BREAKTHROUGHS

A Magazine for Alumni and Friends of the College of Natural Resources, University of California, Berkeley

College of Natural Resources **Fall 2003** VOLUME 9, NUMBER 1

AN INTERVIEW WITH
NORMAN BORLAUG

Fall 2003

BREAKTHROUGHS®

COLLEGE OF
Natural Resources
UNIVERSITY OF CALIFORNIA, BERKELEY

in this issue

Help us serve you better!

Please fill out and return the Communications Survey enclosed in this issue of *Breakthroughs*.

Cover photograph by Peg Skorpinski

EDITOR
Kathryn Stelljes

DEAN
Paul Ludden

DESIGN, EDITING, PRODUCTION
UC Berkeley Extension

PRINTING
UC Printing Services

Volume 9 • Number 1

Please direct all correspondence to:

Breakthroughs
College of Natural Resources
University of California, Berkeley
101 Giannini Hall, #3100
Berkeley, CA 94720-3100

Telephone:
(510) 643-8860

E-mail: breakthroughs@nature.berkeley.edu

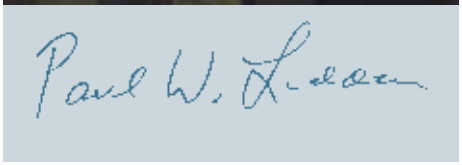
website:
http://nature.berkeley.edu

BREAKTHROUGHS IS PRINTED ON RECYCLED-CONTENT PAPER

A Note from the Dean

COLLEGE STAFF: THE BACKBONE OF OUR SUCCESS

Noah Berger



As I complete my first year with the College, the thing that has struck me as the biggest positive is the quality of the College's staff. Their dedication, loyalty, and abilities are both gratifying and amazing. Before arriving, I knew that CNR boasts excellent faculty and students. Now I know that the staff members who support their activities are equally important to our College.

While it is often the faculty of the College who receive the fanfare, and deservedly so, it is the activity of the staff that makes the miracles possible. The College is fortunate to have so many dedicated, long-term staff members who look after the administrative needs of our students, care for the College's facilities and field plots, and provide support for our programs.

Behind each of the stories in this issue are staff members who make the programs possible, from field support for Sudden Oak Death treatment trials, to administrative support for the summer Beahrs Environmental Leadership Program and the new Californian Cooperative Ecosystem Studies Unit.

CNR undoubtedly has the most diverse set of job titles of any college at Berkeley. Included in our family are not only the administrative assistants, academic coordinators, and student affairs officers found in other colleges, but also librarians, computer specialists, cooks, editors, farm maintenance workers, food service managers, laboratory assistants, and a spectroscopist.

Protecting these staff is critical in the current budgetary environment. Approximately 90 percent of the College's budget is used to pay the salaries of faculty and staff of the College. When massive budget cuts such as those currently being imposed on the College are dealt with, it is important to keep sight of the fact that those dollars represent people's jobs and positions. The knowledge and experience of our staff are not commodities that can be put in storage or rehired when times are better. We have committed to maintaining the excellence of our staff through this crisis.

One component of that commitment is the subcommittee on staff climate and experience chaired by Associate Dean **Lew Feldman.** This subcommittee is a component of the College's strategic planning committee and is attempting to discover and define the issues most important to our staff. A number of the College's staff are participating on this committee. It is our hope that we can not only protect the positions of our staff but also improve their working environment and their job satisfaction. While it is a small step, we have just announced a program of staff awards to recognize the excellence in our staff.

So, to those who serve as building managers, thank you. To those who serve as the departmental management services officers, thank you. To those who maintain the greenhouse facilities, thank you. To all the student affairs officers, thank you. To those who work in the College business offices, thank you. To you and all of your colleagues in the CNR staff, thank you.

The College would not survive for a minute without your dedication and service.

Research News

COLLEGE HOSTS NEW STATEWIDE RESEARCH COLLABORATION

Craig Moritz, Barbara Allen-Diaz, James Shevock, and Steven Beissinger

A new era of scientific collaboration for the benefit of the environment began this fall as the Californian Cooperative Ecosystem Studies Unit (CESU) met to set goals for the next five years.

This unit and others like it nationwide establish a streamlined method for matching the research and technical assistance needs and funding of federal agencies with the scientific interests and expertise of university faculty and graduate students. The Californian CESU, hosted by the College of Natural Resources at UC Berkeley, brings together nine University of California campuses, three California State University campuses, and six federal agencies.

While other CESUs have been established for a dozen other geographic regions nationwide, the Californian CESU has several unique traits.

"The Californian CESU provides the largest scope of collaboration among educational institutions," said **Steven Beissinger**, chair of the College's Department of Environmental Science, Policy, and Management. Beissinger and Professor **Craig Moritz**, director of UC Berkeley's Museum of Vertebrate Zoology, wrote the original proposal that successfully competed to bring a CESU to California. The Californian CESU is hosted by the Berkeley campus and housed in the office of **Barbara Allen-Diaz**, executive associate dean of the College of Natural Resources.

"The potential benefit of this arrangement to the environment is huge. California has a tremendous amount of public land managed by the federal government, along with the greatest number of endangered species on the mainland and a population that includes one of every nine people in the U.S.," said Beissinger. "The CESU provides a way to help maintain biodiversity and protect ecosystems by providing expertise to the land managers who need scientific information."

"The great thing about this CESU is the breadth of expertise available. This allows us to broaden our research perspectives beyond the natural and physical sciences," said **James Shevock**, CESU program liaison for the National Park Service. "That's important for the National Park Service, which manages a wide array of historical, cultural, archaeological, and natural places." Shevock's role will be to market the research and technical assistance needs of the National Park Service and match those needs with the expertise found at the CESU universities. He will reside on the Berkeley campus beginning January 1, 2004.

Unlike typical federal agreements, research projects under CESUs are collaborative in design.

"The CESU is a genuine two-way relationship. Agency and university researchers will plan projects together, and share data and expertise, rather than the contractual relationship where a researcher completes a study and may never see how it is used," said Moritz. "As a researcher, I find that such collaboration is much more satisfying."

Another benefit is bringing together agencies that may be facing similar problems. "The larger-scale problems are the ones that will really stimulate the interest of faculty," said Moritz. The collaborative nature also allows the project to evolve as new information becomes available. Although separate from campus, the CESU will also support recently launched campus initiatives, Moritz notes (see box).

"This arrangement provides a great avenue for graduate students to do research and get funding," said Shevock. "It would be much harder for a student to obtain a federal contract, and we're also hoping that some of these graduate students will become federal employees," he said.

The Californian CESU was officially established this summer but met as a unit for the first time in October. Cooperating institutions are the University of California's Berkeley, Davis, Irvine, Los Angeles, Merced, Riverside, San Diego, Santa Barbara, and Santa Cruz campuses; California State University at Fresno and Los Angeles; San Francisco State University; the Bureau of Land Management; the Bureau of Reclamation; the U.S. Geological Survey; the National Park Service; the USDA Forest Service; and the National Aeronautics and Space Administration.

Although the initial CESU agreement lasts five years, Shevock believes it will be renewed and continued into the future. "Environmental issues aren't going away, and having access to the best research available is an ongoing need of the federal government" he said. "We're in this partnership for the long haul."

Campus Launches New Initiatives

This spring, the Chancellor's office challenged the faculty to define the most critical new areas of teaching and inquiry to undertake as we move into the 21st century. Five interdisciplinary initiatives were selected to move forward. The College of Natural Resources will play key roles in two of them: Computational Biology and The Future of the Planet. Computational Biology brings biology, mathematics, and physical sciences together to address basic biology and health science questions. The Future of the Planet is a wide-ranging initiative designed to harness Berkeley's vast environmental expertise to study changes in the environment caused by human intervention and to develop sustainable solutions to environmental problems.

A NEW FOCUS FOR ENVIRONMENTAL ACTIVISM? HERE'S THE DIRT

Researchers find pristine soils losing out to farming and development

Map illustrates the distribution of agriculture and urban land use in the United States, and the resulting distribution of soil series that have lost 50 percent or more of their original area to land use.

A study by Berkeley researchers may lead some people to rethink the phrase "common as dirt." A paper published in the journal *Ecosystems* finds that certain soils—like certain plants and animals—are becoming increasingly rare, with some effectively extinct or at imminent risk of becoming so.

In some agricultural regions, up to 80 percent of soils considered rare have been reduced to less than half of their original extent. That is, more than half of the soil has been converted to agricultural or urban uses.

"Over the past two centuries, we have reconfigured part of a continent to the point where today's landscape is almost unrecognizable compared to its natural state," said **Ronald Amundson**, professor of ecosystem sciences in the College of Natural Resources and lead author of the paper. "The Great Plains used to be characterized by tall grasses and prairies. They have now been replaced by crops and housing tracts."

Like plants and animals, soils have their own taxonomy. In the United States, 11 soil orders are ultimately divided into 13,129 series. (A soil series is comparable to a plant or animal species.) Soils that comprise less than 25,000 acres are considered rare; "rare-unique" soils are similarly limited in acreage and in addition exist within the boundaries of a single state.

Amundson and colleagues, who considered a rare or rare-unique soil endangered if more than half of its area was tilled, excavated, or otherwise disturbed, found 508 endangered soil series in the United States. Six states have more than half of their rare soil series in an endangered condition, with Indiana leading the group at 82 percent, followed closely by Iowa at 81 percent. Most of the soil danger hotspots are located in the country's agricultural heartland.

Why the concern over undisturbed, virgin soil? In essence, says Amundson, soil diversity is tied to biological diversity. As the foundation of terrestrial ecosystems, soils form an intimate bond with the plants and animals they support. Rare plants have evolved to inhabit rare soils, such as those that are highly acidic or low in nutrients. But tilling the soil changes its biogeochemistry by stimulating microorganisms to quickly metabolize the soil's organic matter for food. The disturbance of the soil thus impacts the plants and animals that depend upon it.

Ronald Amundson

"Soil that has been cultivated is like an animal that has been domesticated," said Amundson. "It retains some resemblance to its wild or native ancestor, but there are enormous and profound changes in its characteristics."

Research has also shown that the process of digging up soil produces carbon dioxide, which contributes to the level of greenhouse gases in the atmosphere. "Soil has more carbon in the form of organic matter than all the plants in the world," said Amundson. Twenty percent of the carbon dioxide added to the atmosphere by human activity is related to land-use activities such as burning forests and farming, he added.

Standing at the forefront of soil activism, Amundson argues for the preservation of rare and unique soils. "Soil might harbor microbial life that has benefits unknown to us today," said Amundson. His argument is supported by at least one famous precedent: The antibiotic streptomycin was discovered during the search for natural antibiotics in soils that keep them from being contaminated when diseased bodies are buried in the ground.

"We certainly need land to farm and develop," Amundson continued. "I'm not advocating the discontinuation of agricultural expansion. But I think it'd be fair to set aside modest areas of these remaining natural landscapes for study and contemplation."

"Some of these soils developed over thousands to millions of years," added **Peng Gong**, professor of remote sensing at CNR and coauthor of the paper. "We can destroy that in a few hours. It's a preservation issue. We need to save it for future generations."

—*Sarah Yang*

NEW TREATMENT FOR SUDDEN OAK DEATH APPROVED

Courtesy of Matteo Garbelotto

At left, an untreated oak sapling eight weeks after being infected with the Sudden Oak Death pathogen. At right, an oak sapling treated with Agri-Fos and then inoculated seven days later with the Sudden Oak Death pathogen. After eight weeks, the inoculation wound is still present, but the treatment has prevented the pathogen from growing.

State regulators opened the door on October 1 for a treatment for Sudden Oak Death to be legally applied by licensed professionals to oaks and tanoaks. **Matteo Garbelotto**, an assistant specialist in Cooperative Extension for the College and assistant adjunct professor of ecosystem sciences, has proven the treatment effective in preventing or slowing down infection, and developed an innovative technique to make it significantly easier to administer.

The Department of Pesticide Regulation approved a special registration for this treatment on a fast-tracked, special-needs basis. It is the first and only treatment approved by the state for use against a pathogen that has killed tens of thousands of coastal oak trees from California's Big Sur to the border of Oregon.

"The likely areas where the treatment would be used include mostly private-owned land, but trees around high-use facilities in public parks may also be potential candidates," said Garbelotto. "It's really meant for individual oaks or tanoaks that are at high risk for infection, such as those in the vicinity of infected California bay laurel trees."

