

Chronicle

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CU scientists create single-atom transistor with a 'designer' molecule

By David Brand

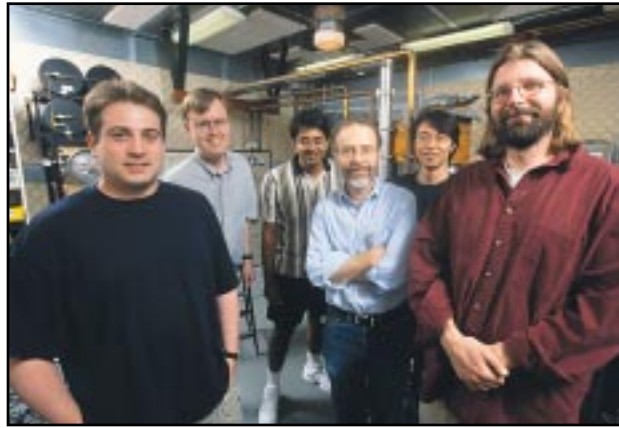
A long-sought goal of scientists has been to shrink the transistor, the basic building block of electronic circuits, to smaller and smaller size scales. Scientists at Cornell have now reached the smallest possible limit: a transistor in which electrons flow through a single atom.

The Cornell researchers have created a single-atom transistor by implanting a "designer" molecule between two gold electrodes, or wires, to create a circuit. When voltage was applied to the transistor, electrons flowed through a single cobalt atom within the molecule. Paul McEuen, professor of physics at Cornell, describes the process by which electrons pass from one electrode to the other by hopping on and off the atom as "a virtual dance of electrons."

McEuen and his colleagues at Cornell's Center for Materials Research, including Dan Ralph, associate professor of physics, and graduate students Jiwoong Park and Abhay Pasupathy, report on their creation of a single-atom transistor in the latest issue (June 13) of the journal *Nature*.

McEuen cautions that the device cannot yet be described as having all the functions of a traditional transistor, such as amplification. But he sees a potential application for the new transistor as a chemical sensor because a change in the environment around the molecule could cause a measurable alteration of the conductance of the device.

At the heart of the Cornell group's transistor is the



Nicola Kountoupes/University Photography

The Cornell research group, in Clark Hall, working on the single-atom transistor includes, from left, graduate student Jonas Goldsmith, Associate Professor Dan Ralph, graduate student Abhay Pasupathy, Professor Héctor Abruña, graduate student Jiwoong Park and Professor Paul McEuen.

"designer molecule" synthesized by Héctor Abruña, professor of chemistry and chemical biology, and graduate student Jonas Goldsmith. At the molecule's center is a cobalt atom surrounded by carbon and hydrogen atoms and held in place on either side by molecular "handles" made of pyridine, a

relative of benzene. On their outer side, the "handles" are attached to sulfur atoms, which act like "sticky fingers," to bond the molecule to the gold electrodes. Two different molecules were studied, one with longer "handles" than the other. The shorter molecule was found to be a more efficient conductor of electrons.

"As chemists, we can deliberately design and manipulate molecules to achieve a specific function," said Abruña. "This is very important because we are now able to incorporate the properties of these molecules into electronic devices."

The challenge faced by the Cornell researchers was to place a molecule less than two nanometers long (about the length of five silicon atoms) between two gold electrodes. To do this they used a technique called electromigration, by which an increasingly large current is run through a gold wire, forcing the atoms to migrate until the wire breaks. The molecule is then "sucked" into the gap by the high electric field present, and the sulfur "sticky fingers" bond the molecule to the gold. "Using this technique you can very reliably get wires with a gap on the order of one nanometer," or about three silicon atoms, said McEuen.

The technique was invented by McEuen and his former postdoctoral colleague, Hongkun Park, when both were researchers at the University of California-Berkeley. Park, now at Harvard University, reports in the same issue of *Nature* on a similar development in molecular electronics,

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Matthew Fondeur/University Photography

Terry Kilmer Oosterom '82, a co-chair for her reunion class, gets ready on Schoellkopf Field June 8 for Reunion 2002's "Big Red Live" event. Following President Hunter Rawlings' State of the University address, alumni from all returning classes gathered on the athletic field to be part of an aerial photograph (right) that was taken from a helicopter. Copies of the photo are available at <www.Jonreis.photorelect.com> or by calling toll-free 1-888-202-1589.

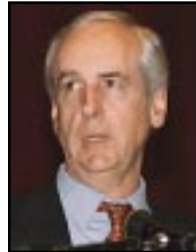
President credits alumni support for strong 'State of the University'

By Roger Segelken

Addressing a 2002 Cornell Reunion audience June 8 in Bailey Hall, President Hunter Rawlings said the state of the university is stronger than ever.

The arts and humanities faculties led students in developing capacity for analytical thought and emotional generosity during traumatic events of the past eight months, the president said. At the same time, biologists are joining forces with other scientists in the New Life Sciences Initiative, and may eventually explain, he joked, why there is a 50 percent similarity in the human and tomato genomes.

Students themselves have excelled, Rawlings said, winning unprecedented numbers of scholarly awards and bringing glory to the university on the fields of athletic endeavor. And former students who are now Cornell alumni continue to be extraor-



Rawlings

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dinarily loyal and generous, he said, announcing some familiar names that will be attached to new facilities on campus.

The president was introduced by outgoing Cornell Board of Trustees Chair Harold Tanner to about a thousand alumni and family members in a stuffy Bailey Hall ("This is where I took that big psychology class," one alum was overheard explaining to his wife), and Tanner promised a renovated, air-conditioned venue "with comfortable seats" the next time Cornellians gather for Reunion.

Tanner also introduced the next trustee chairman, Peter Meinig, and his wife, Nancy, then heralded the return to campus of another well-known couple: President Emeritus Frank H.T. Rhodes and his wife, Rosa, had come from Florida, where the 75-year-old geologist and avid hiker had been critically injured by a hit-and-run driver

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Jon Reis Photography

HR/Payroll systems to be down between July 3 and 8

From Wednesday, July 3, at 6 p.m. until Monday, July 8, at 7 a.m., all Human Resources and Payroll systems will be unavailable, Cornell Information Technologies and the two departments involved have announced.

The underlying database platform for the systems is being converted from Informix to Oracle. This change will have many positive impacts for the technical operation of the systems.

The systems that will not be available include the PeopleSoft HR/Payroll system, COLTS, PEDL, Student Employment System (SES) and Employee Essentials (EE). Kronos users will still be able to swipe their cards, but the data will be held at the clocks until the system is restored.

Most people will not see any differences in the systems as a result of this change. After the systems come back up, people who use COLTS, PED or SES will have a one-time download from Bear Access, but the systems will function normally.

People who manage Kronos users through a PC client will need to have software installed. Details can be obtained from their main Kronos payroll representative.

Officials from the Oracle Migration Team (Cornell Information Technologies, Human Resources and Payroll) have said that they thank the Cornell community in advance for its understanding during this system outage.

Questions regarding this outage or the conversion can be e-mailed to <slk9@cornell.edu>.

BRIEF

■ Volunteer tutors needed: Literacy Volunteers of Tompkins County is seeking volunteer tutors to work with adult students who would like to increase their literacy skills. Students need assistance with adult basic education. At this time, especially needed are volunteers who would like to tutor math or basic computer skills. Also needed are reading partners for people with developmental disabilities.

Volunteers meet with students about two hours per week, based on their schedules, and each attends 15 hours of training before being matched with a student. Upcoming training sessions will be held in July. For more information, call 277-6442.

CORNELL Chronicle

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Horse of a different color



Frank DiMeo/University Photography

Susan Harris, right, of Cortland, N.Y., explains the muscle physiology of "Laddin" at Cornell's in-service training program for 4-H leaders from around New York state, May 29 in the university's Livestock Pavilion. Laddin, an Arabian gelding, is owned by Marie McRae of Freeville, and the horse is trained for endurance riding. Harris painted the horse in a variety of nontoxic colors to display where its muscles are located and how the different muscle groups work. The 4-H youth program is run in New York by Cornell Cooperative Extension.

