

WORKING SOLUTIONS

NEWS FROM STANFORD'S INITIATIVE ON THE ENVIRONMENT AND SUSTAINABILITY

WINTER 2007

▶ IN THIS ISSUE

FRONT PAGE NEWS

- \$50 Million for E&E Building
- Biofuels Workshop

Education & Leadership..... 3&4
 SEJ Update.....5
 Research..... 6
 News & Notes.....7
 Initiative Mission Statement..... 8
 Contact information..... 8

▶ UPCOMING EVENTS

FEBRUARY 14–MAY 6

“In the American West”—Photographs by Richard Avedon. Cantor Arts Center. Avedon’s oversized images of working-class Westerners continue to generate heated debate and are classics in the history of photography.

Editor’s Note: The following weekly events, sponsored by the Woods Institute, take place during the academic year and are free and open to the public. They are subject to speaker availability and the academic calendar, and may change. Please check the Consolidated Environmental Calendar at: <http://events.stanford.edu/environment/> to confirm details.

ENVIRONMENTAL FORUM

Thursday afternoons, 3:30 p.m.
 Goldman Conference Room
 4th Floor, Encina Hall West

ENERGY SEMINAR

Wednesday afternoons, 4:15 p.m.
 History Corner, Bldg. 200

Yahoo! Co-founder, Wife Pledge \$50 Million to Fund E&E Building

Stanford trustee Jerry Yang, co-founder of Yahoo! Inc., and his wife Akiko Yamazaki, both Stanford alumni, have pledged \$75 million to enhance multidisciplinary programs at Stanford. The bulk of the gift—\$50 million—will be used to cover construction costs for the new Environment and Energy Building, which will serve as the hub for interdisciplinary environmental studies on campus. Another \$5 million will go toward the construction of the high-tech Learning and Knowledge Center for the School of Medicine. The remaining \$20 million will be earmarked for projects to be determined later.



▶ Jerry Yang and Akiko Yamazaki

The gift—the largest of several donations Yang and Yamazaki have given to their alma mater—represents a major contribution to The Stanford Challenge, the university’s recently announced campaign dedicated to finding solutions to the most pressing challenges facing society today and to strengthening multidisciplinary teaching and research across the campus.

“Stanford is indeed fortunate to have friends like Jerry Yang and Akiko Yamazaki,” said Stanford President John Hennessy. “Jerry and Akiko have always been loyal supporters of their alma mater, but this gift is particularly meaningful for the university as it seeks to address important issues of environmental sustainability. At the same time, it recognizes the critical role that cutting-edge research facilities play as hubs for dynamic intellectual exchange and innovative research in the ongoing search for knowledge that serves the public good. We are truly grateful for the generosity of spirit and breadth of vision embodied in this magnificent gift.”

Continued on page 2

Ideas Into Action

Biofuels: ‘Potential for Win-Win’

The potential for biofuels to provide clean energy and reduce dependence on greenhouse gas-generating petroleum has received a lot of national and international attention in recent months. In December, the Woods Institute brought together a group of scientists and representatives from business and industry, government and NGOs to discuss, “Environmental, Resource and Trade Implications of Biofuels.”

The event was one in a series of “Uncommon Dialogues” organized by the institute to help public and private leaders find workable

solutions to the sustainability challenges they face. Previous topics have been the Endangered Species Act and the U.S. Farm Bill.

“The institute is able to serve as a neutral convener, working with diverse organizations in seeking solutions,” said institute director Barton H. “Buzz” Thompson Jr., Robert E. Paradise Professor of Natural Resources Law. “At the same time, the university’s substantive research and expertise provide a basis for focusing discussions that avoids traditional polarization.”



▶ Workshop participants Margot Gerritsen and Roland Hwang

Institute Director Jeff Koseff, William Alden and Martha Campbell Professor of Civil and Environmental Engineering, moderated the opening session, featuring presentations by Kenneth

Continued on page 2

E & E BUILDING OCCUPANTS

The following groups are among those slated to move into the E & E Building late this year:

- Bill Lane Center for the Study of the North American West
- Civil & Environmental Engineering
- Earth Systems Program
- Environmental and Natural Resources Law & Policy Program
- Interdisciplinary Graduate Program in Environment & Resources (IPER)
- Precourt Institute for Energy Efficiency
- Woods Institute for the Environment

Cover Story

Yahoo! Co-founder, Wife Pledge \$50 Million to Fund E&E Building

Continued from Page 1

Born in Taiwan and raised in the Bay Area, Yang co-created the Yahoo! search engine in April 1994 when he was a doctoral student in electrical engineering at Stanford. He is currently a director of the company and holds the title of Chief Yahoo. In 2005, he was elected to the Stanford Board of Trustees for a five-year term. Yamazaki, BS '90, was raised in Costa Rica and came to the United States to study industrial engineering at Stanford. The couple met in Japan in 1992 at the Stanford-in-Kyoto overseas studies program.

