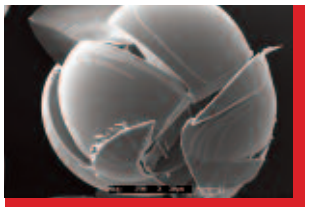
CTC

The Cornell Theory Center (CTC) supports data-intensive research initiatives at Cornell through its facilities and services, such as information access and analysis systems, data archive management, and tool and algorithm development. In many cases, CTC assists in making research results available internationally through an infrastructure based on web services, which allows applications to interoperate across programming languages, platforms, and operating systems. CTC currently supports the WebLab project, in which Cornell researchers are exploring the web by analyzing more than 40 billion web pages. CTC supports researchers who are working with the Arecibo Observatory by gathering approximately one terabyte of data per day—predicted to be 18 terabytes once the project is operational in about a decade. CTC also supports the researchers who are investigating options for physically accurate rendering in computer graphics. Data analysis—based on scans totaling up to 50 terabytes—illustrates fundamental properties of materials and opportunities to represent complex objects realistically.
www.tc.cornell.edu

CU

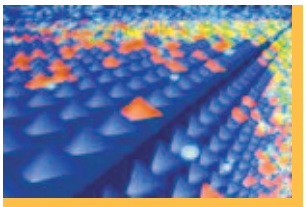
Steven Strogatz directs CAM.

Jeremy Steinbacher



CNF

CTC



CVG

The Center for Vertebrate Genomics (CVG) is composed of 44 faculty and nine associate members from 13 departments across five Cornell colleges working towards four main goals. One is to foster research interactions among vertebrate biologists across campus. The CVG therefore hosts a popular monthly lunch meeting on the second Tuesday of each month, the VERGE, at which representatives from two member labs present their work. It also hosts an annual symposium—scheduled this year for July 20—and a student- and postdoc-run journal club, held the fourth Thursday of each month. CVG provides seed grants for research with high promise in genomics. For student and postdocs, CVG offers several vertebrate genomics fellowships and travel funds for meetings and conferences. CVG supports shared resources and the acquisition of technologies to enable modern genomics research. Most notable is CVG's support for the founding of a DNA bank in the veterinary hospital, which will allow Cornell researchers to harness the animal patient base and to identify the genetic basis of animal and human diseases. CVG also assists with the recruitment of faculty in vertebrate genomics.
www.vertebrategenomics.cornell.edu

LASSP

Daniel Ralph and Robert Buhrman, together with students in the Laboratory of Atomic and Solid State Physics (LASSP) and the School of Applied and Engineering Physics, have recently developed a new all-electrical measurement strategy that allows magnetic dynamics to be measured in samples with volumes 1,000 times smaller than any other technique. Small magnets, on the scale of 100 nanometers and smaller, are becoming common in magnetic memory devices, and likely soon in high-speed signal processing applications. The processes by which the north and south magnetic poles reorient are central to the operation of these technologies. However, the traditional technique for studying the dynamics of magnets, by monitoring the changing magnetic fields that their movement produces, does not have the sensitivity to detect the motion of magnets as small as 100 nanometers. Ralph and Buhrman are using their new technique to understand different modes of motion that operate in devices designed for magnetic memory applications. They are also currently working to extend the technique to even smaller sizes, approaching the limit of single-molecule magnets.
www.lassp.cornell.edu

Life Science Enterprise

The Institute for Biotechnology and Life Science Technologies is home to one of 15 New York State Centers for Advanced Technology (CAT): the Center for Life Science Enterprise. The center funds industry-university collaborative research and assists in entrepreneurial activities, including the creation and growth of start-up businesses, general business planning, and assistance with finding the resources to meet companies' individualized needs. Some of the services provided to businesses include connecting them with Cornell researchers for assistance with sponsored research projects; helping them find and understand alternative sources of funding; locating support services; workforce development; and introductions, referrals, and networking opportunities. The center is leading efforts in planning the IDEA Center, an 11,000-square-feet business incubator to be located in the new life science building currently under construction. To prepare entrepreneurs for the incubator, the center hosted two pre-seed workshops. These workshops presented researchers with a systematic approach to evaluating the commercialization potential of an invention and provided essential information from the venture capital and business community for launching a start-up company.
www.biotech.cornell.edu

