$1.2 million USDA grant helps create CU-managed organic farm network

By Blaine P. Friedlander Jr.


Rangarajan

The U.S. Department of Agriculture's (USDA) Initiative for Future Agriculture and Food Systems has awarded a $1.2 million grant for the creation of a new organic farming network managed by Cornell's Department of Horticulture.

The group, the Northeast Organic Network (NEON), is composed of university researchers, farmers, extension educators and nonprofit organizations. It will examine ways to enhance production and consumption of locally grown organic food in the northeastern United States.

"We will coordinate research, extension and outreach efforts among the Northeast organic community, land grant universities and agricultural experiment stations, as well as the public and private sectors, to determine how organic food production will improve small farm viability in this region," said Anusuya Rangarajan, Cornell assistant professor of horticulture and an organizer of NEON. "The growth in organic markets, development of national organic standards, concentration of consumers in the Northeast and recent federal recommendations to ensure small farm viability make this project timely and relevant."

Over the next two years, NEON will develop enterprise budgets and farm-business management information for established organic farms in the Northeast. At the crop-production level, the group will address information gaps in soil fertility and crop- and pest-management practices through applied research. It also will develop support tools to improve organic farming management.

NEON partners include the University of Maine, the Connecticut Agricultural Experiment Station, Rutgers University, Northeast Organic Farming Association of New York, Northeast Organic Farming Association of New Jersey, the New England Small Farm Institute, the Organic Materials Review Institute and New York Certified Organic, as well as several farm operations.

In addition to Rangarajan, the Cornell founding members include Anthony M. Shelton, professor of entomology; Laurie E. Drinkwater, associate professor of horticulture; Charles Mohler, senior research associate in crop and soil sciences; Antonio Ditommaso, assistant professor of crop and soil sciences; Wen-Fei Uva, senior extension associate in applied economics and management; and Brian Caldwell of Cornell Cooperative Extension (Tioga County).

The web site for the Northeast Organic Network is <http://www.neon.cornell.edu/>.

CU's Digital Earth Project offers global database and mapping tool

By Bill Steele


Bill Steele/Cornell News Service
Dogan Seber, a senior research associate with Cornell's Institute for the Study of the Continents, poses in front of a topographic map of the Middle East, where many Cornell geological studies are focused.

An institute at Cornell is building a "digital Earth" that will become an important resource for geoscience researchers and also will provide easy-to-use teaching tools for educators from elementary school through college.

The Digital Earth Project, part of the Cornell Geoscience Information System (GIS), is a global database created by the Institute for the Study of the Continents (INSTOC) at Cornell to make accessible geological information accumulated by Cornell researchers over the last eight years. The GIS includes over 100 different data sets on the structure of the Earth's crust, location of earthquake faults, a record of earthquake and volcanic events, magnetic and gravity measurements and descriptions of aquifers, along with details of surface topography. Interactive tools allow users – from advanced researchers to elementary schoolchildren – to create maps with almost any selection and combination of the data.

The GIS site is at <http://atlas.geo.cornell.edu>.

Dogan Seber, a senior research associate with INSTOC, described the Digital Earth Project in a talk at the annual meeting of the Geological Society of America in Boston in November.

"The potential of having all [geoscience] information and knowledge along with access, modeling and visualization tools under the fingertips of a user represents a power that has rarely been tapped," Seber said.

The web site will become part of the National Science Digital Library, a National Science Foundation (NSF) project to make professional scientific databases widely and easily available for education. In September, INSTOC received two grants totaling $770,000 from the NSF for further development.

The project builds on extensive previous work by Cornell. The Cornell Solid Earth Information System (SEIS), which contained detailed information about the Earth's crust drawn largely from Cornell research in the Middle East, North Africa and the United States, now is being expanded with data provided by many other researchers to create the global database.

Originally, most of this data could be accessed only with specialized software. The Cornell site, however, incorporates a Java applet that allows users to create maps of any location they choose, displaying whatever data they wish. Users also can create cross-sections of the Earth's crust between any two points and analyze sea-level changes interactively. Future plans include a global seismicity analysis tool, an earthquake locator tool, tools to study volcanism and its relation with plate boundaries, plate tectonics and ages of the ocean floor.

There are many pages of tutorials explaining basic concepts of geology and guiding students and teachers in using the database. Alexandra Moore, Cornell visiting professor of earth and atmospheric sciences, has been testing the tools in her classes.