Garbelotto explained that in the wild, California bay laurel trees are considered the most important vector for spreading Sudden Oak Death. Spores congregate on the leaves of those trees, where they can easily become airborne.

Garbelotto and **David Rizzo**, associate professor of plant pathology at UC Davis, first identified *Phytophthora ramorum* three years ago as the fungus-like pathogen responsible for Sudden Oak Death. Since the disease was first observed in Marin County in 1994, it has spread to 12 California counties, including Alameda and Contra Costa counties, and it has been confirmed in at least 25 different plant species, including California bay laurels and rhododendrons. It has also been found in nurseries in Washington State and British Columbia, Canada.

"It hasn't been long since the pathogen was first isolated," said Garbelotto. "The development of a treatment has been incredibly rapid."

The approved treatment is a phosphite compound sold under the brand name Agri-Fos, and its effectiveness has been proven for oaks and tanoaks. Agri-Fos is a fungicide that has been effective for other *Phytophthora* species, but Garbelotto was the first to test it on *P. ramorum*. Agrichem, the Australia-based company that sells Agri-Fos, will make the treatment available to trained professionals licensed by the state to apply pesticides.

Garbelotto emphasized that the treatment is not a cure-all, and said there is no evidence to show that it would be recommended on a widespread basis. The treatment has not been tested on other plant and tree species susceptible to Sudden Oak Death.

The confirmation last year that redwood and Douglas fir—two of the state's most highly prized trees—were susceptible to the pathogen sparked concerns of the pathogen's ability to do more damage. But it is the state's oak trees that have suffered the pathogen's most dramatic impact, exhibiting oozing lesions and cankers as they die.

Garbelotto has conducted more than 30 independent trials of treatment protocols. **Steven Tjosvold**, a Cooperative Extension specialist with Santa Cruz County, helped Garbelotto with field experiments.

To test whether the treatment worked on diseased trees, Garbelotto infected potted oaks and tanoaks with *P. ramorum* and then waited several days to several weeks before injecting the phosphite compound. The injections slowed down the growth of cankers on trees that were treated.

Not surprisingly, he found that the effectiveness of the treatment declines steadily the longer the tree has been infected. "Ideally, this would be used as soon as symptoms are noted," said Garbelotto. "The treatment is not recommended if the symptoms have been around for a year or more."

He noted that the treatment does not kill the pathogen, but that it stops its growth if used in the early stages of infection.

He also found that injecting oaks and tanoaks with the chemical first and then inoculating them with the pathogen effectively prevented infection. When used as a preventative agent, the treatment completely protected smaller trees, and it reduced the canker size by half on adult trees.

Through his experiments, Garbelotto also developed an innovative way of increasing the effectiveness of the phosphite compound by combining it with an organosilicate carrier, named Pentra-Bark, that helps trees gradually absorb the

"It hasn't been long since the pathogen was first isolated," said Garbelotto. "The development of a treatment has been incredibly rapid."

treatment over time. Instead of injecting the compound, Garbelotto sprayed it directly onto the bark of the trees.

"This method of delivering the treatment to the tree is completely new," said Garbelotto. "It's a discovery that can revolutionize the way trees are treated."

The organosilicate used in this treatment had not been proven successful in carrying chemicals through the bark until Garbelotto paired it with the phosphite compound. The matching works well because the molecular structure of the phosphite is compatible with that of the organosilicate, he said.

"By combining the phosphite compound with organosilicate, the treatment can be sprayed onto the bark instead of injected," said Garbelotto. "The application is easy compared to injection, which is complicated and requires a lot of skill to do right. With injection, it is hard to know if you are getting the compound into the tree's vascular system, so if you don't know what you're doing, a lot of the compound can get lost."

In addition, applying the treatment to the bark makes the treatment available to the tree for more than six months. "Once applied, it doesn't rub off," said Garbelotto. "It's comparable to a time-release drug patch for humans."

Based upon existing research, the treatment is recommended once a year, said Garbelotto.

However, the topical application has thus far only been shown effective in oak trees. The compound has not been successfully absorbed through the bark of tanoak trees.

Garbelotto noted that phosphites have been used for more than 10 years and are considered a low-toxicity chemical. In addition, the methods of application—both injection and bark spray—are targeted so that the chemical is not dispersed into surrounding areas. Nevertheless, he emphasized the need for training before the treatment is used for Sudden Oak Death.

Garbelotto's research was supported by the Gordon and Betty Moore Foundation and the USDA Forest Service Pacific Southwest Region. The Valley Crest Tree Company provided hundreds of potted trees used for the research, and Lucasfilm, Ltd., granted access to company property for this research.

—Sarah Yang

Frequently Asked Questions About Sudden Oak Death Treatment

Q: How is this new treatment applied? Will it affect other trees nearby?

A: The phosphite compound, sold under the brand name Agri-Fos, is injected directly into the tree's vascular system by a trained professional. When combined with an organosilicate, sold under the brand name Pentra-Bark, it can be applied topically to the bark of the tree.

Agri-Fos and the combination of Agri-Fos with Pentra-Bark are the only chemicals approved by the California Department of Pesticide Regulation for use to prevent or treat Sudden Oak Death infection. Oak trees—coast live oak, Shreve's oak, black oak, and canyon live oak—can be treated by injection or bark application. Tanoaks can only be treated by injection.

Because the method of application is very targeted, the chances of the chemicals impacting the surrounding environment are very low.

Q: Which trees will be helped by this new treatment?

A: The treatment is only approved for use on oak and tanoak trees. There is no evidence that the chemicals are effective in other species of trees. In addition, there is a range of susceptibility to the Sudden Oak Death pathogen within individual trees in the oak and tanoak species. For instance, the treatment may not help oak trees that are extremely susceptible to the pathogen. The treatment is best used to prevent infection. However, it may be possible to prolong the life of an infected tree if it is treated quickly. The treatment should begin within one to two months of the first signs of an infection—usually viscous brown droplets on the intact bark of the tree. The treatment is not recommended for trees that have had symptoms for one year or longer.

Q: How long does it take for the treatment to work?

A: The treatment requires three to four weeks to be assimilated by the tree before it starts working.

Q: How can I get the treatment?

A: Agri-Fos and Pentra-Bark are sold through Agrichem, an Australia-based company with U.S. headquarters in Ohio. At present, the chemicals are only available to licensed professional pesticide applicators. Training sessions will be made available to professional arborists through the UC Cooperative Extension in conjunction with Agrichem and the California Oak Mortality Task Force. For more details about the training program, contact Katie Palmieri at (916) 747-1924.

CONFERENCE LOOKS BACK AT LANDMARK WATER LEGISLATION

Jim Block

Right: Senator Bill Bradley speaks about the Central Valley Project Improvement Act. Below left: Professor David Sunding at the CVPIA Conference. Below right: Cal alum and one of the conference's sponsors, George A. Miller, discusses water issues with Dean Paul Ludden.

A decade ago, federal water projects in California were operated to provide cities and farms with water and power, with little consideration given to their environmental impact. Today, environmental interests have a seat at the table as a result of landmark reform legislation passed in 1992 called the Central Valley Project Improvement Act.

"It is hard to think of any other system of government that is more conservative, more resistant to change, than water policy, even when there is an obvious need for change," said Senator **Bill Bradley**.

Bradley, along with Bay Area Congressman George Miller, cosponsored the Act when he was chair of the Senate Committee on Energy and Natural Resources, in an effort to change the way the Department of the Interior managed water in California. Bradley was the keynote speaker at a day-long conference in San Francisco hosted by UC Berkeley's College of Natural Resources and Boalt School of Law to examine the success of the law and implications for future water policy in the state.

Beyond listing environmental restoration as an objective of water project operation, the Act specifically reallocated roughly 10 percent of water supplies to the environment, mandated a doubling of wild salmon populations in the state, and changed the way long-term federal water contracts are designed and implemented in California.

CNR Dean **Paul Ludden** presented Bradley with a Chancellor's Distinguished Honor Award for his commitment to California. In addition, the College has established a graduate award for water policy research in honor of Senator Bradley. Congressman Miller was also recognized for his efforts.

"An unusual thing about the Act is that it is so specific," said **David Sunding**, professor and Cooperative Extension specialist of natural resource economics at the College of Natural Resources. "The CVPIA gave very detailed instructions to the Department of the Interior about how federal water projects were to be operated in California, including how much water was to be set aside for the environment. Congress usually leaves such technical decisions up to agencies, but in this case the legislature simply did not trust the Department of the Interior to faithfully implement its wishes," he said.

The conference brought together experts in water policy, many of whom participated in the creation of the Act, along with students, lawyers, scientists, and representatives from agriculture, fisheries, cities, and environmental groups.

While the various parties agree that the Act was a milestone in water law and policy, there is wide disagreement as to whether the Act is beneficial or effective. In most cases, target salmon population numbers have not been reached. Agricultural and environmental interests have had multiple legal battles over interpretation and implementation of the Act.

The Cal-Fed Bay Delta Program, a subsequent effort to balance water supplies among various users statewide, with an even wider scope than the Act, continues to stall as well. In September, a court decision in Fresno revived a major lawsuit by agricultural businesses against the Cal-Fed program.

Conference participants agreed that the outcome of these decisions will be crucial to California's future. Water is likely to present the next big crisis in California and the West, said **Cynthia Koehler**, a visiting scholar at CNR's Center for Sustainable Resource Development. Groups on all sides of the debate remain watchful as to whether the flexibility introduced by the Act will allow lawmakers to meet future challenges.

ACCURATE MAPPING OF PLANT GENOME COULD LEAD TO A NEW GENERATION OF HYBRID PLANTS

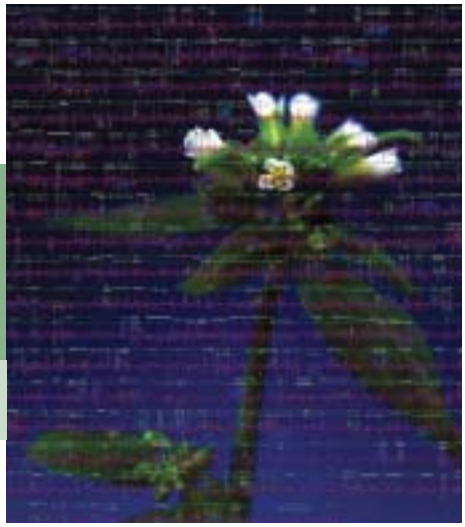


Image by Jamie Simon, Salk Institute, and Peggy Grob, USDA Agricultural Research Service

An image of the *Arabidopsis* plant is superimposed with readings of its whole genome array.

In a study led by researchers at the University of California, Berkeley, and the Salk Institute in La Jolla, Calif., scientists have accurately mapped the genes of the common mustard weed, *Arabidopsis*. The achievement may lead to the next generation of genetically modified crops that can grow faster, produce more food, and resist disease.

The study, which appeared in the Oct. 31 issue of *Science*, reveals the existence of nearly 6,000 genes, about one-third of the genes that exist in *Arabidopsis*. Knowing these genes and how they work can allow researchers to, within a short period of time, use them to change the characteristics of other plants.

"*Arabidopsis* has all the genes a plant needs," said **Joe Ecker**, Salk professor of plant biology. "All flowering plants are closely related, and so the genes that encode various traits are also shared. It's possible, then, to take a gene for flowering from *Arabidopsis* and insert it into rice or poplar, and have that gene function."

Ecker and **Athanasios Theologis**, adjunct professor at UC Berkeley's College of Natural Resources and senior scientist at the Plant Gene Expression Center, are the principal investigators on the project, which includes a team of 72 scientists from nine institutions in the United States and Japan. The Plant Gene Expression Center is a collaboration between UC Berkeley's Department of Plant and Microbial Biology and the USDA's Agricultural Research Service.

The findings revealed some shortcomings of computer-based gene prediction programs, including those that have been used to sequence the human genome and the *Arabidopsis* plant, the plant biologists' equivalent of the fruit fly for genetics research.

The researchers point out that computer algorithms can't always distinguish whether a piece of code corresponds to a single gene or to two overlapping genes. And while the programs have become increasingly accurate in recent years, computer programs may still put genes' parts in the wrong places, find genes that aren't really there, or miss genes altogether. What researchers often get from an initial sequence of a genome is a "best estimate" lineup of transcription units.

To get the real picture of what's there and what's not, researchers say they need empirical, experimental verification.