CU-developed flat-screen technology wins top international display award

By Adrienne Kroepsch

Rainbow Display Inc. (RDI), a Cornell start-up company created to build color flat-screen displays from technology developed at the university, has received the Society for Information Display/*Information Display* magazine Display of the Year Gold Award. Presented at the society's annual conference in Boston May 22, the international award cited RDI's innovative approach to building flat-panel video and television screens known as large active matrix liquid crystal displays (AMLCD).

The founders of RDI are Peter Krusius, Cornell professor of electrical and computer engineering, and Che-Yu Li, F.N. Bard Professor Emeritus of Materials Science and Engineering. The company was created in 1994 by Krusius; Li; Kailash Joshi, who earned his Ph.D. at Cornell; and Donald Seraphim, an IBM fellow who worked with the Cornell Electronic Packaging Program, which Krusius directs. The company aims to become a key supplier of large AMLCD displays for business and consumer markets.

"We are very proud of the award," said Krusius, former director and now RDI technological consultant. "When we started, it was not clear if the technology would work, and now it has been internationally recognized. What remains to be seen is if these displays will be commercially successful."

In 1999 RDI signed a joint development agreement with Philips Flat Display Systems, a unit of Royal Philips Electronics of the Netherlands, one of the world's largest consumer electronics companies. The result is RDI's prototype 37.5-inch (diagonally) Rainbow Spectrum Model 3750, the first seamless tiling technology for large-area AMLCD's. Based on 38 patents, the new screen is made up of three smaller panels tiled together into a single, seamless display.

RDI was set up with the aid of the Cornell Research Foundation, which licensed the patents for the Cornell-developed technology exclusively to the new company. Development began six years ago in the Cornell Electronic Packaging Program, with the company operating out of the Electronic Packaging Facility on campus for its first year. It now is based in Endicott, N.Y.

The largest AMLCD flat-screens on the

market today are limited to 30 inches. These displays are built as one defect-free panel on a single piece of glass. Anything bigger than about 21 inches and today's manufacturing yield of display panels drops to an unacceptably low level, according to a paper that Krusius presented at the society presentation.

A more indirect way to build flat-panel displays, especially larger than 30 inches, is to make a screen of smaller display "tiles." According to Ken Werner in the December issue of *Information Display* magazine, to make a screen in such a way that the seams between tiles are invisible to the human eye has challenged display designers for years.

Competing plasma-based, large-format displays that exist today are expensive and must be replaced after every one or two years of constant use due to fading and image burn-in. According to RDI's web site, the Model 3750 operates for two to three times longer than plasma-based displays and can be inexpensively serviced after years of constant use, regaining its original picture quality.

"The plans for the future are to begin volume manufacturing during the third quarter of this year," said Krusius. "The first year of manufacturing, we hope to produce something on the order of 20,000 displays and then increase production from there." The ultimate goal is for the displays to be much less expensive than plasma, said Krusius.

"One of the fundamental driving forces behind this project is that university people have an obligation to create new technology," he said. "Engineers, especially, have a social responsibility to create and develop new technology. When a new technology becomes commercially successful, it generates new businesses, more jobs, higher incomes and technological innovation that are beneficial to the region and the nation."

CORRECTION

An item in the Briefs section of the June 6 edition, concerning service changes for TCAT buses, contained some incorrect and incomplete information about the hours of operation for the new campus Route 86. Route 86, which has consolidated campus Routes 82, 83 and 84 through late August, runs hourly from 7:30 a.m. to 5:30 p.m., Monday through Friday; Saturdays from 9:30 a.m. to 5:30 p.m.; and Sundays from 8:30 a.m. to 5:30 p.m. The complete TCAT schedule is available at <www.tcatbus.com>.

NOTABLE

The Cornell Theory Center (CTC) has announced the awarding of two undergraduate summer internships in computational biology. Cornell biology majors **Nicholas DeNunzio** and **Katherine Varley**, both entering their senior years in the fall, will spend the summer in Rhodes Hall working with scientists at CTC's Computational Biology Service Unit (CBSU). Each student also receives an award of \$5,000.

DeNunzio will use computers to explore a segment of the X chromosome of the fruit fly, *Drosophila melanogaster*, helping researchers from Professor Charles Aquadro's lab in molecular biology and genetics look for functional genes in a region that is currently considered empty.

As an intern, he will have the opportunity to hone his skills in bioinformatics under the guidance of CBSU scientists Jarek Pillardy and Daniel Ripoll, as well as Golan Yona, professor of computer science.

Varley's internship will focus on annotation of a collection of DNA sequences from the tomato genome being studied by Steven Tanksley, professor of plant biology. Varley will compare amino acid sequences from the tomato against the entire proteome of the model plant species, *Arabidopsis*, using the CBSU LOOPP software to predict the function of tomato genes based on their similarity to known genes in *Arabidopsis*.

In addition to the two internships, CTC announced three \$1,000 honorable mention awards given to **David Arnold** ('03 chemical and biomolecular engineering), **Christopher Parkhurst** ('02 neurobiology and behavior) and **David Rand** ('04 computer science).

"We were very impressed by the quality of proposals that we received for this program," said CTC Director Linda Callahan. "And we were very pleased with the breadth of the fields from which we received applicants. This is a great opportunity for such exceptional students to immerse themselves in bioinformatics with the staff at CTC's CBSU."

CTC's undergraduate summer internships in computational biology are funded through an IBM University Partnership award. The program runs from June into August. The call for proposals for 2003 will be available in February of next year.

Trustee committee will meet in NYC

The Cornell Board of Trustees Executive Committee will meet in New York City Thursday, June 20.

The meeting will be held in the Fall Creek Room of the Cornell Club of New York, 6 E. 44th St.

In a brief open session at 2 p.m., the committee will hear a report from President Hunter Rawlings.

Tickets for the meeting may be obtained beginning Tuesday, June 18, for the general public at the Information and Referral Center in Day Hall, on campus.

The Buildings and Properties Committee will meet at 9 a.m. Thursday in the Fall Creek Room, with a brief open session at the start of the meeting. No tickets are required.

PUBLICATION NOTE

The *Cornell Chronicle* publishing schedule through June of 2003 is as follows:

2002: June 27; July 11, 25; Aug. 15, 22, 29; Sept. 5, 12, 19, 26; Oct. 3, 10, 17, 24, 31; Nov. 7, 14, 21; and Dec. 5, 12.

2003: Jan. 16, 23, 30; Feb. 6, 13, 20, 27; March 6, 13, 20, 27; April 3, 10, 17, 24; May 1, 8, 15, 22; and June 5, 12, 26.

The deadline to submit items for the *Cornell Chronicle* calendar is 10 days prior to the publication date. Please send notices through campus mail to: Chronicle Calendar, Surge 3.

Institute on black women and Africana studies scholarship is June 15-25

By Franklin Crawford

A 10-day institute at Cornell's Africana Studies and Research Center will devote itself exclusively to the role of black women and scholarship in Africana studies from both theoretical and research perspectives. Sponsored in part by a grant from the Ford Foundation, the institute, titled "Holding Up Both Ends of the Sky: Engendering Africana Studies," will be held June 15 to 25.

The event is one of the first of its kind to directly address the disparities of black women's roles and perspectives in the history and development of Africana studies, said James Turner, Cornell professor of Africana studies and the director and coordinator of the institute. The development of the scholarly literature and research on the experience of women of African descent is integral to the intellectual, pedagogical and curricula advancement of the field, he said.

"Like many areas of American scholarship, Africana studies is male-dominated and paradigmatically male-centered in terms of major theoretical, historiography and social analysis," said Turner. "The function and purpose of this event is to conscientiously support the engendering of the field of Africana studies and to expand the scholarship and intellectual scope of the field."

For instance, Turner said, much of the history of the civil rights movement focuses on men like W.E.B. DuBois, Martin Luther King Jr. and Malcolm X, with tan-

genial references to significant women contributors. Most people know of Rosa Parks, a citizen who took a well-publicized stand against segregation and thus became an icon. But less is known about Ella Baker, a mentor and role model to King. Baker was a powerful influence on the work of the Southern Christian Leadership Conference as well as the Student Nonviolent Coordinating Committee. Before anyone knew of King, Baker was a field organizer for the NAACP, taking enormous personal risks in her efforts to secure black voters' rights in the south.