Seber is assisted by INSTOC research aides Christine Sandvol, Carrie Brindisi and Dan Danowski and works with Muawia Barazangi, Cornell professor of earth and atmospheric sciences and associate director of INSTOC. The earlier work on SEIS was funded by the Department of Energy, the Department of Defense, the NSF and the petroleum industry.

Low-vision sufferers could be aided by CU computer graphics technology

By Bill Steele


Ferwerda

A computer graphics project at Cornell could lead to an improved quality of life for people with visual disorders classified as "low vision."

James Ferwerda, a research associate in the Cornell Program of Computer Graphics, is developing computer simulations of the ways in which people with several kinds of low vision see the world. Working backward from these computer models, he plans to process images of the real world into forms that low-vision sufferers can more easily comprehend. The work is funded by a three-year, $450,000 grant from the National Science Foundation's (NSF) Information Technology Research program.

By the end of the project, Ferwerda hopes to create small hand-held devices that would help visually impaired people read and move around.

Ferwerda, whose background is in both experimental psychology and computer science, said he undertook the project because "it offers an opportunity to use computer graphics technology to make a real difference in people's lives." He will collaborate with Gordon Legge, the Distinguished McKnight University Professor of Psychology at the University of Minnesota and director of the Minnesota Laboratory for Low-Vision Research, who will test the new techniques with subjects with a variety of visual impairments.

Common low-vision disorders include glaucoma, cataracts, macular degeneration, diabetic retinopathy and *retinitis pigmentosa*, as well as the overall loss in visual ability that comes with aging. More than 10 million people in the United States have some form of low vision.

Each type of disorder presents the sufferer with different problems. Glaucoma, for example, results in a loss of peripheral vision, while macular degeneration causes a loss of fine detail in the center of the visual field. Other disorders, such as cataracts, lead to an overall loss of contrast.

Textbooks often include illustrations prepared by artists to show how the world appears to low-vision sufferers. "The trouble is, most of these illustrations are completely wrong," Ferwerda said. For example, an illustration of the effect of macular degeneration is usually a picture with a hole in the middle. In fact, Ferwerda said, while the retina might not gather information about the center of the field, the brain is very good at filling in the blanks, and a person sees a poorly detailed image, rather than one with a hole. Glaucoma patients with "tunnel vision" don't see the edges of their visual field as dark; they just have trouble orienting themselves in space.

Rather than manipulating images optically, Ferwerda will work from computer models of human visual processing. Experimental psychologists have broken down visual processing into a series of steps, beginning with the absorption of light by rod and cone photoreceptors, moving through preliminary processing in nerve tissue in the retina, proceeding to several steps in the brain. Each step can be represented mathematically and modeled in a computer program. Starting with a model of normal vision, Ferwerda can introduce changes that correspond to various defects in the system.

A reliable computer model of a visual defect, Ferwerda said, should make it possible to process images in a way that compensates for the defect. For example, one way to aid people with macular degeneration might be to shift the central portion of the visual field to an undamaged part of the retina, then modify the contrast of edges in the image to make up for the fact that the off-center parts of the retina deliver less detail. For glaucoma sufferers with restricted peripheral vision, a very simple outline of the larger visual field might be overlaid on the central image to help the person stay oriented. (This approach, called vision multiplexing, already is under development elsewhere.) Image enhancement techniques also might be used to counter the glare effects produced by cataracts or to compensate for the losses in visual sensitivity that accompany the aging process.

Eventually these ideas might be built into a lightweight pair of glasses, but current technology is not that advanced, Ferwerda said. Head-mounted devices, looking something like virtual-reality headsets, take over the whole visual field and often are rejected by people with low vision. Instead, Ferwerda's idea is to incorporate new technology into a small, hand-held device that could be held up and looked into as needed – a sort of high-tech lorgnette. Such a device would take advantage of microdisplay technology currently in development that creates very high-resolution images on a very small screen. The same technology can be incorporated into web browsers to give low-vision users better access to graphical content on the Internet, Ferwerda added.

In addition to the NSF, supporting the project is the Cornell Program of Computer Graphics, founded and directed by Donald Greenberg, the Jacob Gould Schurman Professor of Computer Graphics at Cornell. The program has been a pioneer in the development of advanced computer graphics techniques for more than 25 years, with applications in architecture, art, engineering, psychology and computer science. It is a site of the NSF Science and Technology Center for Computer Graphics and Scientific Visualization.