The research team placed the entire *Arabidopsis* genome, consisting of about 25,000 suspected genes, on a series of six gene chips, then analyzed the chips for any protein-making activity, the primary function of genes. They isolated one-third of the plant's genes, which will be publicly available for researchers to fix errors in the current blueprint of the genome. In addition to finding shortcomings in the much-heralded computerized methods of sequencing a genome, they discovered about 3,300 new functioning genes.

"By putting the entire genome on the gene chips, we could find that what the computers predicted as genes were wrong about a third of the time," said Ecker. "But we also found other genes we had not seen before. Genetically, plants are much simpler than animals, so this information can be used almost immediately to improve crop yields and disease resistance."

"We eventually want to be able to understand the function of all the proteins within an organism," said Theologis. "If you know the correct gene structure, you can clone DNA to express and study proteins. This type of research eventually will lead to advances in proteomics."

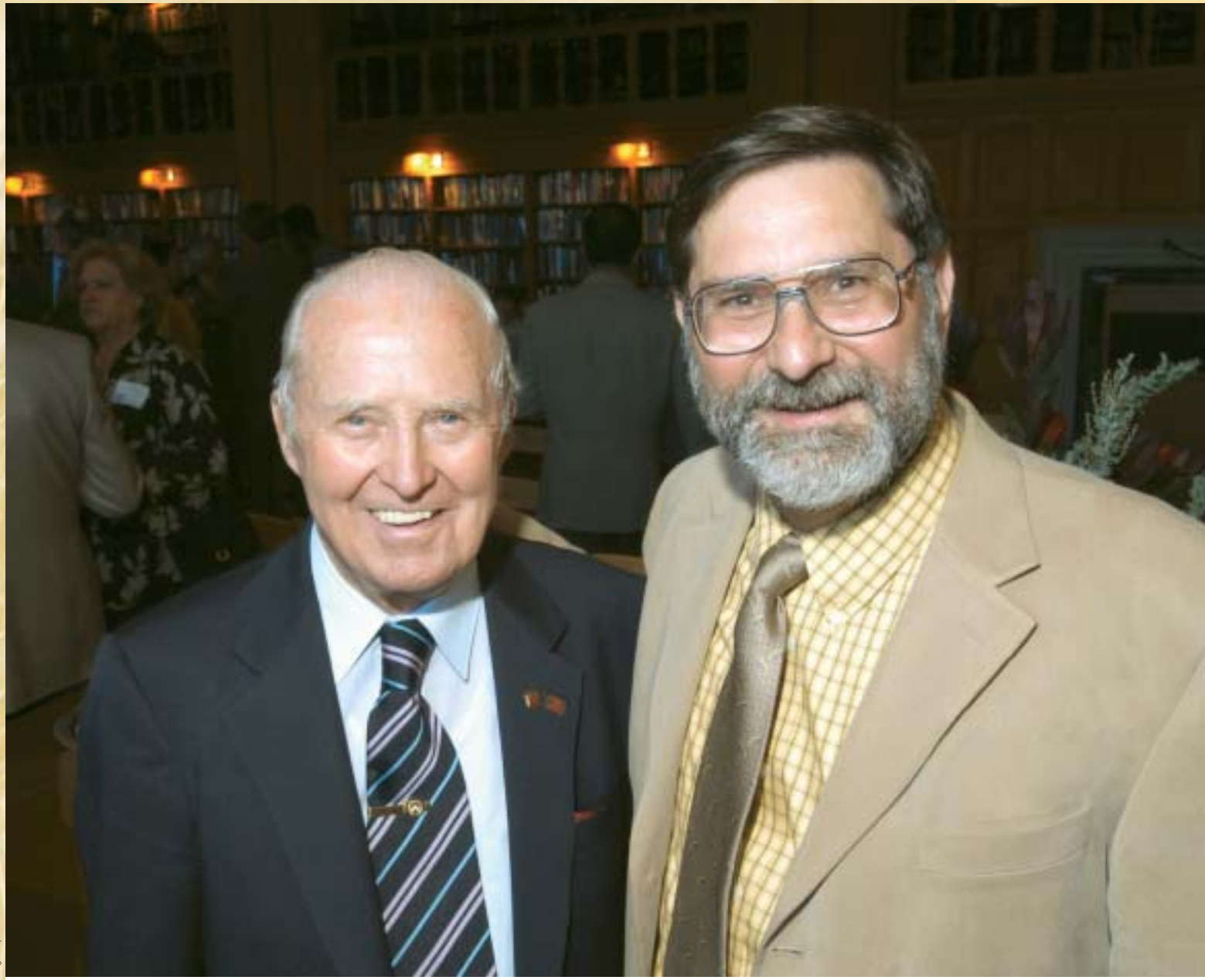
Many of the researchers on this study were part of the team that sequenced the genome of *Arabidopsis* nearly three years ago. The initial genome work and the current research are funded by the National Science Foundation (NSF), which established a project to identify an entire plant genome by 2010.

"The technology used in this research will be able to reveal the dark matter in a genome," said Theologis. "We will be able to identify never-before-seen RNA in regions that were once thought to contain no genes. Researchers could also use this method to get a more definitive answer to how many genes are in the human genome."

"Finding the genes that lurk in the DNA sequence sounds like an easy problem, but in fact it is tremendously challenging," said **Robert Last**, program director of the NSF's plant genome research program. "Completion of the DNA sequence of a genome such as *Arabidopsis* is is an important milestone toward understanding the function of every gene in the plant, and discovering the genes that can positively influence the productivity, nutritional, and medical value of the plant to human beings."

—*Sarah Yang*

Norman Borlaug and Paul Ludden



Peg Skorpinski

EDUCATING Tomorrow's Scientists

Courtesy of Chris Dowswell

Norman Borlaug taking notes on improved wheat varieties in the field.

AN INTERVIEW WITH **NORMAN BORLAUG**

One of the benefits of being at Berkeley is having opportunities to interact with some of the greatest minds of our time—both those who work here and the many who visit.

This summer, thanks to efforts of the College's longtime supporter **Richard Beahrs** (see sidebar, next page), students, faculty, and staff heard lectures from 1970 Nobel Peace Prize winner **Norman Borlaug**.

Borlaug is best known for developing high-yield, disease-resistant varieties of wheat by advanced agronomic methods that together became known as the Green Revolution. Mexico and many developing countries on the Indian subcontinent and parts of Asia used these varieties to save millions of their people from starving.

With former president **Jimmy Carter**, Borlaug also leads the Sasakawa-Global 2000 program, which is developing appropriate technology to increase crop production in Sub-Saharan Africa.

He also founded the World Food Prize, the highest international honor bestowed upon an individual for achievements in improving the world's food supply and reducing hunger. Former Berkeley visiting professor **Pedro Sanchez** and the late **Ray Smith**, professor of entomology, are World Food Prize recipients.

But Borlaug's greatest lifelong contribution has been as an educator. He has trained scores of young scientists worldwide. He continues teaching today in both Mexico and at Texas A&M University.

Borlaug's many accolades include the Presidential Medal of Freedom and more than 50 honorary degrees from universities around the world.

Borlaug and his colleague **Chris Dowswell** came to Berkeley this summer to speak to participants in the Beahrs Environmental Leadership Program. This summer certificate course, sponsored by the College of Natural Resources' Center for Sustainable Resource Development, brings together mid-career environmental professionals from around the world to tackle complex environmental management issues. The program began in 2000 with a generous gift from Cal alumni Richard and **Carolyn Beahrs**.

While Borlaug was here, CNR's Dean **Paul Ludden** spoke with him about his life and the educational needs of the next generation of scientists that will address the task of feeding the world's growing population.

College of Natural Resources Dean Paul Ludden interviews Nobel laureate Norman Borlaug.

Paul Ludden: Dr. Borlaug, welcome. It's a pleasure to be here with you.

Norman Borlaug: Thank you. I'm glad to be here.

PL: Tell me about your own education.

NB: I was born on a very small farm in northeast Iowa. For the first eight years of my life, I was the product of a one-room country school. Children 5 to 17 years old attended during the winter—some of the boys came to school only when there was not very much work on the farm. And from there I went to Cresco High School and became interested in agriculture, science, and athletics. I had an ambition to become a high school science teacher and athletic coach but eventually ended up going to the University of Minnesota, where I took all three of my degrees: a B.S. and M.S. in forest pathology and, later, a Ph.D. in more general genetics, agronomy, and plant breeding.

PL: You grew up in what is called the world's breadbasket and you also experienced the dust bowl in the thirties. Did those experiences shape your educational interests?

NB: Yes. But even before the dust bowl I was old enough to see all of the local rural banks go broke from 1929 to '32, and many of the farmers lost their land. The dust bowl came in '34, and I remember that vividly also.

PL: Was there a key moment when you knew you would be a scientist?

NB: No, I think it was a rather gradual sort of thing. During this period when everything was falling apart, my grandfather used to tell me, "Get an education. You see what's happening. The whole economy is falling apart. If you have a good general education, you'll be in a position to do other things if you lose your job."

Richard Beahrs, Pedro Sanchez, and Norman Borlaug

A Tale of Serendipity: Casual Conversations Lead to Great Meetings

Richard Beahrs, '68, recipient of the 2002 CNR Citation, was interested in agricultural and environmental issues in the developing world long before he worked with the College to establish the Environmental Leadership Program. Those interests put him in touch with some of the world leaders of research aiming to solve hunger problems, including **Robert Chandler, Pedro Sanchez,** and **Norman Borlaug.**

In the mid 1970s, Beahrs attended a dinner at University House and sat next to alumna **Georgiana Stevens.** "She kindly served as the catalyst to my being appointed to the board of the Near East Foundation. On that board, I met Bob Chandler and **Bob Herdt,** who became my mentors on environmental issues," Beahrs recounted.

"Being aware that the exponential increase in yields from the Green Revolution was leveling off, I once asked Chandler what the future held. Bob spoke glowingly of the potential of agroforestry. This led to a 'cold call' to Professor **Louise Fortmann** at the College of Natural Resources to ask how I could help support such a program at Berkeley through the Buck Kingman Fund. All my CNR involvement commenced then."

With the support of both Herdt and Chandler, Beahrs was appointed to the board of the World Agroforestry Centre (ICRAF), where he worked with its leader, Pedro Sanchez. Sanchez has also received numerous honors, including the 2002 World Food Prize and a MacArthur fellowship in 2003 (see the spring 2002 issue of *Breakthroughs* for a story on Sanchez' work).

Chandler remained active until his death at age 92. Beahrs attended a memorial symposium for Chandler at Cornell. At the memorial, he met Norman Borlaug and his close associate **Chris Dowswell** for the first time. At that ceremony, Sanchez arranged for Beahrs and a few associates to spend an afternoon with Borlaug and Dowswell discussing paradigms to scale up development success stories.

"Just as in my conversations with Chandler, I couldn't write fast enough as I took notes furiously. Now Chris and I work with Pedro on the UN Hunger task force." Beahrs said.

Beahrs explained that this ultimately led to Borlaug's visit to Berkeley.

"At a meeting in Nairobi, Chris and I discussed the feasibility of Norm and Chris participating in the ELP. Happily, Pedro had been a key participant in the first two years of the ELP so he was able to convey what a good fit their participation would be."

"Many people get discouraged about development work because of the complexities and many hurdles," said Beahrs. "I always try to push optimism by emphasizing that the Green Revolution did happen and something as revolutionary can burst forth once again. I'm aware that there are critics who point out the problems and remaining challenges accompanying that progress. I should note that Chandler and Borlaug have never ducked those realities. They have always been up front in acknowledging the complexities and seeking to resolve the remaining and resulting challenges. At the same time, we need to ask ourselves what the world would be like today if the Green Revolution had not occurred."

Peg Skorpinski

Executive Vice Chancellor and Provost Paul Gray presented the Chancellor's Award to Norman Borlaug.

That was a strong motivation. He looked at all the chaos of the economic depression, the dust bowl, and said the best protection is an education.

PL: Do you think that's still good advice for our young students?

NB: I do.

PL: Tell me about the project that became the Green Revolution. Was it exciting?

NB: It had an accidental beginning. In 1940, when Henry Wallace was vice president–elect, he was sent to Mexico to represent President Franklin Roosevelt at the inauguration ceremony for President Manuel Avila Camacho. The outgoing president, Lázaro Cárdenas, wanted Wallace's counsel. The American ambassador wanted to help Mexico, but by the time he got back to Washington the war clouds were on the horizon, and it would have taken a special bill through Congress to get funding for support of foreign agriculture. So Wallace turned to the Rockefeller Foundation, which had been working for more than 25 years in public health and education in many countries. The Rockefeller Foundation and the Mexican government then set up the first foreign technical assistance program, in 1943. From that grew this research, which gave rise to a sort of revolution in

Norman Borlaug lived on a farm in Iowa and attended a one-room schoolhouse in his youth.