In addition to its central purpose of engendering the field, the institute also will provide a forum for exchange between distinguished scholars of black women studies

and graduate students and recent Ph.D.s working within the discipline.

Among the participants are a dozen leading Africana scholars and 25 institute fellows. Ten of the visiting scholars are women. Among the distinguished professors of Africana studies who will present talks in the Africana Studies and Research Center's Hoyt Fuller Room are: Elsa Barkley Brown, University of Maryland; Sheila Walker, University of Texas at Austin; Marta Moreno-Vega, Hunter College; Beverly Guy-Sheftall, Spellman College; and V.P. Franklin, Columbia University.

For dates and times of presentations, or for more information about the institute itself, contact Judy Jones at 255-4291 or Turner at 255-0531.

Grant helps establish Recombinant Protein Expression Lab at CU

By Roger Segelken

Molecular biologists at Cornell have established a Recombinant Protein Expression Laboratory with a five-year, \$986,000 grant from the National Cancer Institute.

Located in the Department of Chemistry and Chemical Biology, the centralized facility will produce proteins for cancer-related research throughout Cornell's Ithaca campus as well as at the Weill Medical College of Cornell and its Tri-Institutional Collaboration partners (Rockefeller University and Memorial Sloan-Kettering Cancer Center) in New York City.

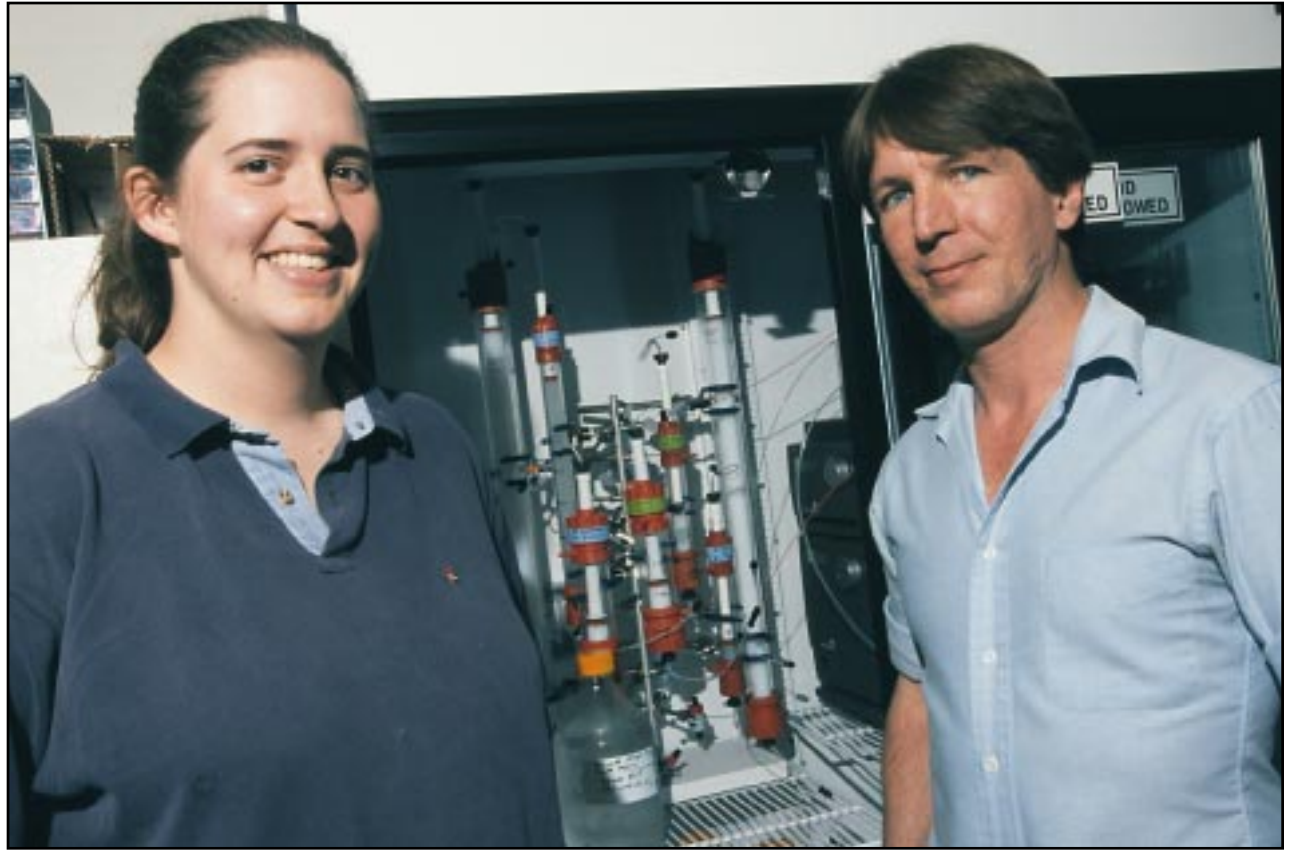
At first the facility will produce milligram quantities of naturally occurring proteins for structural analysis with X-ray crystallography and nuclear magnetic resonance (NMR), using bacterial (*E. coli*) and insect cell systems. Subsequently, as rational design identifies molecular targets to treat disease, the facility can scale up to produce larger quantities of proteins for clinical trials in the Comparative Cancer Program of the College of Veterinary Medicine and at other cancer centers.

Another goal of the new Cornell facility is to move beyond bacterial and insect cell-based production systems to the much more difficult – but potentially useful – process with mammalian cells, according to Danny Manor, assistant professor of nutritional sciences and director of the laboratory.

"Biomedical research benefits tremendously from being able to understand the three-dimensional structures of relevant proteins," Manor explained. "Such molecular-level pictures can open the door for educated design of intervention strategies by modifying the protein's biological activity."

But a bottleneck in structural determination of proteins often is the limited supply of highly purified proteins, Manor noted. "A centralized facility, where the necessary resources (equipment, personnel and know-how) are available, achieves three objectives: access for researchers who are not able to prepare such proteins on their own, reducing the cost associated with large-sale protein production, and expert help and training for interested investigators."

One cancer researcher who understands the difficulty of producing purified proteins and welcomes the new facility is Richard Cerione, a professor in the Departments of Molecular Medicine and Chemistry and Chemical Biology.



Shown in the Recombinant Protein Expression Laboratory in the S.T. Olin Laboratory are co-managers of the new facility, Cynthia Kinsland, left, research associate in the Department of Chemistry and Chemical Biology, and Stephen Campbell, research support specialist in the Department of Molecular Medicine.

His studies of molecular "switches" and other signaling components during malignant transformation of cells are aimed at eventually developing intervention strategies. But first he must determine the structure of numerous proteins functioning in complex, and that requires quantities of purified proteins that have been made, with considerable difficulty, in his labs.

"Our ideal goal, if we know the structure of a molecule we think is playing a role in cancer, is to make a small molecule in chemistry that can affect the protein's activity, then test the small molecule in clinical trials," Cerione said. "The first step is to be in a position to obtain molecular information about these important proteins. The advantage of a specialized, centralized facility is to bring together a lot of diverse groups on campus and in New York to expedite getting detailed information about cancer-relevant proteins."

Regarding clinical trials of treatments that are developed

from basic-science studies, Rodney L. Page, director of the Comparative Cancer Program and professor of clinical sciences, said, "It could be quite a while before that happens. But the hope is that by identifying a protein and being able to determine the structure, we can modify it to make it work better or inhibit its function. Then we might be able to develop a research program and test in various systems, from *in vitro* systems up to the animal models."

The new facility has been producing proteins from bacterial systems for several months, and capabilities for insect-cell production are about to be added, Manor reported, "but structural determination of proteins produced in mammalian cells is not something that is done yet, anywhere, so that is a goal to look forward to."

More information on the Recombinant Protein Expression Laboratory is available at <<http://cancerpxl.cornell.edu/>> or by directly contacting Manor at <dm43@cornell.edu>.