NAIC

The Arecibo telescope at the National Astronomy and Ionosphere Center (NAIC), equipped with the new ALFA imaging receiver, is being used to "photograph" the hydrogen gas in the Milky Way. This has allowed astronomers to discover fascinating new phenomena in the interstellar medium. With this technology, NAIC has been able to view an image of a high velocity cloud that is falling into the Milky Way at a speed of nearly 300 kilometers per second—the fastest moving cloud ever discovered in our galaxy.

The cloud was discovered because it is now possible for the first time to make images of very large regions of the sky with the Arecibo telescope. The cloud shown here is 20 times the apparent size of the full moon; the entire image is 20,000 times larger in angular extent than the beam of the telescope used to make the image. The image is color coded to show motion within the gas. Many more images and discoveries are being made with this new imaging capability at the Arecibo Observatory.
www.naic.edu

CVG

John Schimenti directs CVG.

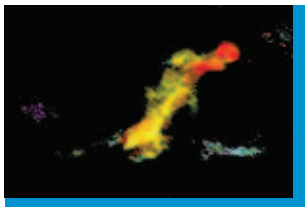
CU

Daniel Ralph

CU

Kelvin Lee directs Life Science Enterprise.

NAIC



NBTC

The Nanobiotechnology Center (NBTC) continues to provide new opportunities for advancing research and education in nanobiotechnology. Following the success of the traveling exhibit "It's a Nanoworld," developed in collaboration with the ScienCenter in Ithaca, NBTC's education team is developing a new exhibit, "Too Small To See." This exhibit is designed to engage children ages 8–13 with interactive displays that promote an understanding of the nanoscale processes occurring in the world around them.

The NBTC has recently secured support from the NSF to administer an International Research Experience program for 13 science and technology centers around the country. After a competitive review of proposals, five such awards were made. The selected NBTC graduate students will spend semesters or summers at international host institutions to enhance their nanobiotechnology research skills and gain valuable experience in international, crosscultural research. These supplemental programs enhance the diversity of NBTC activities and build on the established strengths of the center.
www.nbtc.cornell.edu

ICB

Recognized for its exceptional promise in the coming years, the field of computational biomedicine has found a permanent home at Weill Cornell Medical College with the establishment of the HRH Prince Alwaleed Bin Talal Bin Abdulaziz Al-Saud Institute for Computational Biomedicine (ICB).

Made possible by generous gifts from HRH Prince Alwaleed Bin Talal Bin Abdulaziz Al-Saud of Saudi Arabia, from David Cofrin, M.D., and from other contributors, the institute will allow Weill Cornell researchers to study complex genomic and cellular systems and understand the functions of tissues and organs, such as the heart and the brain—as they relate to maintaining and improving health—using mathematical models, physics, and high-speed computing in an approach that is unique to this new field.

Since 2003, ICB investigators have garnered more than $13 million in research support from the National Institutes of Health (NIH). In addition, ICB staff are coinvestigators of eight NIH grants with subjects ranging from neuroscience to immunology. From an original staff of three in 2003, the ICB now includes 15 researchers, seven of whom are independent investigators and two instructor/researchers. The ICB also supports graduate education in this novel field through the Tri-Institutional Program in Computational Biology and Medicine, which includes Cornell University, Weill Cornell Medical College, and Sloan-Kettering Institute, as well as through the Graduate Program in Physiology, Biophysics, and Systems Biology of the Weill Graduate School of Medical Sciences.
http://icb.med.cornell.edu

NBTC

WCMC

Harel Weinstein, the Maxwell M. Upson Professor of Physiology and Biophysics, directs the Institute for Computational Biomedicine at Weill Cornell Medical College.

Robert Barker/CU