Far right: Norman Borlaug in the field.

Courtesy of Chris Dowswell

Tomorrow's Scientists

Courtesy of Chris Dowswell

Borlaug teaching in Mexico.

Participants from the 2003 Beahrs Environmental Leadership Program with Norman Borlaug.

wheat production but has had implications for many other aspects of agriculture. It also led to setting up one of the first graduate schools for agriculture and science in Latin America. And eventually, after the Nobel Prize, it gave rise to the CGIAR, the Consultative Group on International Agricultural Research, which now has 16 centers functioning in different parts of the world, focusing on different crops and animals.

PL: I have a quote here from Bob Chandler [the first director of the International Rice Research Institute in the Philippines], whom you knew well. He said, "The Green Revolution would never have happened if Norm Borlaug had not been there to sell the idea." How did you sell it, and whom did you sell it to?

NB: You had to sell it at all levels. When the Mexican program was terminated, there were no plans for it to be continued. The goal was to train a new generation of Mexican scientists, and the project was turned over to the team that I trained. I had one year in which to find new pastures, as it were, and I was assigned to travel with the Food and Agriculture Organization across North Africa and the Middle East.

When we moved from Mexico to the Near and Middle East countries, I thought I saw that some of these wheats—and not just seed but the whole production and crop management interdisciplinary program—would work. I suggested that the Rockefeller Foundation bring a number of young people from those countries to Mexico and work out some sort of deal with my former trainees, to permit us to train the new group. From this came an international yield-testing program. We set up cooperative yield nursery testing of not only the Mexican wheats but also the best varieties from Canada, the U.S., Argentina, Chile, India, Pakistan, and Egypt. When the data came back, we saw that these Mexican wheats were unique. Certain techniques that we used gave broad adaptation, and this allowed a number of positive traits to be selected.

It opened the door on photoperiodism. We discovered varieties that were insensitive to the day length when temperature regimes were within reason. They could prosper in many places and they had good disease resistance.

"In Mexico, this was sort of the theme of the whole program: results that could be measured by filling empty stomachs. This became a driving force."

When India and Pakistan had the hunger crisis and famine in the mid 1960s, the people that really moved the technology were all of these young people that were brought to Mexico for six to nine months. They worked not in genetics and plant breeding alone, but in agronomy, soils, irrigation, weed control, learning about farmers' co-ops, all of that. India and Pakistan were the two outstanding examples, but it had impact to a lesser degree in Turkey, Iran, Iraq, some of the North African countries, and Egypt.

PL: Mexico became your laboratory in many ways. Were there policies or institutions that fostered that, or was it serendipitous?

NB: When we started the program in Mexico, there were only two scientists in the whole Department of Agriculture there who had ever set foot in a graduate school, so we started out by training a new generation of agricultural scientists. There were many graduates, but it was book learning. There were no experiment stations that functioned, so we set up the whole thing. There was no extension service to move the new technology, so when we thought we had something worthwhile, we moved onto the farms and set up the demonstration plots. It was an ongoing training period. I suppose we trained 700 Mexican scientists at some level—150 or so during that period starting in 1943.

PL: The Nobel Peace Prize was awarded to you as much for your humanitarian work as for your science. What led you to step out of the laboratory, out of the field, and become a hunger fighter for the world?

NB: In Mexico, this was sort of the theme of the whole program: results that could be measured by filling empty stomachs. This became a driving force. The spirit to win this battle was incorporated into all the young people, first in Mexico, then much later in the sixties and seventies in many countries through the training program.

PL: In the 1960s, you used traditional breeding methods to develop these wheat varieties, but the scientific landscape has changed dramatically. What tools do you see as being important for future agriculture?

NB: Of course, now we can take a gene from an entirely different taxonomic group. In our conventional breeding, we couldn't bridge the sterility gaps—if you tried to cross plants from a different genus it wouldn't work in most cases. But now you can cross even from a kingdom, such as taking out a gene from the ubiquitous soil bacterium *Bacillus thuringiensis* and putting it into corn and cotton to control certain insects. It's curious that in Rachel Carson's *Silent Spring* she was recommending the use of Bt that was grown in culture, put in suspension, and sprayed. But now that the gene that controls it has been put into improved corn and cotton varieties, some people say it must be dangerous. It reduces the amount of insecticide that's needed—it's serving a very useful purpose in many parts of the world.

PL: We have so many conflicts between agricultural and environmental interests. How do we bridge this?

NB: If you look at what's happened in the application of improved science and technology to increase world cereal production in the last 50 years, this is the picture:

Production was about 680 million tons of all the different grains worldwide in the year 1950. In the year 2000, it was about two billion tons, so it has roughly tripled. Had we tried to produce the year 2000 harvest with 1950s technology, we would have had to have cultivated more than another billion hectares of land of the same quality. Using technology saved land for Mother Nature, for forestry, for wildlife habitat, for biodiversity.

PL: Both your current institution—Texas A&M University—and Berkeley are land-grant institutions. What role do you see for land-grant universities for the future in agriculture?

NB: Land-grant universities have played a vital role in the development of agriculture here in the United States. They established a model that was in part transplanted to India and Pakistan during the time I was working there. Before World War II, most of the research was done in the land-grant universities or the USDA experiment stations. They were also the agencies that moved research to farmers' fields through the Cooperative Extension Service. After World War II, the private sector began assuming much of the responsibility. But there's one danger in this rapid movement of all of food production and agriculture, research, and extension going to the private sector: Who is going to train the next generation of scientists? Is it going to be done in the private sector? I plead strongly that even with the new biotechnology there needs to be good public-sector programs that continue to train new generations of scientists that the private sector will need.

I'm also concerned that many people don't understand how long it took our own country to get where we are in production of basic food and fiber—this wasn't done overnight. I plead that we try in the developing nations to

Beahrs ELP Alumnus Takes Borlaug's Message Home

Norman Borlaug visited Berkeley to speak with the 40 participants in the third Beahrs Environmental Leadership Program. The three-week summer program was established at the campus's Center for Sustainable Resource Development with a $1 million gift from UC Berkeley alumni **Richard and Carolyn Beahrs.** The program brings together environmentalists and policy makers from around the world to tackle problems of natural resource management.

Dr. **Yanuariadi Tetra,** a 2003 ELP participant from the Indonesian Ministry of Forestry, was so inspired by Borlaug's visit that he spread the message in an August 9 article in *Kompas,* Indonesia's largest-circulation newspaper.

In his article, Tetra wrote that the style and content of Dr. Borlaug's lecture "hypnotized the audience and created a solidarity of spirit among all to empathize with hungry people all over the world."

Tetra went on to respond to critics of chemical agriculture and biotechnology who are concerned about negative impacts on biodiversity and forest cover. He used Salinas Valley—a field trip he took as part of the ELP—as an example.

"Salinas Valley provides 80 percent of the lettuce grown in the U.S.A., and also exports to Canada, Europe, Japan, China and Indonesia. The rental price per acre of land is $1,700 to $2,250 because of this very high productivity made possible through the wise use of inputs," Tetra wrote.

"Many people attack chemical inputs and promote organic farming because it's better for health and the environment, but Dr. Borlaug says 'there is no proof that non-chemical ways can supply food for 6 billion people in the world.'"

"The moral message from Dr. Borlaug that is relevant for us all is that decision makers have to empathize with the condition of hungry people. When the problem of poverty and hunger is discussed in many forums, people who participate are not people who have ever felt hunger but they worry about the chemical inputs," Tetra continued.

"In Indonesia, it is usual that in the dry season peasants have no access to water and their fields go fallow. The answer from the second Green Revolution is biotechnology, chemical inputs, and policy changes that enable our nations to access and adopt these technologies."

Yanuariadi Tetra at a Beahrs ELP course.

Norman Borlaug

"There's one danger in this rapid movement of all of food production and agriculture, research, and extension going to the private sector: Who is going to train the next generation of scientists?"

leave them some pattern of strong public sector support because it's impossible for the private sector to move into these countries and make big investments. It's a slow, painful process.

PL: One thing that comes through in many of your answers is the role of interdisciplinary research, and you have certainly practiced that. How do we best promote interdisciplinary research?

NB: I think it has to go back to early in our educational process. It has to start in our high schools, to give students a good feel for how things interact—chemistry, physics, mathematics, and biology. For undergraduates, I say take history, social sciences, biological sciences, chemistry, and physics during the first two years, so that you develop an appreciation that these things are not simple. I don't think we're doing a very good job at that. We get too many people specializing too early. We need specialists—the best that we can produce—but who is going to produce the ones that know how to take those pieces and put them together to produce a technology that will help solve some of these food, fiber, and forestry problems?

PL: Here at Berkeley we're trying to devise a structure to better organize our interdisciplinary studies in the environment. What advice do you have for us?

NB: When you're talking about the environment, take a look at agriculture, forestry, wildlife, and what's happening to the basic resources on which the environment is built—the soil, all of the problems you have to deal with to bring stability into the food and fiber system, how to control diseases and insects. All of this has to be given to individuals who are going to be the leaders of tomorrow, who are going to integrate all of this new knowledge.

PL: You're here at Berkeley to visit the Beahrs Environmental Leadership Program, a program that brings mid-career professionals from around the world together to discuss these issues. What advice do you have for them, and what role will this program play in the future?

NB: I think this type of program is very necessary. There's too much conflict between disciplines. For example, I consider myself an environmentalist. Many would say no, you're spoiling the environment, but I'm interested not just in agriculture but also forestry and wildlife. I run into too many people who don't understand how tightly these are, or should be, woven together for the benefit of mankind in the broadest sense.

The population monster has a bearing on everything we've been talking about. When I was born, in 1914, the world population was about 1.6 billion. Now we're at 6.2 billion, and adding 80 million more a year. Most of those

80 million are unfortunately being added in countries that are least able to give them basic necessities of life: food, shelter, education, public health. In the industrial nations, starting with ours, the population has leveled off. Even though the projections show that we're supposed to level off in the developing nations, I'm still worried about the population monster in those countries.

PL: Are you optimistic about our ability to feed the world's population in the future?

NB: Yes! In my Nobel acceptance speech and lecture, I said that we then had the technology to produce the food that would be needed for the next three generations. This is production. The problem of equitable distribution is another matter. Now I say, from the standpoint of production, we have the technology available now or in the research pipelines to produce the food that will be needed for 10 billion, without destroying the environment. But I hope that 10 billion won't come until 2100 or some long distance down the road. So we've got a big job to do. And education is the primary consideration in the Third World.

You can view this interview and a lecture that Dr. Borlaug presented to UC Berkeley online at http://webcast.berkeley.edu/events/details.html?event_id=86.

Peg Skorpinski

Norman Borlaug, Academic Coordinator Robin Marsh, Richard Beahrs, and Professor David Zilberman

Faculty and Specialists

NEW FACULTY: DARA O'ROURKE AND MARY WILDERMUTH

Dara O'Rourke

Mary Wildermuth

Dara O'Rourke joins the Division of Society and Environment as an assistant professor after teaching and conducting research for several years at the Massachusetts Institute of Technology. O'Rourke received a joint undergraduate degree in mechanical engineering and political science from MIT, and his M.S. and Ph.D. degrees in Energy and Resources at Cal.

O'Rourke's research analyzes global production networks of major consumer products. These supply chains can lead from U.S. designers and marketers, to massive factory complexes in the developing world, to individual women workers who sew parts of garments or solder subcomponents of electronics in their homes. O'Rourke is exploring the environmental and social impact of these far-flung supply chains, as well as how governments and nongovernmental organizations attempt to regulate such operations.

The trend of outsourcing production to foreign countries, O'Rourke said, means that supply chains are "very long, very complex, and very mobile. It's difficult to find these factories, let alone regulate them."

O'Rourke's work has taken him to China, Vietnam, Mexico, Indonesia, and parts of the U.S. as he examines the workings of international corporations and the paths that products travel before they end up on store shelves. He focuses on the global forest products, oil, footwear, garment, electronics, and coffee industries.

Part of his research looks at the role of nongovernmental organizations that have tried to police international companies when governments cannot or will not. He also is working with affected workers and communities on ways that they can help monitor their own working conditions and local environment, such as learning to use high-tech monitoring equipment to independently test air quality.