University joins statewide consortium to improve environmental quality

By Susan Lang

Cornell is one of eight academic institutions and four not-for-profit organizations forming a statewide consortium with corporate and economic development partners to improve environmental quality through the development of new integrated systems that enhance human health and performance, reduce lifecycle costs and improve the quality of built and urban environments.

On June 5 at Syracuse University, New York Gov. George Pataki announced the creation of the consortium – the Center of Excellence in Environmental Systems (CoE-ES) – with support of \$37 million from the state to fund the center. The CoE-ES, which has headquarters at Syracuse, is a regional partnership founded to coordinate and channel the research, development and production of environmental system solutions.

Through a network of shared facilities in central New York, CoE-ES will seek to

improve human health and performance, reduce energy consumption and improve quality of life by focusing on research and development, technology transfer and education in the areas of built environment systems (indoor air quality, comfort, lighting, acoustics, energy efficiency and intelligent control systems) and urban ecosystems (renewable resources, ambient air quality, water resource management, waste management and sustainable development).

The College of Human Ecology at Cornell will be involved with the center's human health and performance segment, including researching human responses to a range of environmental disturbances, such as air quality, sound, lighting, ergonomics and thermal comfort. Alan Hedge, a professor in the Department of Design and Environmental Analysis, will serve on the center's Science and Technology Advisory Committee. Joseph Laquatra, associate professor of design and environmental analysis, will be the

leader for outreach in the business development area, which is focused on technology transfer and commercialization of the center's research and intellectual property. Ann Lemley and Kay Obendorf, professors in the college's Department of Textiles and Apparel, also will be involved in both research and outreach education.

In addition, faculty members from the School of Mechanical and Aerospace Engineering at Cornell, including Sidney Leibovich, John Lumley, Zellman Warhaft and Albert George, will work with the center's built-environment segment in the area of thermofluid engineering and acoustics, specifically on turbulence modeling, flow control, atmospheric flows and atmospheric turbulence.

The members of the consortium, with Syracuse and Cornell, include the Metropolitan Development Association of Syracuse and Central New York, the New York Indoor Environmental Quality Center Inc.,

the State University of New York (SUNY) College of Environmental Science and Forestry at Syracuse, SUNY Upstate Medical University, Clarkson University, Rensselaer Polytechnic Institute, SUNY Albany, SUNY Buffalo, the Institute of Ecosystem Studies and the Upstate Freshwater Institute.

To date, the CoE-ES has generated more than \$170 million in public and private support from a consortium of university, research, corporate and economic development partners and from New York state and the federal government. The CoE-ES is supported by more than 50 corporate and economic development partners, who have pledged \$100 million in support of the center. Of the 50 partners, six have pledged a combined \$90 million: Pyramid Management Group Inc. (\$45 million); Niagara Mohawk Power (\$15 million); McQuay International (\$10 million); Syracuse Research Corp. (\$10 million); Carrier Corp. (\$6.5 million); and Welch Allyn (\$4 million).

CU's Nanobiotechnology Center will hold 'Moving Into the Future' meeting

The Nanobiotechnology Center (NBTC), a national research center at Cornell, will hold its annual meeting June 21 in 700 Clark Hall. The meeting, under the theme of "Moving Into the Future," will feature presentations on current research, including opportunities in medicine and life sciences and the novel properties of nanostructures.

The public is invited to attend the meeting without charge, although there will be limited seating. The meeting begins at 8:30 a.m. and ends at 5 p.m., following a poster session and reception.

Throughout the day there will be updates on the latest research by faculty from Cornell and the Weill Medical College of Cornell, as well as from graduate students.

The NBTC was designated as a science and technology center by the National Science Foundation in 2000. Support also is received from the New York State Office of Science, Technology and Academic Research.

Faculty members from six institutions,

including Cornell, the Wadsworth Center of the New York State Department of Health, Princeton University, Oregon Health Sciences University, Clark Atlanta University and Howard University, participate in the center's collaborative research program.

Nanobiotechnology (the name was coined at Cornell) uses the tools and processes typically applied to the fabrication of microelectronics to create novel devices that are used to explore questions in biology. Through an examination of nature, the researchers are developing new devices that mimic biological systems.

A significant effort is devoted to designing new classes of "biochips" that can analyze chemicals in minute samples and separate DNA with unprecedented speed and precision.

Registration information can be found on line at <<http://www.nbtc.cornell.edu/June2002.htm>>, or contact Lorraine Capogrossi at the Nanobiotechnology Center at 254-5393 or <nbtc@cornell.edu>.

Ellie, 1988-2002



College of Veterinary Medicine

The College of Veterinary Medicine cow, whose fistula (portal in the side) was a window to the mysteries of ruminant digestion, died June 2 of old age. Ellie, born in May of 1988, was a perennial favorite for thousands of Veterinary College Open House visitors and an esteemed "instructor" for hundreds of veterinary students. The removable cap on the fistula fitting also let Ellie serve as a rumen donor to less healthy cows, whose digestive juices needed a jump-start. Remembered by Farm Animal Hospital staffers as a gentle and patient animal who craved love and attention, Ellie outlived most Holsteins.

Site of golf's U.S. Open is sharply reducing pesticide use, with CU help

By Blaine P. Friedlander Jr.

Forget the sand traps and the water hazards. The real battle on Long Island's Bethpage State Park golf course, the site of this year's U.S. Open, today, June 13, through Sunday, June 16, is making the putting greens free from fungal diseases, cutworms and weevils – and safe from the pesticides used to combat them.

Turf scientists at Cornell and the Bethpage greenskeepers have been looking for ways to substantially reduce pesticide use on one of the nation's busiest public golf-course complexes.

Using techniques known as integrated pest management, insecticide use was reduced by 50 percent on the Bethpage Green golf course in 2001. Herbicide use was reduced by 33 percent and fungicide use was cut by about 30 percent, according to the first year's (2001) report of a three-year study conducted by Jennifer A. Grant, Cornell pest management specialist, and Frank S. Rossi, Cornell assistant professor of horticulture. Bethpage Green is one of the five courses at the state park. The U.S. Open is being played on Bethpage Black course, considered one of the toughest in the country.

"Because of changes in the laws, we won't have many of the pesticides available to use in the future, so we're trying to invent new ways, new tools to manage the older golf course. We're taking a management-systems approach," said Rossi. "Instead of looking for a silver bullet, we're changing the management system."

This research project accords with the late New York City Parks Commissioner Robert Moses' vision for the Bethpage State Park. "Whether it's holding the U.S. Open



Grant



Rossi

or conducting research on the park's Green course, he envisioned Bethpage as the leader on how you should be doing things," said Rossi.

The Bethpage Green course hosts more than 55,000 rounds of golf annually and was an original component of the state park when it opened in the 1930s. The putting greens are constructed of a native loamy soil, which is typical of older courses in the North-

east. Rossi said that conducting research on reducing pesticide use is a challenge on any course, particularly one so busy. "Everybody talks about thinking outside the box. With our project, there is no box. No one has ever tried to do anything like this before," he said. "We've become so reliant on pesticide chemistry that to completely remove it is a formidable challenge."

One of the Green course's toughest putting-green pests is a fungus called dollar spot, which produces small, tan-colored, circular spots in the turf about the size of silver dollars. It is a common, easy-to-control disease when typical pesticides are available.

Without pesticides applied at this early stage, dollar spot has devastated greens in the past. Today, though, greenskeepers remove the morning dew from the greens every day to reduce the fungal infection, Grant said. They also are able to delay the use of fungicides by vigilantly monitoring the turf and only treating when and where necessary. "It's still a challenge," she said.

In another effort to check diseases, velvet bentgrass has been installed on holes 7, 10 and 15 as a test. Typically the grass – with its velvetlike texture – is used on more northern or maritime golf courses. It can withstand the close mowing heights required for a good

putting surface but is much less susceptible to disease than creeping bentgrass or annual bluegrass, the more popular putting-green grasses in the Northeast.