“When The Stanford Challenge defined the environment and sustainability as a major fund-raising initiative, it really hit home for Akiko and me,” said Yang, BS '90, MS '90. “When you live in a place like Costa Rica, the environment is just part of life,” Yamazaki added. “Because it’s such a small country, everything is very accessible. Sloths are always coming into your backyard, and if you want to see white-faced monkeys, you just drive an hour and there they are.”

A director of the Wildlife Conservation Network in Los Altos, California, Yamazaki said that she and her husband welcomed the opportunity to make a substantial contribution toward construction of the Environment and Energy Building, which began in 2005 and is expected to be completed in December. The estimated price tag for the finished building is \$118 million. The 166,000-square-foot, eco-friendly facility located at Via Ortega and Panama Street will provide a new home for the Woods Institute for the Environment, the Department of Civil and Environmental Engineering and several interdisciplinary environmental research programs.

“The future is in interdisciplinary problem solving,” Yamazaki said. “This building and the programs it will house will allow the best and the brightest to convene and engage in problem solving in a unique way that’s only possible in an academic setting. What better place than Stanford for that, with its excellence in engineering, law, Earth sciences and biology. It will really be drawing on all the strengths that Stanford has.”

The new facility will serve as a “coming together place” for the Stanford’s environmental community, added civil and environmental engineering Professor Jeffrey R. Koseff, director of the Woods Institute, William Alden and Martha Campbell Professor of Civil and Environmental Engineering, and Michael Forman University Fellow in Undergraduate Education.

“The Environment and Energy Building will allow us to move our ‘ideas into action’ by providing space and technology for collaboration and connections with decision makers, and creating the spaces needed to train and educate leaders in the environmental realm,” he said. “We are all enormously grateful to Jerry and Akiko for their incredible generosity.”

Added Yang: “I think in 5, 10 or 15 years we’ll be able to say, ‘Wow, look at all the great things that have come out of that building.’” ■

Biofuels: ‘Potential for Win-Win’

Continued from Page 1

Cassman, University of Nebraska-Lincoln; Andrew Karsner, assistant U.S. secretary for energy efficiency and renewable energy; Jikun Huang, Chinese Academy of Sciences; and Scott Rozelle, senior fellow at Stanford’s Freeman Spogli Institute for International Studies. Subsequent sessions focused on food, agriculture and trade; land use and conservation; greenhouse gases and climate; and local air quality. Much of the discussion focused on the lack of research consensus on the implications for climate change, water usage, and food security as a biofuels market is developed.

After breakout sessions, Thompson moderated a lively discussion of

cross-cutting issues. “I’ve learned a great deal,” said Pam Matson, Stanford’s dean of Earth sciences and a senior fellow at Woods. “There’s a lot of potential for a win-win situation, but the challenge is the complex issues involved—scale, location, policies, multiple feedstocks, environmental issues—and the overall interconnectivity of the planet.

“Policies to address these issues have to have a global context—that’s essential to getting this right,” she added.

Following the workshop, Thompson moderated a public panel discussion on “Biofuels Opportunities and Challenges,” as



► Jikun Huang, Chinese Academy of Sciences, addresses the biofuels group.

part of the Woods Institute’s Energy Seminar. Discussants were Cassman and Huang, along with Ronald Christenson, Cargill Inc.; Jason Clay, World Wildlife Fund; and Stanford researcher Mark Jacobson.

A report and policy briefs from the workshop are being developed for release this spring. ■

IPER Awards Ph.D., First Dual Master's with Law

Congratulations to two new graduates of the Interdisciplinary Graduate Program in Environment and Resources (IPER): Holmes Hummel defended her dissertation in December, "Technology and Policy Implications of Global Energy Scenarios that Stabilize Global Warming," and Peter Morgan, the first IPER master's student, just completed his JD and IPER MS through the dual-degree program with the Law School.

"IPER has opened windows of opportunity to independent research with full faculty support, and my interactions with IPER peers and faculty have sharpened my sense of how complex systems

interact and extended the relevance of my own investigation of energy scenarios to other fields of interest," Hummel said. With an IPER PhD in hand, Holmes plans to work with decision-makers who frame and influence capital investments in the energy sector.

Morgan is interested in the intersection between science and law generally and the ways in which these elements inform land conservation decisions. His IPER work included looking at incentives for private conservation and restoration of native hardwood forests in the Kona region of



► Holmes Hummel

Hawaii. Currently he's a post-doc at Stanford with the Natural Capital Project [<http://www.naturalcapitalproject.org>], until he moves to Alaska for his law clerkship this summer. ■

Training Program Brings Together Scholars, Policymakers

The Woods Institute for the Environment in November launched the Inter-University Scholars Training Program to improve understanding and communication between university researchers and California policymakers working on climate change.