Mary C. Wildermuth is an assistant professor in the Department of Plant and Microbial Biology. Wildermuth received her B.S. in chemical engineering from Cornell University and her Ph.D. in biochemistry from the University of Colorado at Boulder.

Wildermuth's research focuses on the molecular and biochemical systems plants use to defend themselves when exposed to pathogens such as the powdery mildew fungus. These systems may include chemical defenses and physiological responses, such as dropping a diseased leaf.

Her work specifically examines the roles of small molecules, such as salicylic acid, in plant-pathogen interactions. The research builds on her work as a postdoctoral fellow at Massachusetts General Hospital's Department of Molecular Biology (Department of Genetics, Harvard Medical School).

Wildermuth is a member of the American Association for the Advancement of Science, the American Society of Plant Biologists, and the International Society for Computational Biology. Her doctoral work examined the biochemistry of isoprene (a small gaseous hydrocarbon) emission from trees. Wildermuth's research as a visiting scientist at the National Center for Atmospheric Research in Boulder measuring and modeling non-methane hydrocarbon emissions from forest species led to her fascination with plant isoprene emissions.

Wildermuth also spent two years teaching eighth- and ninth-grade-level science to children in Botswana, Africa, through the World Teach program, operated from Harvard. She taught not only classical eighth- and ninth-grade biology and chemistry but also Botswana-specific topics such as how to prevent cholera and how to maximize insulation and cooling when designing traditional huts.

Wildermuth called the experience "fantastic."

—Kelly Hill

Class and Field

NEW STUDENTS BRING GLOBAL ENVIRONMENT HOME

Associate Professor John Battles dines with student residents at the Global Environment House.

On a field trip to Point Reyes, students from the Global Environment House studied a variety of natural systems, ranging from the movement of tectonic plates to tule elk.

This summer, **Steve Andrews** biked seven miles to a tree plantation and then back to his walled-in medieval village in tiny Tuscania, 70 miles from Rome. He was running an experiment on the effect of water stress on a poplar tree species. The overseeing professor visited sporadically on weekends, but Andrews had to gather data and make a life on his own.

The (now) Berkeley freshman missed interacting with people who shared his interests in the environment. Finding an active community at UC Berkeley was a decisive factor in his decision to attend the school.

This semester, Andrews is one of 23 students at the newly inaugurated Global Environment House, a novel theme residential program in the Foothill Residences on the northeast side of campus.

"I love the atmosphere here," Andrews said. "I've been waiting my entire life to get to college and to do what I want to do. So far, I'm very impressed with this program and the people I've met."

The Global Environment House provides a living and learning setting for Cal students interested in social, economic, and scientific issues affecting the environment. It brings students and faculty together in a variety of structured and informal ways in order to explore issues such as global environmental change, policy and management of natural resources, sustainable rural and urban environments, and environmental leadership.

The house, cosponsored by the College of Natural Resources and the Office of Residential and Family Living, is the sixth theme program to be offered by UC Berkeley. Student residents earn one unit of academic credit per semester for attending the Freshman Seminar and other activities held at the dorm.

The idea for the house was hatched two years ago by six faculty members from the College of Natural Resources, explained **Allen Goldstein**, program chair and associate professor of biogeochemistry in the Department of Environmental Science, Policy and Management.

"We wanted to foster interest in the environment and to provide an opportunity for students to see what's happening in the field," Goldstein said. "We wanted to create closer communication between faculty and students, particularly when they first arrive at Berkeley."

Communication may well be one of the most important assets of the new residence. Not only are 23 students provided with a communal forum for exchanging ideas, they have unprecedented access to six faculty members who teach the seminars, lead the field trips, and are available as advisers. The professors come directly to the dorm for lectures and discussions, join students at dinner, and take them out for weekend field trips.

Students involved in the program, who like Andrews are mostly freshmen, say the atmosphere at the house goes "above and beyond learning." And they are excited to be pioneers in the program's pilot year.

"The first couple weeks everyone was just struggling to get settled in. Now is when the fun starts," said **Suk-Ann Yee**, the house resident assistant. "We've already had a trip to Point Reyes, guest speakers, and a really good discussion regarding the direction where our planet is going in terms of the depletion of resources and space. But we're just beginning to discover all the cool things we can do when a bunch of like-minded people get together."

So far, students have started planning several service projects. Starting up a garden, educating elementary school children, putting up a website, bringing in political speakers, and pumping up the school's recycling program are in the works.

"We still have to decide what the house really is," Andrews said. "It has so much potential, but we have to sift through a big bag of ideas."

Students also say that one of the house's most important goals will be to build stronger environmental awareness in the campus community.

"I would like to get people to revise all their activities, such as consumption," said house resident **Gina Lopez**, a Los Angeles native. "I'd like them to be aware and concerned about environmental issues. Even people in the program don't always turn off the lights, so we all need to learn how to conserve."

—Malgorzata Wozniacki

GENOMIC EDUCATION PROGRAM RECEIVES CHANCELLOR'S RECOGNITION

Barbara Baker in the laboratory with El Cerrito High School students Tomas Santiago and Tara Jones.

A unique collaboration sponsored by the National Science Foundation's Potato Genome Project was one of eight innovative programs recognized at a reception by Chancellor **Robert Berdahl** and his wife, **Peg**, on September 18.

Established in 2002, the Plant Genomics Training and Education Program merges the efforts of the College's Department of Plant and Microbial Biology; the CNR/USDA Plant Gene Expression Center; the UC Berkeley Botanical Gardens; The Institute for Genomic Research (TIGR) in Rockville, Maryland; Heritage College in the Yakima Valley, Washington; El Cerrito High School; the USDA Agricultural Research Service laboratories in Prosser, Washington, and Albany, California; and the Makah and Yakama Nations in Washington.

The program promotes science education and environmental awareness through public exhibits, community biodiversity gardens, and summer training and education workshops using real-world application of the latest genomic technology.

The community-recognition event—the fourth hosted annually by the Chancellor—celebrated wide-ranging projects in the areas of access to higher education, public health, science and environmental education, social welfare, services and resources for people with disabilities and learning difficulties, and youth/business mentorship.

"I am very proud to recognize and celebrate these remarkable partnerships, which improve many lives and demonstrate the kindness, determination and strength of the human spirit," the Chancellor said.

The Plant Genomics Training and Education Program received recognition for its support of increased participation in the biological sciences, specifically in the growing area of genome research and biodiversity.

"Direct real-world application and the latest technology make genomics an excellent field for introducing high school and college students, as well as the general public, to the exciting and important world of biology," said CNR Associate Adjunct Professor **Barbara Baker**, principal investigator for the genome program.

"Due to recent advances in fields such as genomics and bioinformatics, having access to current information and technology is becoming increasingly important to educators, the public, and students alike," Baker said.

Additional information about the Plant Genomics Training and Education Program can be found at http://outreach.potatogenome.org.

The Plant Genomics Training and Education Program team receive a University/Community Partnership Award from Chancellor Robert Berdahl. (From left to right: Meghan Flanagan, program director; Barbara Baker, principal investigator; Tara Jones and Tomas Santiago, interns; and Jennifer White, Christine Manoux, and Lauri Twitchell, UC Botanical Garden.

HOMECOMING 2003: SOMETHING FOR EVERYONE

Peg Skorpinski

Professor Lew Feldman discusses the science behind gardening.

More than 5,000 alumni, parents, and friends attended this year's Homecoming. The College of Natural Resources offered visitors fun and informative talks on gardening, insects, and forest management.

Gardeners Return for a Biology Lesson

Whether a person, a lemon tree, or a camellia, all share the same biological imperative: to reproduce.

With that theme, Professor **Lew Feldman** explained to more than 70 Homecoming visitors on October 3 how biology underpins gardening successes and failures. Feldman has been teaching plant biology at Cal for more than 25 years at the College of Natural Resources.

Feldman shared the science behind the following horticultural tips:

- Chill bulbs: Plants native to cold environments require cold temperatures for a certain period of time to destroy chemicals that prevent them from sprouting.
- Prune shoots when transplanting: Individual plants have an optimum balance of roots and shoots. Transplanting reduces the amount of roots and disrupts the balance. Reducing the above-ground plant material at the same time restores the balance and returns the plant to flowering and fruiting sooner.
- To restore last year's poinsettias, put the plants in the closet for 16 to 18 hours: Many plants rely on a specific day length to signal the appropriate time to bloom. That can require artificially producing a shorter day length.

While you can fool Mother Nature—sometimes—such as by promoting roots with auxin or breaking plant dormancy with gibberellins, Feldman said environment is everything.

Around Berkeley, for example, it can be hard to grow tomatoes because the pollen growth requires specific temperatures. If it is too cold, or if there's a sudden heat spell, the pollen dies and the fruit won't set.

Feldman recommended using varieties designed to grow in specific regions rather than trying to compensate for disease and pest problems by using toxic chemicals. He also passed on tips for growing giant camellias (apply gibberellins) and helped with problems raised by the audience.

And the visitors weren't the only ones who enjoyed the day. "I teach a large class of 500 to 600 students, most of whom plan to go to medical school and don't believe me when I say they will someday likely have an interest in plants," Feldman said. "I wish I could take a picture of all of you in this room and show it to my class."

Tackling Troublesome Pests

What we can't see *can* hurt us, according to a Homecoming panel of faculty experts who discussed the impact of insects on our lives. But the methods used for managing insects and the trouble they cause can be just as important as the goal of controlling pests. Professors from the College's Division of Insect Biology and Department of Plant and Microbial Biology

Professors Alexander Purcell and Steven Lindow display grape vines infected with Pierce's disease, and the glassy-winged sharpshooters that spread the disease.

Leslie Leong (Business Administration, '74) and her daughter Danielle examine live termites during a Homecoming lecture on insect control.

emphasized the need for preventative and environmentally safe methods to deal with insects that cause human diseases, plant ailments, and property damage.

Wayne Getz, professor of insect biology, discussed several significant insect-borne diseases in the U.S. and the world, including a newcomer to this country, West Nile virus. Carried by mosquitoes, West Nile virus was first detected in the U.S. in 1999 and infected more than 4,000 people in 2002. The first case believed to have been contracted in California was reported in October.

"Controlling diseases has to be done through preventative treatment," Getz said. "And that's what we advocate in this College." Treatments for some diseases like sleeping sickness, Getz said, are so toxic that in 5 percent of the cases they kill rather than cure the infected person.

Prevention is also the most viable option for Pierce's disease, which kills grape vines and other agricultural crops. Pierce's disease is caused by a bacterium that is spread by glassy-winged sharpshooters.

In California, the disease is present in the Napa Valley, and has been known to spoil entire harvests. According to Professor **Alexander Purcell**, Pierce's is also responsible for preventing viticulture in the southeastern U.S. Purcell's colleague, Professor **Steven Lindow**, explained how his lab is working to control Pierce's disease by genetically engineering plants to confuse internal signals given to the insects.

"It's a fun time to be a biologist, because with advancing technology we have more tools," Lindow said.

Cooperative Extension Specialist **Vernard Lewis** also underlined the importance of alternative methods of preventing property damage from insects like termites. He tests everything from baits to microwaves to liquid nitrogen. He's currently part of a team advocating nonchemical treatment for termites internationally, where dangerous chemicals like DDT are still used to keep termites from destroying their crops.

—Malgorzata Wozniacki

Adaptive Management: A Big Step in the Right Direction

Adaptive management is expensive, time-consuming, and complicated. But it's the next step in balancing diverse forest management needs, **Kathleen Sullivan** told an attentive crowd at Boalt Hall on October 3.

Sullivan, manager of watershed programs for Pacific Lumber Company's science department, was the featured speaker at the 32nd annual S.J. Hall Lecture in Industrial Forestry sponsored by the College's Center for Forestry. The series was established in memory of the late **S.J. Hall**, founder of the Gualala Redwood Company.

Adaptive management is an exciting strategy being implemented by many forest products companies and public land management agencies. The process treats any management approach as a hypothesis that is tested by collecting and analyzing environmental data. These data serve as a feedback loop for refining and modifying future management strategies. For example, a strategy may be designed to provide economic benefits from timber harvest while still maintaining water quality. Adaptive management, among other things, would include monitoring sediment levels after harvesting. This information would allow land managers to know if the buffer zones around watercourses provided sufficient protection for water quality or if these should be increased or decreased in future operations.

Adaptive management requires a huge investment in time and data gathering, Sullivan noted. Geologists catalog landslides to determine which were natural and which could have been prevented by company practices. Other scientists survey plant and bird populations, including more than 1,200 spotted owl call points. Still others report on aquatic life in rivers and streams and examine road runoff levels to pinpoint the sources of excess stream sediment.