Organic compost also has been helpful. During the winter, under the instruction of the turf scientists, the greenskeepers covered half the greens with organic compost to halt snow mold development. While preventing the fungus from growing, the compost fed the greens with nitrogen and micronutrients – possibly making the greens stronger and more able to resist future mold attacks. In February the compost was removed from the greens before the grass started to grow.

Early in the project, the scientists were aware that annual bluegrass weevils were over-wintering in the leaf litter and pine duff on the course. During the spring warm-up, greenskeepers tried using landscapers' large vacuums to remove the weevils as the insects migrated toward the greens. "It's very experimental, but I think it has some potential," said Grant.

The fungus *Anthraxnose* also was problematic at times on the greens, its appearance probably the result of turfgrass weakened by stress. Rather than fight the problem directly with fungicide, an effort was made to reduce the stress by manipulating traffic on the putting surfaces. The greenskeeping staff changed the hole locations on beleaguered greens, reduced the "clean-up passes" when mowing around the green and sometimes had to set up temporary surfaces to allow the greens to rest.

Extending the battle against *Anthraxnose* and other pests, Rossi and Grant took a radical step: They raised the mowing height on half of the greens from .12 of an inch to .18 of an inch. The longer grass should reduce the stress on root systems, rendering healthier plants. "Letting the bentgrass grow that high is a huge change in the world of golf," said Grant.

Fun with fractals: Math department campus conference slated for June 16-20

By Blaine P. Friedlander Jr.

The complex, symmetrical and seemingly haphazard world of fractals will come to life at the Conference on Analysis and Probability on Fractals, June 16-20, at Cornell's Department of Mathematics in Malott Hall. The conference is intended for any mathematicians or scientists interested in the subject.

A fractal – which is an irregularly shaped object, or any of its smaller parts, that is similar in shape to its whole – looks like a video-game image gone awry. Understand-

ing fractals has serious mathematical and scientific applications. By grasping the equations that make fractals, mathematicians may be able to build new models of the environment; astronomers may be able to understand the chaotic nature of the universe; and meteorologists may be able to develop accurate long-range forecasts from apparently aimless weather patterns.

The area of analysis and probability on fractals, created about 15 years ago, seeks an understanding of dynamic processes taking place in them. For example, how would a fractal vibrate if it were hit by a hammer?

Or how would it diffuse if a blowtorch were applied to it?

"We wanted to do something that is not often done and that is to bring together mathematicians working in this area, and also graduate students and researchers from related areas, who would like to learn more about it," said Robert Strichartz, Cornell professor of mathematics, who is organizing the conference. It will include a short course – intended to bring those mathematicians unfamiliar with analysis and probability on fractals up to speed on the subject. The course will start with basic definitions

and examples, and ultimately reach to the frontiers of research.

There also will be a presentation by Alex Smith '02, who graduated from Cornell in May and who worked with Strichartz through Cornell's Research Experiences for Undergraduates program, which is sponsored by the National Science Foundation. Smith has developed numerical analysis algorithms to study differential equations on the fractal called the pentagasket.

To register for the conference, contact Donna Smith at <dls37@cornell.edu> or 255-6757.

Single-atom transistor *continued from page 1*

using a different molecule. Both teams were able to start and stop the flow of electrical current by adjusting the voltage near the bridging molecule.

Although the single-atom transistor demonstrates the potential for shrinking the size of components well beyond what is possible using conventional lithographic techniques, said McEuen, there are major technological hurdles to be overcome in order to build such a transistor for electronic

applications. One problem to be solved, for example, is gain, the ability to amplify a small signal.

The Cornell group plans next to focus on engineering a molecule with two different geometries (or shapes) that could act as a switch, changing between the two forms with the application of a voltage. "No one has yet put a single molecule in a circuit and activated it electronically," McEuen observed.

Other collaborators on the *Nature* paper, titled "Coulomb blockade and the Kondo effect in single atom transistors," are, at Cornell, James Sethna, professor of physics; postdoctoral associate Yuval Yaish; and graduate students Connie Chang and Jason Petta; and Oberlin College undergraduate Marie Rinkoski. The research was funded by the National Science Foundation, the Department of Energy, the Department of Education and the Packard Foundation.

R E U N I O N 2 0 0 2

Olin panelists discuss the Middle East crisis with alumni audience

By Franklin Crawford

During his presentation June 7 at the Spencer T. and Ann W. Olin Lecture on the Middle East crisis, Cornell Professor Ross Brann brought home the region's growing body count in figures American audience members might grasp.

As of mid-April, Brann said, more than 400 Israelis and more than 1,200 Palestinians – mostly civilians on both sides – had been killed. Brann converted those figures to numbers proportional to the U.S. population: 400 dead Israelis would equal about 24,000 dead Americans; 1,200 dead Palestinians would equal about 120,000 dead Americans.

"It is time for the U.S. and NATO to step into this fray," said Brann, the M.R. Konvitz Professor of Judeo-Islamic Studies and chair of the Department of Near Eastern Studies. "There is no military solution to the Palestinian-Israeli conflict. ... Those who believe in terrorizing of Jews or in the humiliation of Palestinians are doomed to fail as surely as they will spill ever more blood."

Brann was among three members of a distinguished Olin Lecture faculty panel for Reunion 2002 speaking on the subject of "The Middle East Crisis: Reflections on the Israeli-Palestinian Impasse" to an audience of more than a thousand alumni in Bailey Hall. Brann was joined by Peter Katzenstein, the W.S. Carpenter Jr. Professor of International Studies in the Department of Government; and Vice Provost Isaac Kramnick, the R.J. Schwartz Professor of Government. President Hunter Rawlings provided introductory remarks and served as forum moderator.

Brann said he saw signs of hope for a two-state solution to the conflict, but not without political, military and economic intervention from the United States and NATO.

Katzenstein followed Brann's call to international and, specifically, American involvement in the Middle East with observations on the limits of the U.S. influence as a global power broker. Referring to the United States as the "new Rome," Katzenstein said the Bush administration, for all the collective savvy of its foreign policy experts, languishes in a Cold War geopolitical paradigm and fails to appreciate the profound domestic divisions of other nations.

"The world is no longer divided into clearly demarcated rival blocks. ... Ours is a world of regions, with the U.S. at the center of the hub ... actively engaged in all world regions," said Katzenstein. "But with the exception of Central America, [the United States] cannot dictate the political outcome in any region, including the Middle East. Local factors are typically too strong and American interest too weak to impose lasting political solutions."

As the Middle East conflict intensifies, said Katzenstein, political extremists on both sides have gained power, while the Bush administration has vacillated.

"History teaches us that the Middle East conflict is inherently intractable to mediate



Nicola Kountoupes/University Photography
Panelists for the Reunion weekend Olin Lecture, June 7, in Bailey Hall include, from left, Ross Brann, the M.R. Konvitz Professor of Judeo-Islamic Studies; Peter Katzenstein, the W.S. Carpenter Jr. Professor of International Studies; and Vice Provost Isaac Kramnick, the R.J. Schwartz Professor of Government.



Nicola Kountoupes/University Photography
Following the panel discussion, questions and comments came from audience members, including John Wolberg '57, an engineering professor living in Haifa, Israel.

even for the biggest of all powers," said Katzenstein. "Only when our thinking catches up with the new realities of world politics will we have a chance, but not a guarantee, to do better."

Kramnick then delivered a 10-minute talk on "How Americans Debate the Middle East." A key figure in organizing teach-ins and other group discussions on campus in the wake of Sept. 11 and the eruptions in the Middle East, Kramnick assessed the state of Middle East debate based on observations of four key American institutions: the Congress, the president, the press and the universities.

Kramnick examined his subject by the rarified light of 19th-century philosopher

John Stuart Mill, who saw democracy as a process of reasoned debate, where all opinions are examined with an attitude of tolerance and a willingness to compromise. As much interested in the tone and manner of the debate as in its content, Kramnick averred that signs of pure democracy in the American debate have been spotty at best. America's historically strong support for Israel has persisted through the current crisis, he said, "even though the Muslim population in America has come to nearly equal the Jewish population."

That support was visible in the bipartisan resolutions passed by Congress with little or no debate declaring unqualified support for Israel's military actions against the Pales-

'The world is no longer divided into clearly demarcated rival blocks. ... Ours is a world of regions, with the U.S. at the center of the hub ... actively engaged in all world regions.'