The program began through the Woods Institute's California Climate Change Project, a Stanford, UC-Berkeley and UC-Davis collaboration dedicated to finding effective strategies for reducing statewide greenhouse gas emissions.

Fifteen scholars from the three universities were selected to participate in the November program, including five from the Stanford community—Margot Gerritsen, assistant professor of energy resources engineering; Michael Mastrandrea, research associate at the Center for Environmental Science and Policy; Nicholas Switanek, doctoral candidate in the Graduate School of Business; Thomas Weber, assistant professor of management science and engineering; and Ken

Caldeira of the Carnegie Institution's Stanford-based Global Ecology Department.

The program consisted of four informal training sessions with legislators, regulators and scientists. The morning session focused on state climate-change legislation and regulation, with emphasis on Assembly Bill 32, the Global Warming Solutions Act of 2006, co-authored by Assemblywoman Fran Pavley, D-Agoura Hills. Speakers included Adrienne Alvord, Pavley's principal consultant; Bart Croes, research division chief of the California Air Resources Board; and Assemblyman Ira Ruskin, D-Redwood City.

The afternoon seminar featured an interactive tutorial designed to help participants hone their communications skills led by Woods Institute senior fellow Stephen Schneider, the Melvin and Joan Lane Professor for Interdisciplinary



► Woods Institute senior fellow Stephen Schneider offered advice to help scholars communicate more clearly with the media and policymakers. Photo by L.A. Cicero

Environmental Studies at Stanford. A prominent voice on global warming, Schneider offered advice on dealing with media and governmental representatives who may be unfamiliar with the statistical and scientific fundamentals of climatology or computer modeling.

When communicating with policymakers, consider using straightforward stories and analogies, he said. For example, what do you do when you're about to propose major changes in energy consumption that would affect countless lives and yet are based on a computer model that

"The IPER dual degree offers the flexibility to pursue the tools I feel I need to be an effective practitioner, the support of a community of accomplished and dedicated peers, and opportunities to collaborate with leading thinkers and environmental problem solvers,"

—Peter Morgan

GOLDMAN HONORS PROGRAM SEEKS UNDERGRAD APPLICANTS

Stanford's Goldman Interschool Honors Program in Environmental Science, Technology and Policy seeks applications from undergraduate students. The program brings undergraduates from the schools of Humanities and Sciences, Engineering and Earth Sciences together into a small group seminar to analyze important environmental problems. The program combines a year-long research seminar, an honors thesis, an oral presentation of honors research and, where relevant, field study. **Deadline** for applications is April 20, 2007. More information: <http://cesp.stanford.edu/docs/goldmanhonors/>

Continued on page 4

Leopold Leadership Program Seeks Applications; Deadline April 16

A program that provides a unique opportunity for mid-career academic environmental scientists to participate in intensive communications and leadership training is now accepting applications for fellowships in 2008. The deadline for applications is April 16, 2007. Complete details are available at the program's web site, www.leopoldleadership.org.

The Leopold Leadership Program at Stanford's Woods Institute for the Environment advances environmental decision-making by providing academic scientists with the skills and connections needed to be effective leaders and communicators. Fellows take part in intensive training sessions focused on developing leadership skills and effective methods for

communicating science to non-scientific audiences including journalists, policy makers, business leaders and citizens.

Mid-career environmental scientists in tenured or tenure-track positions who are active in teaching and research at an academic institution in Canada, Mexico or the United States are eligible to apply. Up to 20 fellows will be selected.

The 2008 fellows will join a network of more than 115 past fellows who are actively engaged in scientific outreach on a range of issues from marine conservation science and river restoration ecology to the impacts of global climate change on human health. Fellows' training takes place in two separate one-week sessions and features hands-on, interactive modules led by journalists and policy specialists, leading scientists, business leaders and representatives of non-governmental organizations. Highlights of the sessions include mock Congressional hearings, videotaped practice interviews with professional journalists and opportunities to meet with members of Congress. The program is funded by a major grant from The David and Lucile Packard Foundation. ■



► Woods Associate Director Debbie Drake Dunne, left, and LLP Fellows in Washington

Training Program Brings Together Scholars, Policymakers

Continued from Page 3

forecasts only a 10 percent chance of catastrophic climate change? The answer: Use an ordinary example, like home insurance, to make your point.

"How many of you have ever had a fire in your house?" Schneider asked the audience. Only 1 or 2 percent raised their hands.