Kathleen Sullivan discusses adaptive management at the 2003 S.J. Hall lecture.

"The analysis helps the company to understand how the watershed functions, how to plan and design site work, and how to monitor in the future," Sullivan said. "It turns the watershed from a black box into something I can comprehend."

However, Sullivan said, the system isn't perfect. There are many challenges to balancing ecological science, internal management, and environmental regulations from various agencies. The attempt to integrate huge amounts of data and multiple perspectives can leave the company open to criticism.

But she said the company is committed to its adaptive management model as a big step toward sustaining forests, watersheds, and timber harvesting.

—Kelly Hill

College Support

HONOR ROLL OF DONORS

Contributions to the College of Natural Resources help ensure that the College remains an intellectually vibrant place. In fiscal year 2002/2003, we received many generous gifts—ranging from $1 to more than $1 million. We gratefully acknowledge the alumni, friends, foundations, and corporations listed below. These gifts and pledges support every aspect of the College, including research, scholarships, outreach, graduate and undergraduate students, scientific equipment, facilities, and special programs and projects.

We've also highlighted three alumni who share their personal reasons for supporting the College. All gifts are important to the College, but due to space considerations, the list below reflects donors giving $100 or more. In addition, please look forward to a full listing of our Hilgard Society membership in the spring issue of *Breakthroughs*.

Once again, we thank our donors for their loyal and generous support.

$1,000,000 and above

Corinne Rustici, '46

$500,000-$999,999

The Ford Foundation

$100,000-$499,999

Alfred P. Sloan Foundation
Thelma Edlund Buchanan, '29*
California Pistachio Commission
Gerald B. McClaine, '62 & Lynne McClaine
The Nature Conservancy
Pear Pest Management Research Fund
Richard & Rhoda Goldman Fund

$50,000-$99,999

California Almond Board
Dow AgroSciences
Mrs. George R. Goertz
Mendocino Redwood Company
Syngenta Crop Protection Inc.
Dr. Marion Marliave Zivnuska, '33

$10,000-$49,999

Anonymous
3M Canada
American Vineyard Foundation
Applied Phytologics, Inc.
Bay Area Economic Forum
Bayer CropScience
Robert T. Brownscombe, '41
Byotix Inc
Cerus Corporation
Dr. Alain F. De Janvry, '65
Dr. Marc K. Hellerstein
Annie Allan Henry, '31
K/T Foundation
Kinemed, Inc.
Marin Community Foundation
Monsanto Company
Dr. Roderic B. Park &
Catherine Bromage Park, '66
Russell L. Rustici, '48
Dr. Elisabeth Sadoulet
Save the Redwoods League
Sierra Pacific Industries
June Cuff Smith, '48
Springer-Verlag GmbH & Co KG
Dr. Sidney N. Stone, '51 &
Marcia McClain Stone, '52
UC Berkeley Club of Indonesia
Uniroyal Chemical
University of Hong Kong
Walnut Marketing Board
John R. Zivnuska & Carole L. Kelly

$5,000-$9,999

A.G. Edwards & Sons, Inc.
The Clorox Company Foundation
CN Utility Consulting
Ruth C. Dyer, '44
Elsevier Science
F. Eugene Forsburg, III, '75 & Kass Green, '74
Dr. & Mrs. Herbert M. Hull, '46
Dr. Sydney G. Kustu
James R. Lugg, '56 & Marilyn G. Lugg
Foster E. Murphy, '48
Murphy-Payne Charitable Trust
PT RAPP
Jerry C. Russell & Marilyn R. Russell
Russell Sage Foundation
Shasta Wildlife Conservation Foundation
Tokyo Rikakikai Co., Ltd.
Dr. & Mrs. Henry Vaux, Jr., '62
Drs. Jennifer White, '67 & Marshall White, '67

* Deceased

Helen Jean (Gross) Dierkes
Nutritional Sciences and Dietetics, '53

Some of **Helen Dierkes'** fondest memories of Cal were her courses with noted professor Dr. **Agnes Fay Morgan**.

"She was a taskmaster, but you did your very best and studied intensely," Dierkes said. "I well recall the nitrogen balance experiments."

Dierkes also took home a pet.

"To determine the protein efficiency of nuts, we fed rats test diets to see how they grew. I became very fond of one of my subjects, which was growing very well on walnuts—he was almost the size of a cat! I named him Rudolph and took him home. I don't think that Dr. Morgan knew," Dierkes said. Rudolph ultimately lived with her fiancé, Donald, in the dental fraternity at UCSF along with a cat, a crow, and a de-scented skunk.

After graduating and completing her internship at Stanford, Dierkes married and accompanied her husband to Germany for two years. But it wasn't until they returned to the States that she was able to put her education to work as a metabolic researcher and clinical dietitian at Northwestern University Hospital in Chicago.

"With the army of occupation, wives were not able to work unless they were in the military," Dierkes said of her experience in Germany.

A native of Berkeley, Dierkes returned to the Bay Area in 1958 and has been an active volunteer with both the dietetic community and Cal ever since.

"Nutrition has been a lifelong education; you're always learning something new," Dierkes said.

Dierkes has given substantial gifts to several university programs, including those at the College of Natural Resources. She's also been active on her class campaigns and reunions. This Homecoming, her class—which had only seven dietetics graduates—celebrated their 50th reunion.

Dierkes says she contributes in part to perpetuate awareness of nutritional sciences.

"We owe our existence to a healthy lifestyle—exercise and well-balanced nutrition. It's important to keep that in the forefront of people's minds, even though everyone seems to be moving at a fast pace."

She also has a family history with Cal. Her father, Charles F. Gross, was a professor of naval architecture and marine engineering, and her daughter Diane graduated in landscape architecture in 1981.

$2,500-$4,999

Alameda County Mosquito Abatement District
Donald L. Haid, '97 & Hallidie G. Haid
Raymond E. Helm, '51
Frances Joos
E. Robert Munsey, '69
Dr. Robert O. Nesheim
Pacific Lumber Company
Pebble Beach Company
Ruth M. Schubert
Joel R. Singer, '79
The Urban Institute
Valent USA Corporation
Alice Vaux-Hall

$1,000-$2,499

Anonymous
Alexander & Baldwin Foundation
American Society of Plant Physiologists
Burton A. Anderson, '49 & Alice V. Anderson
Claude U. Babcock, '52
Sherman G. Babcock, '41
John V. Beahrs, '35 &
Virginia Oakley Beahrs, '34
Phillip S. Berry
Blackwell Publishing
Thorley D. Briggs & Gloria B. Briggs
California League of Food Processors
Cerexagri, Inc.
Chiron Corporation
R. Ken Coit & Donna Schemanske Coit, '72
George A. Craig, '39 & Viola Harris Craig, '39
Del Monte Fresh Produce Company
Dr. Wayne M. Getz
Robert E. Gilbert, Sr., '47 & Beverly S. Gilbert
Mary Beahrs Grah, '39
Dr. Donald D. Dierkes, '54 &
Helen Jean Gross Dierkes, '53
Dr. Suzanne Hendrich, '82
Dean W. Lloyd, '49
Dr. Paul W. Ludden & Linda Ludden
Alexander G. MacInnis & Bo Y. MacInnis
Natalie H. Magy
Alan H. Matthews, '48 & Elizabeth Matthews
Margaret Lockie Navarra, '70
Barbara Schnoor Nielsen, '49
Novartis Pharma AG
J. Roger Samuelsen, '58 &
Jeane Stewart Samuelsen
Scentry Biologicals, Inc.
Bernice Schwabacher
System Experts Corporation
Trece, Inc.
James P. Vokac, '76 & Stacey T. Baba, '77
Dr. William E. Waters
Weyerhaeuser Company Foundation
William L. Woods, III, '73 & Kathleen C. Woods

$500-$999

Anonymous
Ann Bzik Foundation
Daina Dravnieks Apple, '77 &
Dr. Martin A. Apple, '68
Robert D. Archibald
Stephen L. Beck, '66 & Terry Duffy Beck, '65
Caroline S. Bledsoe
Steven S. Bremner, '73
John L. Casazza, '77
Nancy Dawson Christensen, '50 &
Deal Christensen, Jr., '50
Dr. James L. Clayton, '65
Dr. S. Loren Cole, '70
Joseph J. DiConza, '68
Kenneth Groefsema, '48 &
Priscilla Groefsema
Nelletje Groenveld, '84
Kathleen G. Gundry, '74
Ann E. Harrison, '82 & Vincente Madrigal, '82
Kathleen Ohlson Hartzell, '72
George R. Holden, '47
George G. Ice, '72
Douglas E. Kain, '76
Dr. John Lang
Douglas S. Lipton, '91
Nancy Kresser Lusk, '64
Iona Rockwell Main, '49
Dana Malas
Dr. Richard Malkin, '67 & Carole Malkin
Byrne C. Manson
Steven J. Merlo, '73
Barbara Walsh Moser, '80 &
David E. Moser, '81
David A. Nielsen, '84
Rose M. Sarquis
Dr. Douglas M. Sinton, '73
J. David Sterner, '90
Joan Striplin
Roger Tsao & Theresa Y. Tsao
Kathleen D. Walt
Brett A. White, '82
Charles F. Wilkinson, IV
Diane S. Yu, '96
Frances Jones Zivnuska, '35

Donald Haid
Wildland Resource Studies, '97

Donald Haid knows that working for a forest products company isn't popular in some circles. But he also knows that it is important.

"The reality is that people live in wooden houses, relax on wooden decks, read newspapers, and use cardboard boxes made from wood fiber—and they don't show any signs of doing less of that. What we do is find ways to produce those products," Haid said.

After working for the Canadian forest service, Haid came to Berkeley in part because its programs deal with controversial issues as well as basic production techniques. Now he works in marketing and economics research for Weyerhaeuser.

"The links to economic theory as well as the heavy policy emphasis of the Forestry faculty provided a really strong applied economics degree," he said.

Haid also feels it's important to give back to the College, and he's done so regularly since graduation.

"I think going to graduate school is a good thing, and I realize it's pretty tough to make ends meet. Supporting the general fund to the extent it supports graduate teaching is important," he said. "I also believe it's important to support programs, especially the less fashionable ones that have trouble raising money."

Matching funds from his company help his gift go even further.

"I'm proud that I went to Berkeley, and I like to be connected. I'm in a position to give something back and I'm glad to do it."

$250-$499

Richard H. Allan, '82 & Kelly L. Allan
Dr. Michael F. Allen & Dr. Edith B. Allen
Dr. Martin M. Barnes, '41
Raul N. Tuazon, '84 & Mary K. Bartoloni, '84
Michael B. Beeman, '67
William R. Bentley, '60
Allison C. Blakley, '78
The Boeing Company
Everett T. Brown, '86
Charles Burton, '74
R. Gordon Carson
Helen Chow, '96
Dr. Michael E. Colvin, '86
James H. Cooney, Jr., '66
Elizabeth Fordyce Cuff, '80
Jon W. D'Alessio, '68 & Carole Lebow
D'Alessio, '69
Dr. Howell V. Daly, Jr. & Barbara B. Daly, '61
Dr. Richard J. Dare, '79
Frederick L. Ehrman, '27*
Marian Koyama Endo, '78 & Dean K. Endo
Dr. Susan C. Flores, '77
Jacob M. Frankel, '40
Geo Safety, Inc.
Rudolf Glauser, '67
Dr. Lynn R. Goldman, '76 &
Douglas G. Hayward, '91
Carole Johnson Gray, '82
Lorna MacDonald Groundwater, '91
Harriet L. Hamlin
Robert T. Hatamiya, '56
Alice Danner Holden, '47*
Shen L. Howng & Sue-Faye L. Howng
Leroy A. Jebian, '64 &
Winifred Camp Jebian, '65
Roger G. Jones, '39