– Peter Katzenstein, the W.S. Carpenter Jr. Professor of International Studies

tinians, Kramnick pointed out.

"From the Republican Tom Delay to the Democrat Joe Lieberman there was only praise for Sharon and disdain and disgust for Arafat," said Kramnick. "... This makes it difficult for anyone in Congress to see the conflict as possibly the tragic clash of two peoples' national aspirations and thus to explore any mediated compromise solutions."

By comparison, President Bush seems willing to explore reasonable compromises between Israel and the Palestinians, he said – but, on closer examination, the administration more closely resembles Congress and, in fact, appears to favor Israel unilaterally. As for the press, some efforts at reasonable and balanced reporting have been criticized as being supportive of the Arab cause, Kramnick said. CNN and NPR have been accused of pro-Palestinian leanings when presenting balanced views, and some New York rabbis organized a boycott against *The New York Times*, "claiming that it had created a false equivalency between the two sides ... and gave disproportionate attention to Palestinian sufferings."

On American campuses, pure democratic debate also has received a good drubbing but there are some signs of the Millsian concept – right here at home, Kramnick said.

"The public discussions about the Middle East here at Cornell these past two semesters would have pleased John Stuart Mill, characterized as they have been by rational debate and the civil exchange of ideas and positions even when anger and passionate loyalty informed those positions," Kramnick said.

The panel then fielded questions from the audience.

John Wolberg '57, an engineering professor living in Haifa, Israel, said he had just come from Israel.

"I can tell you the mood of the country is that we've come to the conclusion that they [Palestinians] really don't want to get rid of the settlements and the occupation; what they really want is to drive the Jews into the sea," he said. "We've come to that conclusion, that's the logic of the current situation."

Katzenstein responded in part by suggesting that framing the conflict in terms of "us" against "them" oversimplified complex issues and is one of the big reasons why the conflict is so intractable.

Another Reunion panel has a spirited discussion on aftermath of Sept. 11

By Linda Myers

"The Aftermath of Sept. 11" was the subject of a rapid-fire Reunion Weekend panel discussion that presented a range of views. Panelists included a government professor, a historian, a Near Eastern studies expert on the Arab-Israeli conflict and an authority on international law.

The panel, which was followed by a heated question-and-answer session with alumni attendees, took place in G-08 Uris Hall on June 6. Panelists, who each spoke for 10 minutes, included these Cornell faculty members: Jonathan Kirshner, professor of government; Barry Strauss, professor of history and classics and director of Cornell's Peace Studies Program; Samer Alatout, a visiting assistant professor of Near Eastern studies in 2001-02 who is now at Dartmouth, and David Wippman, professor of law. The event, which drew a large crowd, was sponsored by the Einaudi Center for International Studies and the Peace Studies Program.

'I believe, by and large, that American power is a good thing for the U.S. and the world at large.'

– Panelist Barry Strauss, Cornell professor of history and classics

Kirshner began, warning against harboring a false sense of optimism because of early U.S. success in the war in Afghanistan. A more difficult phase in the war is beginning, he said, "with political goals becoming less clear, more-sluggish military progress and support for the U.S. tending to erode as the war broadens." He called Pakistan a danger point at risk of becoming "East Talibistan." Predicting that more terror attacks by extremist groups against U.S. targets

would lead to more calls for curbs on U.S. civil liberties, he reminded the group that "civil liberties is what we're fighting for." He also cautioned against appearing "too powerful" to allies and enemies.

Strauss disagreed. "I believe, by and large, that American power is a good thing for the U.S. and the world at large," he said. "The war is going well; the United States and its allies are winning and likely to do better as the war goes on," and the events of Sept. 11 have "taken the world on a better path, rather than a worse one." While he also predicted that there would be more terrorist acts, "if we had not acted [after the attacks of Sept. 11, 2001], it would have been worse."

Alatout, whose family is Palestinian, said that the events of Sept. 11 had moved some Israelis to call for an end to the occupation of the West Bank, but others, unfortunately, among them Israeli prime minister Ariel Sharon, he said, were using the attacks to paint the Palestinians with the same

Continued on page 6

9/11 talk *continued from page 5*

brush as Al Qaeda terrorists. "That [claim] should be rejected by all of us," said Alout. He asserted that most Palestinians, unlike Al Qaeda members, were not extremists from the Moslem religious right engaged in an armed struggle against the West, but a people involved in a liberation movement characterized by genuine resistance activities against an occupying army – Israel's – a point of view later concurred with by Strauss.

Wippman, who served on the U.S. National Security Council in 1998-99, offered an international lawyer's point of view on the war in Afghanistan. "What international lawyers care about is whether the United States had a legal basis, under the United Nations charter and related, customary international law, for the use of force and whether the war is being fought consistently within the rules of humanitarian law" under the Geneva Conventions of 1949, he said.

Although experts worried that U.S. actions flaunted international laws, "NATO, the OAS and individual countries accepted the U.S. position that its actions were in self defense, and the U.N. Security Council and General Assembly acquiesced. This shows a relaxation in the constraints on the use of force made possible by the end of the Cold War," said Wippman.

However, U.S. plans to try detainees at military tribunals, and bypass Geneva Conventions rules, were moderated in the face of strong international criticism and worries by U.S. Secretary of State Colin Powell and the Joint Chiefs of Staff that the questionable decision "would come back to haunt us," Wippman observed.

During the question-and-answer session, one audience member asked what Al Qaeda's goal was. Strauss responded: "To get American power out of the Middle East, replace the current Saudi regime with [one that adheres to] a fanatical version of Islam."

Another questioned Alout on why Palestinian Liberation Organization leader Yasser Arafat had rejected former Israeli prime minister Ehud Barak's offer of land for peace, and the two sides allowed peace negotiations to fall apart after years of efforts. Alout acknowledged errors on the part of both leaders, but added that Barak's decision to allow Sharon to visit the Temple Mount, home to a revered Moslem holy site in Jerusalem's Old City, accompanied by hundreds of armed guards, "didn't help." Although Israel retains formal sovereignty over the site, it is governed by an Islamic trust that allows non-Muslims to visit during limited hours. A second Palestinian "intifada," or uprising, began in fall 2000 shortly after that visit, which also precipitated Barak's fall and Sharon's rise to power.

Responding to a question about the success of the surprise terrorist attacks of Sept. 11, Strauss commented: "Some people think that 9/11 was not a success for Al Qaeda but the worst thing they did." The American public had been divided on how to respond to earlier attacks such as the one on the U.S.S. Cole in Aden's harbor in Yemen in October 2000, he noted. "But this [attack on the World Trade Center and Pentagon] was such a dramatic symbol that it drew a major response [of condemnation]."

But Wippman said he was worried that the Sept. 11 terrorist attacks might be used to justify further U.S. military strikes that violate international law. "We do not have a legal reason to attack Iraq," he stressed.

R E U N I O N 2 0 0 2



Robert Barker/University Photography

Above: Howard Greenstein '57 and Bill Hodges '52 sing a duet with the Alumni Chorus and Glee Club during Cornelliana Night in Bailey Hall Saturday during Reunion 2002.

Right: Jide Bell '97 and Victor Borges '97, who were recently engaged, enjoy an evening with friends at the reunion tents on the Arts Quad.

Below: Debra Weinberger '82 introduces her son, Evan, to President Emeritus Frank H.T. Rhodes at the Class of '82 lunch on the Arts Quad Saturday.



Robert Barker/University Photography



Robert Barker/University Photography

State of the University *continued from page 1*

last winter. "Frank has made remarkable progress (in his recovery)," Tanner announced. "Welcome home!"

The Class of '52 had set a new university record for participation (54 percent) in a fund-raising campaign, Tanner observed, calling Cornell alumni "legendary for their love of our university" and the level of Cornell alumni support "the envy of the entire country." Then Rawlings cited some specifics: The new and five-times-larger Lab of Ornithology facility, which will open next year, will be named the Imogene Pow-

ers Johnson Center for Birds and Biodiversity, the president said. Speaking of "Gene" Johnson, and introducing her husband, Sam, Class of 1950, "and a distinguished Cornellian in his own right," Rawlings said: "Her interest has touched virtually every aspect of the lab's operations, from management of the sanctuary to its efforts in education and outreach, to the new building, in whose planning she has had a major role."