* Deceased

College Support

Kennedy Associates Inc
Joanna Renetzky Kingham, '39
David L. Knutson, '53
Dr. Watson M. Laetsch & Sita Laetsch
Robert L. Leatherman, Jr., '49
Lockheed Martin Corporation
Dr. Clifford O. Marks, '80
Robert A. McCord, '71
Dr. Ann McGowan-Tuskes, '80
Dr. Elmer L. Menzie, '61
Scott L. Miller, '78 & Judey Wall Miller, '75
Dr. Jennifer Simone Money, '86
Morro Coast Audubon
David C. Nuban, '82
Ronald Okimoto, '79
Susan R. Orbuch, '86
Dr. Brian R. Payne, '61 &
Almuth Fahrenbach Payne, '61
John E. Pehrson, Jr., '51 & Mary E. Pehrson
Dr. Klaus W. Radtke, '81
Phillip A. Rogers & Sally Toke Rogers
Dr. Alan G. Stangenberger, '65
Dr. Harvey J. Stein, '91 & Irina G. Stein, '85
Michael T. Sullivan, '73 &
Mary Mulligan Sullivan, '75
Dr. Edward S. Sylvester, '47 &
Marian Uhl Sylvester
Mark L. Travis, '88
Mark E. Triebwasser, '71
The United Way of the Bay Area
David L. White, '79
Tim T. Wong, '61
Lt. Col. Susan Zivnuska

$100-$249

Daniel A. Airola, '76
John S. Doctor, '85 & Mary L. Alleman, '76
Amos F. Almand, III & Sue Coffey Almand
Jean B. Amidon, '94
Gary D. Andrews, '78
Daniel M. Cotton, '90 & Diane J. Appel, '85
Dr. Charlene Quesnoy Arbogast, '60
Loukas G. Arvanitis, '66
Barbara J. Baker, '62
Steven S. Balling, '74 &
Carolyn Sorensen Balling, '74
Helen C. Barber
James C. Bates, '58
Coleman D. Bazelon, '89
William T. Beeman, '55 & Betty Beeman
Dr. Jeri L. Berc, '81
Dr. Peter Berck, '71 &
Cyndi Spindell Berck, '85
Donna M. Berg, '75
Biomed Inc.
Frances Bowman, '70
Harold F. Bowman, '43
Maj. Gen. Allison C. Brooks, Ret., '38
David E. Buschena, '93
Daniel Cahn, '80
California Native Plant Society
J. Kevin Carroll, '93
Ruth Woolson Catlin, '77
William F. Chamberlain, '43
Chester C. Chan, '49 &
Annie Foon Chan, '54
Andrew M. Chapman, '77
Michael A. Chase, '73 & Ellen Maldonado, '74
Michel H. Chavet, '72
Wen S. Chern, '71
Dr. Richard S. Colman, '70
Dr. Katherine M. Condon, '83
Dr. James E. Constantz, '73
Cheri R. Cruikshank, '88
Robert H. Culbertson, '44
Gerald B. Cullinane, '49 &
Carol White Cullinane, '50
Dr. Clytia Montllor Curley, '85
Erwin R. Davidson, '38 &
Ruth Eichar Davidson, '38
Dr. Nita A. Davidson, '88
Randy L. Davis, '76
Nicholas B. Dederer, '73
Del Monte Foods USA
Frank G. Delfino, '51 & Janice B. Delfino
Victoria Gillmeister Dibbern, '63
Richard D. Drager, '71 & Annette Barry, '75
Richard F. Droege, '36 &
Mildred Jones Droege, '36
Don M. Eisenberg, '75
Dr. Joseph S. Elkinton, '79
Frank C. Elliott, '75 &
Michelle A. De Corte, '77
Brian K. Estwick, '79
Dr. Robert A. Ewing, '67
Eric S. Ewing, '83
Andrew T. Fagan, C.F.A., '78 &
Eileen D. Fagan
Duncan Fallat, '84
Dr. Lewis J. Feldman, '67
Christopher P. Ferguson, '83 &
Catherine Calkin Ferguson, '84
Susan O. Fischer, '88
Dr. Anthony C. Fisher
Jennifer C. Fletcher
Andrew K. Fogg, '92 &
Eva M. Ramirez-Fogg, '92
Virginia L. Fox
Donald R. Franson, Jr., '74 &
Anne Woolf Franson
Lester M. Fujii, '59
Thomas H. Gaman, '72
William H. Gavelis, '72
Genentech, Inc.
Thomas A. Gey, '76
Dr. J. Keith Gilless
Karen A. Goldberg, '81
Donald K. Gordon, '48
Donald R. Gotthold, '48 &
Mary McGarr Gotthold, '61
Dr. Douglas J. Gould, '44
David W. Graves & Elizabeth McKinne
James P. Gray, '65
Elizabeth Gustavson, '93
Heidi Stettler Hagler, '82
Guy H. Hall, Jr., '51 &
Barbara Morrison Hall, '49
Diane M. Hamberlin, '90
Giles M. Marion, '74 &
Dawn C. Hammond, '75
Pamela L. Harlow, '91
James B. Harsh, III, '75
Dr. Tracy E. Hart, '93
Dr. Lawrence P. Harter, '73 &
Nancy K. Harter, '75
Douglas W. Hayden, '57
Dr. A. Carl Helmholz, '40 * &
Elizabeth Little Helmholz
Daniel O. Holmes, '73 &
Robin Spencer Holmes, '80
Barbara A. Holzman, '83
Rowena Carlson Horn, '66 &
William G. Horn, Jr., '65
Margaret E. Huflejt, '90
William B. Hull, '80
Dr. Heather C. Huppe, '89
D. Bruce Imbeau, '75
David W. Ingersoll, '80
June E. Irizarry, '88
Karin A. Jacobson, '77
Scott T. Kain, '79
A. Arlene Kasa, '59
Jeffrey H. Kato, '85
Dr. Pamela Madsen Keagy, '68 &
Robert S. Keagy, '66
Carolyn Aarts Keddington, '84 &
Michael K. Keddington
Betty Courtright Keogh, '41
Eric L. Kho, '98
Dr. Sharon Korr, '74
La Purisima Audubon Society
Benjamin T. Laflin, Jr., '47 &
Patricia Baker Laflin, '49
Dr. Gary A. Lamberti, '83
Donald T. Lauer, '63 & Carol Millinich Lauer, '63
Robert H. Laws, '56 &
Beatrice Challiss Laws, '49
Dr. Clifford A. Lee, '84
Robert J. Lenahan, '70
John T. Lerch, '72
Dr. Vernard R. Lewis, '75 & Flordeliza L. Kala, '78
Dr. Angela Capobianco Little, '40
George G. Little, '47*
Dr. Louis N. Locke, '50 &
Frances Shearer Locke, '50
Thomas P. Loorz, '75
Los Angeles Mycological Society
Dr. Harold A. Love, '88 &
Dr. Diana M. Burton, '86
Mark R. Lundell, '90
Magnolia Veterinary Clinic
Judith Smith Malamut, '83
Traver S. Martin, '38
Elizabeth J. McCosh-Lilie, '68
Dr. Janet B. McDonald, '74
Philip A. McDonald, '71
Robert J. McDonald & Marjorie H. McDonald
Michael P. McDowell, '79
Michael D. McKaig, '70 & Kathryn A. O'Neal, '76
Dr. William L M McKillop, '65
Dr. Charles I. McNeill, '75 &
Joan Falkenberg McNeill, '73
Christine Merten, '90
Dr. Jay H. Messinger, '70 &
Judith S. Messinger
Kendrick W. Miller, Jr., '65
Ross D. Mobley
Martin R. Mochizuki, '78
Mary Jo Hilliard Morris
Dr. David H. Mack, '84 &
Kathleen T. Mulligan, '82
Joe M. Murphy, '84 & Margaret J. Murphy, '83
Laurie Klein Nelson, '76
Philip E. Nemir, '69
Douglas J. Ng, '77
Kirsten A. Nielsen, '93
Kathleen M. O'Loughlin, '78
David L. Ozawa, '81
Pacific Gas & Electric Company
Loralee Lauder Parish, '62

* Deceased

Robert S. Patterson, '76 &
Anne Carpenter Patterson, '75
Walter G. Patton, '50
Robert J. Penzien, '74 &
Dr. Beverly Downing Penzien, '74
Piyasena C. Perera, '83
James M. Perich-Anderson, '77
Drew A. Perry, '78
Jean-Noel D. Pinkney, '73 &
Donna A. Pinkney, '78
David S. Pitou, '76
Enrique O. Polle, '66
Wee Y. Pong
The Procter & Gamble Company
Dr. Edison W. Putman, '42
Benjamin Puttler, '55
Dr. Cyrus A. Ramezani, '91
Patricia Wheatcraft Rapp, '62
David M. Rector, '78
Srinivasa T. Reddy, '92 & Sailaja M. Reddy, '92
Jack P. Ren, '93 & Bonnie J. Chen, '96
Jacqueline V. Rich, '73
Louis A. Riehl, '36
Dr. Gail Miller Simpson, '84 &
David M. Roberts, '74
Jacqueline Schwartz Robertson, '69
Alexis Wilson Robinson, '93
Rose Marie J. Rockwood, '96 &
Chris Rockwood, '96
Dr. Jeffrey M. Romm, '64
Carol L. Ruprecht
David E. Salk, '73 & Leah Kaizer, '73
Santa Barbara Audubon Society
Naftali Sauerbrun, M.S., '73
Marie Dufau Schirmer, '65
John C. Schuyler, '78
Tom G. Schwan, '83
Science Applications International Corporation
Albert J. Shaheen, Jr., '78
Frederick M. Shanks, '53 &
Catherine Rhorabough Shanks, '53
Jon C. Shawl, '64
Dr. Surendra P. Shrivastava, '67
David G. Silver, '79
Dr. Jonathan L. Simon, '84
Skadden, Arps, Slate, Meagher & Flom LLP
Alison L. Smith, '80
Gordon J. Smith, '76
Susan A. Snedecor, '66
Dr. Josephine Benton Soliz, '79
Randolph L. Sperry, '77
Jill E. Stavosky, '76
Peter A. Stine, '75
Dr. Edward C. Stone, '40*
Michael C. Stroud, '69
Thomas W. Sutfin, '76
Marjorie Menoher Sutton, '53
Sycamore Associates
Dr. Sigurd L. Szerlip, '80
Liana Lam Szeto, '80
Bonnie W. Tam, '00
Amy N. Tang, '00
Dr. Maurice J. Tauber, '67 &
Catherine Toschi Tauber, '62
Clay D. Taylor, '97
Dr. Dennis E. Teeguarden, '58 &
Sally A. Teeguarden
Erik M. Terreri, '93
Ms. Diana Dair Theriault, '97
Jane Sun Tien, '73
E. Alison Tribble, '99
Henry K. Trobitz, '38
Kai Umeda, '78
Union Pacific
United Way Silicon Valley
Robert M. Vaux
Jose R. Velasco, '49
Dr. James Vlamis, '35 &
Nancy MacBride Vlamis, '38
Dr. Loy E. Volkman
Dr. Thomas W. Von Geldern, '84 &
Cynthia L. Skrukrud, '87
Dr. Ronald H. Wakimoto, '70 &
Dr. Sandra J. Sheppard, '74
Barbara Encarnacao Walker, '83
Dr. George C. Wall, '73
Dennis Jay Walton, '73 &
Barbara Smith Walton, '73
Washington State University
Linda C. Whitehand, '66
Robin Gleyzal Wilkins, '75
Elizabeth R. Will
Michael B. Winton, '79
Edward S. Wong, '48
Dr. Barbara A. Wood, '68
Richard C. Worden, '86
Dr. Charles L. Woronick, '55
John M. Wray, '79
Kristi Wrigley, '71
Ellen Li Yee, '79
Fay A. Yee, '82
Dr. C. Spencer Yost, '76
David Zajanc, '94
Minli Zhang, '92
Dr. Robert L. Zuparko, '75 &
Carolynn Harvey Zuparko, '75

* Deceased

Viktoriya Mass
Environmental Economics and Policy, '03

For **Viktoriya Mass**, CNR's intimate feel was central to her initial interest and her ongoing commitment to the College.

"It's become kind of cliché that 'everyone is on a first-name basis,' but it's true," she said.

After graduating from George Washington High School in San Francisco, she was interested in studying the environment. "I thought one of the best ways to affect the environment was through economics. When I saw the environmental economics and policy major, it really hit home," Mass said.

But the College's reputation of having a close-knit community really convinced her. "I was told that one of the biggest drawbacks about Berkeley was that it was so big and impersonal, but CNR was more like a small college," she said.

While she was here, Mass took advantage of the resources at the College and excelled, earning her the 2003 Kenneth L. Babcock Prize in Environmental Science. The prize—established in 1995 in memory of Babcock—is awarded annually to the College's most outstanding graduating senior in the field of environmental science.

In addition to top grades, Mass minored in forestry and was active in the Forestry Club, worked as a reader and a tutor, helped gather data for one of Associate Professor **Ethan Ligon**'s research projects, and completed an internship with the Center for Safe Energy in Berkeley. A native Russian, Mass helped the center with grants and workshops to help women in the former Soviet republics to start their own businesses.

Now she's an environmental planner for a consulting firm in San Francisco and plans to attend graduate school in the future.

In the meantime, she plans to stay connected to the College.

"I definitely feel it's important to give back, obviously financially but also by staying in touch with advisers, classmates, and undergraduates," Mass said. "Especially my senior year, I felt a great sense of community and an incredible sense of belonging—that hasn't come easy to me, being an immigrant and having to adapt to the culture here. It was a real surprise for me to feel like I belonged at Cal."

Alumni News

CLASS NOTES

'36

Richard (Dick) Droege, B.S., Forestry, hopes to make a trip on Amtrak with his son David.

Richard Hardiman (Hardy) Fowler, B.S., Soil and Plant Nutrition, is 92 years old and is active in Lions Club, church, and lodge groups.

'39

Edward P. Jepsen, Jr., B.S., Forestry, spends his time boating, fishing, and adjusting marine compasses.

'40

Ronald S. Adams, B.S., Forestry, co-manages the Forest Center at Cal Expos and serves as the class secretary for the Forestry class of 1940.

'41

James A. Burris, B.S., Forestry, is still working, cycling, and sailing.

'42

William Dresser, B.S., Forestry, has made two boat trips down the Amazon River.

Emerson L. Smith, B.S., Forestry, is a practicing land surveyor.

'43

Lorraine McLaughlin, B.S., Agricultural Science, travels abroad every year.

'44

Marie McKeown, B.S., Home Economics, moved to Ellensburg, Washington, and has six grandchildren and four great-grandchildren.

'47

John H. Hastings, B.S., Forestry, volunteers at a local college, travels, and plays tennis in his retirement.

Jack Hiehle, B.S., Forestry, leads nature walks for the Native Plant Society in Sacramento.

Ross S. Miller, B.S., Entomology, is a cotton farmer and consulting entomologist in the San Joaquin Valley.

'48

John Evans, B.S., Agricultural Economics, has retired from the University of California Cooperative Extension.

'56

Evelyn Venstrom Preston, B.S., Agricultural Science, is active in Kiwanis. She collects aluminum flip tops for the Shrine Hospital and Ronald McDonald House in Spokane.

'58

Richard Erwin Dresser, B.S., Forestry, is retired from the California Department of Forestry and is an associate professor at the College of the Redwoods.

'61

Philip H. Beam, B.S., Forestry, is retired and enjoys restoring old automobiles.

'62

Geri V. Bergen, B.S., Forestry, M.A. '65, Botany, is the 2003 president of the Nevada County Land Trust and has been active with that group for seven years.

'69

Michael C. Stroud, B.S., Forestry, and M.S. '70, Range Conservation, recently retired from the federal government after 33 years. He is currently director of operations for the Center for Natural Lands Management, a nonprofit land conservancy. He is coordinator for the Society of Range Management's annual Range and Natural Resources Youth camp, now in its 20th year. He is serving his second term on the Professional Foresters Examining Committee of the State Board of Forestry. Married to Georgia, he has one stepson and one step-grandson.

'73

William D. "Bud" Rice, Jr., B.S., Forestry, works on National Environmental Policy Act documents for the National Parks in Alaska as the regional air resources coordinator and spill response coordinator.

'79

Chris Mosher, B.S., Forestry, has worked as operations manager for a recreation services company for 17 years.

Allen Robertson, B.S., Forestry, is an environmental coordinator for the California Department of Forestry.

'80

Katrina Marshall, B.S., Forestry, works as a plant pathologist for the U.S. Forest Service in Oregon.

Kathi Robertson, B.S., Forestry, works at the Fire Protection Headquarters in the administrative office for the California Department of Forestry.

'81

Yong Lee (Lam), B.S. Nutrition and Dietetics, is the Assistant Residency Director at Scripps Family Practice residency program.

'82

Richard H. Allan, B.S., Political Economy of Natural Resources, is a partner with the law firm Ball Janik LLP in Portland, Oregon, where he has practiced environmental and land use law for 14 years.

Andrea Rosanoff, Ph.D., Nutrition, coauthored *The Magnesium Factor,* a book for the lay public on magnesium nutrition as it relates to risk factors for heart disease.

'83

Joseph Blachman, B.S., Political Economy of Natural Resources, was recently promoted to vice president of finance and strategic planning for a software development, maintenance, and support division of Countrywide Home Loans.

James Osborne, B.S., Conservation and Resource Studies, spent 20 years interpreting park resources at the Golden Gate National Recreation Area. He is married and has two children.

David Stanley, Ph.D., Entomology, spent January to April as a guest professor at Catholic University, Leuven, Belgium.

'87

Don Flickinger, M.S., Wildland Resource Science, is doing Endangered Species Act consultations of fisheries in Siskiyou County for the National Oceanic and Atmospheric Administration.

'89

Sonia Flowers, B.S., Nutrition and Food Science, works as a scientist at Roche Molecular Systems in Alameda, California.

'92

Dona Horan, B.S., Resource Management, conducts fisheries research and chairs a committee that is organizing the public to clean the Boise River annually.

Susan Miller, M.S., Wildland Resource Science, works as an ecologist for the U.S. Forest Service at the Payette National Forest in Idaho.

'94

Theodore K. Raab, Ph.D., Agricultural Chemistry, is a Carnegie Fellow at the Department of Plant Biology and a visiting researcher at Advanced Light Source, Lawrence Berkeley National Laboratory.

'95

Sarah Beamish, B.S., Environmental Economics and Policy, is a restoration ecologist for the Natural Heritage Institute, specializing in wetland and river restoration and natural resource management. She has worked for Save the Bay to restore wetlands around the San Francisco Bay and delta. Before graduate school, Sarah worked in the national office of the Trust for Public Land and as a park ranger for Muir Woods National Monument.

'96

Hanspeter Walter, B.S., Forestry, is working as an environmental specialist in the Department of Water Resources in Sacramento.

'99

Serena Chu, B.S., Environmental Economics and Policy, is a senior associate for Triage Consulting Group in San Francisco. In her senior year, Serena spent a semester abroad at the Hong Kong University of Science and Technology.

Janice Dean, B.S., Conservation and Resource Studies, is a second-year student at the Pace University School of Law.

'00

Ara Erickson, B.S., Resource Management, is finishing a master's degree in urban forest management at the University of Washington.

'01

Ilana Peterson, B.S., Resource Management, is working as a seasonal park ranger at Olympic National Park in Washington.

'02

Heather O'Hara, B.S., Forestry, is an assistant for a San Francisco Bay Area land trust.

'03

Efren Carrillo, B.S., Environmental Economics and Policy, is a project coordinator for the Sonoma County Economic Development Board in Santa Rosa.

Nancy Wei, B.S., Dietetics, is enrolled in a dietetic internship and master of public health program.

IN MEMORIAM

Donald L. Dahlsten, '63, Ph.D., Entomology, died September 3, 2003, after a two-year battle against a rare type of skin cancer. Over the course of his 40-year career, Dahlsten developed a reputation as one of the world's most respected leaders in biological control of insects that feed on trees in forests and in urban environments. Known as a dedicated educator, Dahlsten spent his entire career on the faculty at UC Berkeley. He was appointed associate dean for instruction and student affairs at UC Berkeley's College of Natural Resources in 1996. He advised 39 graduate students during his tenure, but he also extended his enthusiasm for insects and education beyond the campus by developing and heading outreach programs through the College and through the campus's Interactive University Project. His efforts and outstanding contributions earned him the UC Berkeley Distinguished Service Award and the College of Natural Resources Citation, both awarded earlier this year. Dahlsten received numerous other honors throughout his distinguished career, including the UC Berkeley College of Natural Resources Outstanding Teaching Award in 1995. A memorial service and tree planting was held on campus on October 12.

Elsie Glotfelty, '36, Food, Nutrition, and Dietetics, loved her years at Cal. Her husband, Roy, says they were "real outdoor lovers and Elsie became a real High Sierra fishing gal."

Mike Koll, '42, B.S., Forestry, died July 1, 2003, after a long illness. Koll, former executive director of the California Alumni Association, began his alumni association career in 1949 as founding director of the Lair of the Golden Bear summer camp in the Stanislaus National Forest, one of the most successful and imitated of the nation's family camps. As an undergraduate, Koll was the only Cal pitcher to win a batting title, and he was proud that he never lost to Stanford University in four years. His baseball career at Berkeley earned him induction into the Cal Athletic Hall of Fame. In retirement he continued his service to the university, assisting with campus fundraising and remaining a guiding influence at the Lair of the Golden Bear. Koll also served as president of the Berkeley chapter of the Rotary Club.

Paul H. Lehigh, '51, B.S., Agricultural Science, died December 14, 2002. After graduation, he worked at the Schmeiser Ranch, west of Davis. In 1952, he worked with the *Livestock Market News* in Stockton and then, in 1967, with *Hay Market News* in Sacramento. He was a senior livestock marketing specialist throughout California and he voiced the market report for numerous radio stations throughout the West. He retired from the California Food and Agriculture Department after 35 years of service. He loved plants, flowers, and animals.

Vernon D. Miller, '47, B.S., Agricultural Science, died April 26, 2002.

Robert M. Vincent, '76, M.S., Forestry, was killed in an automobile accident August 25, 2003.

Jamie Westoby, '03, B.S., Resource Management, died August 29, 2003, as a passenger in an automobile accident. She loved travel and the outdoors and was a member of the university's diving team. After graduation, Westoby spent two months in New Zealand and worked on a tree farm owned by a friend. She was working at the Jackson Demonstration State Forest, between Fort Bragg and Willits.

The College of Natural Resources Citation

Call for Nominations

2002
Richard Beahrs '68

2003
Donald Dahlsten '63

Who will receive the College's highest honor in 2004? Help us decide!

The College of Natural Resources invites nominations for the CNR Citation. The Citation will be awarded in the spring to an individual, couple, or organization that has made important contributions to the College and its programs.

Please submit a written nomination with a rationale, including the nominee's accomplishments and contributions to the College. A formal letter of recommendation is not required.

Recipients of the award will receive a framed certificate and their names will be engraved on a permanent plaque in the lobby of Giannini Hall.

Please send your nomination by February 1, 2004, to:
Dean Paul Ludden
College of Natural Resources
101 Giannini Hall
Berkeley, CA 94720-3100
or by e-mail to citation@nature.berkeley.edu

For more information about the award, send an e-mail to the above address or call the College Relations office at (510) 643-8860.

University of California, Berkeley
Office of College Relations
College of Natural Resources
101 Giannini Hall #3100
Berkeley, CA 94720-3100
ADDRESS SERVICE REQUESTED

Non-Profit Organization
U.S. Postage PAID
San Francisco, California
Permit #2

have you joined?

@cal great minds online

The official online community for alumni of the University of California, Berkeley, @cal offers its members free e-mail forwarding for life as well as:

- connections with your classmates
- news about your college or school
- ways to find alumni with similar interests
- career network with alumni and graduating students
- discussion groups

UC Berkeley's 14 schools and colleges are partners in the community and provide @cal pages with their school or college banner. These pages provide a unique entry to the @cal community, including school-specific news and events.

During the registration process, you choose one preferred @cal opening page. You may choose from:

- your campus
- your school or college
- California Alumni Association home page

To enjoy the full benefits of @cal, register as a member.

For answers to common questions about @cal, read our Frequently Asked Questions.

We welcome your suggestions and comments.

Find out more! Go to https://cal.berkeley.edu/

FEBRUARY 6-7, 2004

Blodgett Forest Research Station Annual Symposium

MARCH 1, 2004

Daniel Arnon Memorial Lecture
"Chloroplasts Revisited: Berkeley 1948-1964." Dr. F.R. Whatley, Oxford University, 4:00 p.m., Room 101, Barker Hall. Reception follows.

MARCH 15-17, 2004

Redwood Science Symposium: What Does the Future Hold? Sponsored by the Center for Forestry. Rohnert Park. For more information, contact Joni Rippee at (510) 643-0095 or rippee@nature.berkeley.edu.

APRIL 17, 2004

Cal Day. Join Cal alumni, friends, prospective students, and parents for faculty speakers, demonstrations, and more!

APRIL 2004

Calloway Memorial Lecture

MAY 23, 2004

College of Natural Resources Commencement

Help us serve you better!

Please fill out and return the Communications Survey enclosed in this issue of *Breakthroughs*.