Also, a recently completed and occupied structure for students on North Cam-

pus will have a new sign – Appel Commons, the president said. The naming is in recognition of the generosity of Robert and Helen Appel, both to construction of the new North Campus facilities, home to first-year students, and for the upcoming construction on West Campus, where what Rawlings called the "residential transformation" will offer living-learning opportunities for upper-level students.

"I am proud of the way Cornell has responded to the crises of the past year," Rawlings said, describing the Sept. 14 gath-

ering on the Arts Quad (in remembrance of the events of Sept. 11) where an estimated 13,000 Cornellians came together "to honor those who had been lost, offer consolation to those in need, acknowledge our common humanity and to affirm our belief in Cornell as a diverse and open community committed to the ideal of freedom and responsibility within a democratic nation."

The events of Sept. 11 and other recent crises have given a renewed urgency to the study of the humanities and to a liberal arts

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R E U N I O N 2 0 0 2



Robert Barker/University Photography



Frank DiMeo/University Photography



Frank DiMeo/University Photography



Frank DiMeo/University Photography

Clockwise from the top: Classmates Amy Ludwig '82 and Mary Mullenhoff '82 catch up on old times at the Reunion tents on the Arts Quad Saturday night. President Hunter Rawlings greets Grace Vigurs '27, the oldest returning alum at this year's reunion and the only member of her class to attend, and her son, Richard '55, at the combined reception for the classes of '27, '32, '37 and '42 in the Statler's Carrier Ballroom Thursday evening. Whitney Mitchell '52 gives a hand to the Big Red Bear (Mitchell himself was the bear in 1951-52) at the Class of '52 reception and dinner in Barton Hall Saturday. Helen Maly '32, the oldest returning alum from what is now the College of Human Ecology, smiles for the camera at the college's reunion breakfast Saturday morning in the Statler Ballroom.

State of the University *continued from page 6*

education, the president said. The humanities – and those who teach and study in those fields, the president said – are “opening up the possibility of apprehending the world more fully, for thinking differently and ultimately for understanding in unfamiliar and more complex ways.”

Elsewhere on campus – virtually everywhere on campus, in fact – the New Life Sciences Initiative “will fuse the traditional biological disciplines with engineering, chemistry and the physical sciences, and also with computer science and mathemat-

ics,” Rawlings explained. About \$100 million has been invested in life science-related programs, people and facilities in the past five years, he reported, but much more is to come.

“Cornell’s commitment to attracting top-flight faculty members, making significant upgrades and additions to our research facilities, and endowing programs has come about largely through the generosity and commitment of alumni,” Rawlings said, hinting how Cornellians could support the \$500 million initiative. “The more you un-

derstand these new initiatives, the stronger and more vibrant Cornell can become.”

As the president was winding down his State of the University address, and telling why “exceptionally bright and energetic” students have inspired him to return to teaching after his retirement from the presidency next year, the Big Red Bear was waiting in the wings. Undoubtedly even more uncomfortable than the shirt-sleeved audience, the furry-suited mascot had a reminder and a gift for the president: Tell the Reunion crowd about

the next event in Schoellkopf Stadium, the “Big Red Live” photo op, where a helicopter would hover over the field to take a group picture, the bear whispered.

Then the Big Red Bear gave Rawlings a bright red ball cap to wear for the picture. The president remarked about the hat’s size, which even for his lanky frame seemed more than adequate. Too big or not, the cap would be just another pointillist dot that sunny morning among the aggregation of happily photographed Cornellians. So Rawlings donned the cap and led the way.

CALENDAR

June 13
through
June 27

TO SUBMIT A NOTICE:

Items for the calendar should be submitted by campus mail, U.S. mail or in person to Chronicle Calendar, Cornell News Service, Surge 3, Ithaca, N.Y. 14853. Notices should be sent to arrive 10 days prior to publication and should include the name and telephone numbers of a person who can be called if there are questions.

exhibits

Johnson Museum of Art
The Herbert F. Johnson Museum of Art, on the corner of University and Central avenues, is open Tuesday through Sunday from 10 a.m. to 5 p.m. Admission is free. Telephone: 255-6464.

- "The Flowers of Pierre Joseph Redouté," through June 16.
- "Reality Reimagined: Photography Since 1950," through July 14.
- "Oh Monal" through Aug. 2.
- "Sandy Skoglund: Raining Popcorn," through Aug. 11.

Hagan Room Gallery, Schurman Hall
(M-F, call 253-3769)
An exhibit of drawings and sculptures by contemporary artist James Rosburg will be displayed through June 20.

Kroch Library
(M-F, 9 a.m.-5 p.m.)
"Not by Bread Alone: America's Culinary Heritage," through Oct. 4.

films

Films listed are sponsored by Cornell Cinema, held in Willard Straight Theatre and are open to the public. All films are \$6 (\$5 for undergraduates and seniors/\$4 for graduate students and kids 12 and under). Cornell Cinema accepts 1/8 Ithaca Hour toward the purchase of one general admission ticket. Visit the Cornell Cinema web site at <<http://cinema.cornell.edu>>.

Wednesday, 6/19
"Lantana" (2001), directed by Ray Lawrence, with Anthony LaPaglia, Geoffrey Rush and Barbara Hershey, 7:15 p.m.
"Lord of the Rings: Fellowship of the Ring" (2001), directed by Peter Jackson, with Elijah Wood, Ian McKellen and Viggo Mortensen, 9:45 p.m.

Thursday, 6/20
"Ram Dass: Fierce Grace" (2001), directed by Mickey Lemle, 7:45 p.m.
"Storytelling" (2001), directed by Todd Solondz, with Selma Blair and John Goodman, 9:45 p.m.

Friday, 6/21
"Band of Outsiders" (1964), directed by Jean-Luc Godard, with Anna Karina, Sami Frey and Claude Brasseur, 7:45 p.m.
"Lord of the Rings: Fellowship of the Ring," 9:45 p.m.

Saturday, 6/22
"Lantana," 7:45 p.m.
"Storytelling," 9:45 p.m.

Sunday, 6/23
"Storytelling," 10:30 p.m.

Monday, 6/24
"Ram Dass: Fierce Grace," 7:45 p.m.
"Band of Outsiders," 9:45 p.m.

Tuesday, 6/25
"Band of Outsiders," 7:45 p.m.
"Lord of the Rings: Fellowship of the Ring," 9:45 p.m.

Wednesday, 6/26
"Storytelling," 7:45 p.m.
"Lantana," 9:45 p.m.

Thursday, 6/27
"The Independent" (2001), directed by Stephen Kessler, with Jerry Stiller, Janeane Garofalo and Roger Corman, 7:45 p.m.
"Human Nature" (2002), directed by Michael Gondry, with Tim Robbins, Patricia Arquette and Rhys Ifans, 9:45 p.m.

music

Summer Session
June 25, 7:30 p.m., Schwartz Center: Cayuga Vocal Ensemble will perform. See story below.

Bound for Glory
June 16: Albums from the studio.
June 23: John Specker will perform in the Cafe at Anabel Taylor Hall. Bound for Glory is broadcast Sundays on WVBR-93.5 FM, 8 to 11 p.m.

religion

Sage Chapel
No service until June 30.

African-American
Sundays, 5:30 p.m., Anabel Taylor Chapel.

Baha'i Faith
Fridays, 7:30 p.m., meet in the lobby of Willard Straight Hall, speakers, open discussion, games and service-oriented activities. Classes, speakers, prayers, celebrations at alternating locations. For more information, call 272-3037 or send e-mail to <bahai@cornell.edu>.

Buddhist
• Tibetan Buddhist Class, instructed by the Ven. Tenzin Gephel, Mondays, 5:30 p.m., 314 Anabel Taylor Hall. For more information contact <tg47@cornell.edu> or call 255-4214.
• Meditations: Monday, Wednesday and Thursday, 12:15-1 p.m., Founders Room, ATH.
• Zen Meditation practice is Mondays and Wednesdays, 5:30-6:30 p.m., Founders Room, ATH. For info, call Anne Marie at 266-7256.

Catholic
Weekend Mass schedule: Sunday, 10 a.m., in the Anabel Taylor Hall Auditorium.

Christian Science
Testimony meetings: Tuesday, 7:15 p.m., Anabel Taylor Hall. Church services: Sundays, 10:30 a.m., and Wednesdays, 7:30 p.m., First Church of Christ Scientist, 101 University Ave., Ithaca.

Cornell Christian Fellowship
Meets every Friday at 7:30 p.m. in the One World Room, Anabel Taylor Hall.

Episcopal (Anglican)
Wednesdays, worship and Eucharist, 5 p.m., Anabel Taylor Chapel.
Sundays, worship and Eucharist, 9:30 a.m., ATH Chapel.
For more information, call 255-4219 or send e-mail to <eccu@cornell.edu>.

Friends (Quakers)
Meeting for worship, Sunday, 10:30 a.m., at the Hector Meeting House on Perry City Road. Child care provided. For information call 273-5421.

Hindu
Hindu discussion every Friday at 5 p.m., in 183 Rockefeller Hall.
Weekly religious service is Saturdays at 4 p.m. in the Edwards Room, Anabel Taylor Hall, followed by a Gita reading at 5 p.m.

Jewish
• Conservative and Reform: Fridays, 5:15 p.m., Welcoming in Shabbat with song, in the lobby of Anabel Taylor Hall, followed by a community Shabbat dinner at 6:45 p.m. in the Kosher Dining Hall. Saturdays, 9:45 a.m., Conservative services in the Founder's Room, ATH. Call the Hillel office at 255-4227 for more information.
• Orthodox: Friday, Young Israel House, call 272-5810 for weekly times; Saturday, 9:15 a.m., Edwards Room, ATH. For daily service times, call 272-5810; all daily services are at the Young Israel House.

Korean Church
Sundays, 11 a.m., One World Room (in English), and 1 p.m., chapel (in Korean), Anabel Taylor Hall. Call 255-2250 for more information.

Latter-Day Saints (Mormon)
Cornell student branch: Sundays, 9 a.m. Call 272-4520 or 257-6835 for directions and transportation. Basketball on Wednesdays, 8 p.m.

Lutheran
Campus ministry at St. Luke Church, 109 Oak Ave., in Collegetown, Sundays, 9:30 a.m. Bible study Wednesday, 7:30 p.m. For more information call 273-6811 or e-mail <rlb8@cornell.edu>.

Muslim
Daily congregational prayer at 218 Anabel Taylor Hall.
Weekly Friday prayer, 1:15-1:45 p.m., One World Room, ATH. Weekly Halaqa, Friday, 6:30-7:30 p.m., 218 ATH.

Orthodox Christian Fellowship
Father Stephen Lilley will lead Vespers followed by discussion, every Monday at 5 p.m. in Anabel Taylor Chapel.

Pagan
For information about United Pagan Ministries, call Cornell United Religious Work at 255-4214.

Protestant Cooperative Ministry
Sunday service at 11 a.m. in Anabel Taylor Chapel.

seminars

Biomedical Sciences
"Leukocyte Adhesion and Bacterial Infection Mediated by PSGL-1," Karen Snapp, Northwestern University Medical School, June 13, noon, Lecture Hall III, Veterinary Research Tower.

"A Novel Wnt/Dv12/b-catenin/Pitx2 Pathway Regulated the Cardiac Outflow Track Development," Chrissa Kioussi, University of California-San Diego, June 25, noon, Lecture III, Veterinary Research Tower.

Molecular Biology & Genetics
"An Epigenetic Switch: Prion-Based Protein Regulation," Jonathan Weissman, University of California-San Francisco, June 14, 4 p.m., G10 Biotechnology Building.
"Generation of Living Color Transgenic Zebrafish and Their Applications," Zhiyuan Gong, National University of Singapore, June 19, 4 p.m., Racker Room, Biotechnology Building.

miscellany

Alcoholics Anonymous
Meetings are open to the public and will be held Monday through Friday, 12:15 p.m., in Anabel Taylor Hall. For more information, call 273-1541.

CU's free 2002 Summer Concert and Lecture Series is announced

Cornell's School of Continuing Education and Summer Sessions has announced its 2002 Summer Concert and Lecture Series. The series, which runs from June 25 to Aug. 2, features Tuesday night classical concerts, Wednesday night lectures and Friday night outdoor concerts. All events are free and open to the public.

The Tuesday night classical concert series brings gifted composers and musicians to the Ithaca community, with something to please every palate. The first concert of the season showcases Ithaca's own professional vocal ensemble, the Cayuga Vocal Ensemble, and features madrigals by Thomas Weelkes, Samuel Barber's *Reincarnations* and a composition by Peter Schickele on life, love and the lottery. This concert will be presented Tuesday, June 25, at 7:30 p.m. in the Schwartz Center for the Performing Arts. Free tickets (four per person) are required for all classical concerts and will be available beginning at 6:30 p.m. in the lobby of the theater on the day of each performance.

The School of Continuing Education and Summer Sessions also is sponsoring a Wednesday night lecture series that brings local and visiting distinguished speakers to the David L. Call Alumni Auditorium in Kennedy Hall. This year's series begins July 10 at 7:30 p.m. with Cornell paleontologist John Chiment, well-known for his instrumental role as the paleontologist in charge of the recent excavation of three

mastodon skeletons found in upstate New York. He will speak on "Dinosaurs, Dirt and Charlemagne's Crown."

A great way to start the weekend is with a picnic and a Friday night concert. This year, the Friday night outdoor concert series begins with Samite on June 28 at 7:30 p.m. on the Arts Quad. As Uganda's unofficial musical ambassador to the United States, Samite celebrates and preserves the music of his native Baganda culture. His songs are sung in the language of his homeland and played on traditional African instruments. Also of special note is the July 5 performance by Luluk Purwanto and The Helsdingen Trio and Stage Bus. It's a music project, with Indonesian, American and Dutch roots, touring the United States and reviving a tradition from the earliest days of American jazz, when musicians traveled with band buses, carrying their music to "out of town" dance halls. What's unique is that the Stage Bus is rebuilt, and the side of the bus can be lowered to form a stage.

Here's the complete schedule for the summer:

- **Classical Concerts:** Tuesdays, 7:30 p.m., Kiplinger Theatre, Schwartz Center for the Performing Arts
- June 25: The Cayuga Vocal Ensemble (vocal)
- July 2: The Serenata Trio (flute, violin and viola)
- July 9: Brendan Callahan with John Brennan (Irish fiddle and guitar)
- July 16: Richard Shuster (piano)

July 23: Jim Self (dance)
July 30: Johnny Russo and The East Hill Jazz Quintet (jazz)
• **Lectures:** Wednesdays, 7:30 p.m., David L. Call Alumni Auditorium, Kennedy Hall

July 10: John Chiment, "Dinosaurs, Dirt and Charlemagne's Crown"
July 17: Sally Satel, "Trauma-rama: How Resilient Are We?"

July 24: Diane Ackerman, "Cultivating Delight"
July 31: Polly Matzinger, "Turned on by Danger"
• **Outdoor Concerts:** Fridays, 7:30 p.m., Arts Quad (rain location for all concerts: Uris Hall Auditorium)
June 28: Samite (African)
July 5: Luluk Purwanto and The Helsdingen Trio and Stage Bus (jazz)
July 12: The Lonesome Road Ramblers (bluegrass)
July 19: Millennium New Orleans Jazz Band (Dixieland jazz)

July 26: Radio London ('60s rock 'n' roll)
Aug. 2: Rising Sign (Latin)

For a summer events calendar, directions or further information about the series, contact the School of Continuing Education and Summer Sessions, B20 Day Hall, Ithaca, N.Y. 14853-2801; e-mail <cusce@cornell.edu>, phone 255-4987, or visit the web at <www.sce.cornell.edu/events.html>.