"How many of you have fire insurance?" he asked. This time, many hands went up, indicating that most homeowners carry insurance even though the risk of an actual fire is well below 10 percent.

"Give them metaphors that they can relate to, that are honest, that really do have a reasonable analogy to the issue you're talking about," Schneider said. "You have limited time, and you're not talking to your colleagues. ... You need to come in prepared with as many metaphors as you can come up with."

Subsequent training sessions were held Nov. 16 at UC-Berkeley and Nov. 30 in Sacramento. Support for the program comes from the Woods Institute and the William and Flora Hewlett Foundation. ■

"Give them metaphors that they can relate to, that are honest, that really do have a reasonable analogy to the issue you're talking about..."

—Stephen Schneider

AAAS Features Sustainability Topics



The annual meeting of the American Association for the Advancement of Science (AAAS) took place in San Francisco Feb. 15–19. With a theme of “Science and Technology for Sustainable Well-Being,” the event featured dozens of sessions and hundreds of presentations, including more than 40 from environmental faculty at Stanford. Following are synopses of two sessions led by Stanford faculty:

Livestock in a Changing Landscape

The harmful environmental effects of livestock production are becoming increasingly serious at all levels—local, regional, national and global—and urgently need to be addressed, according to researchers from Stanford University, the United Nations Food and Agriculture Organization (FAO) and other organizations. The researchers, representing five countries, presented their findings at a symposium titled, “Livestock in a Changing Landscape: Drivers, Consequences and Responses.”

Large-scale livestock operations provide most of the meat and meat products consumed around the world—consumption that is growing at a record pace and is projected to double by 2050, said symposium organizer Harold A. Mooney, professor of biological sciences at Stanford and a senior fellow at the Woods Institute. “We are seeing tremendous environmental problems with these operations, from land degradation and air and water pollution to loss of biodiversity,” he said, noting that the developing world is especially vulnerable to the effects of these operations.

Intensive and extensive systems

Symposium co-organizer Henning Steinfeld of the FAO Livestock Environment and Development initiative emphasized that intensive and extensive forms of production are beset with a range of different problems. In “intensive systems,” animals are contained and feed is brought to them. “Extensive systems” generally refer to grazing animals that live off the land.

“Extensive livestock production plays a critical role in land degradation, climate change, water and biodiversity loss,” Steinfeld said. For example, grazing occupies 26 percent of the Earth’s terrestrial surface, and feed-crop production requires about a third of all arable land, he said.

Expansion of livestock grazing land is also a leading cause of deforestation, especially in Latin America, he added. In the Amazon basin alone, about 70 percent of previously forested land is used as pasture, while feed crops cover a large part of the remainder.

The problems surrounding livestock production cannot be considered in isolation, nor are they limited to the environmental impact, Mooney said, noting that economic, social, health and environmental perspectives “will be critical to solving some of these problems. We hope to develop a greater understanding of these complex issues so that we may encourage policies and practices to reduce the adverse effects of livestock production, while ensuring that humans are fed and natural resources are preserved, today and in the future.”

Other panelists were Pierre Gerber of the FAO; Danielle Nierenberg of the Worldwatch Institute; Bingsheng Ke of the Chinese Ministry of Agriculture; Muhammad Ibrahim of the Center for Research and Higher Education in Costa Rica; and Cheikh Ly of the International Trypanotolerance Center in Gambia. ■

See page 6 for more AAAS presentations by Stanford faculty



— HAROLD A. MOONEY
Symposium Organizer

Executive Editors to Discuss Climate Change at SEJ

Executive news editors from electronic and print media will gather Sept. 5 at Stanford for a day-long discussion on climate change and the challenges reporters face in covering this global issue. The invitation-only event, co-hosted by Stanford and the Society of Environmental Journalists (SEJ), is designed, “to show that climate change is not an environmental story alone, but one that spans the business, international, regional and public health beats as well,” said Leigh Limbach Johnson, associate director for programs at the Woods Institute, which is helping coordinate the workshop and the subsequent SEJ annual conference on behalf of the university.

Participants will hear about the science of climate change from Stanford’s Steve Schneider, Ben Santor, Lawrence Livermore National Laboratory; and Lonnie Thompson, Ohio State University. They also will hear about survey results outlining Americans’ perceptions about climate change, from Stanford’s Jon Krosnick, and about how people get their news from CNN’s Peter Dykstra.

That evening, SEJ will begin its annual conference, to be held Sept. 5-9 at Stanford and environs. The event is expected to draw more than 650 participants, including hundreds of reporters, editors and producers in print, broadcast and online news media along with students, educators, scientists, government officials, environmental leaders, industry representatives and others. This year’s theme, appropriate for both Stanford and the Silicon Valley, is “Innovation and Solutions.” ■



- SEJ and Stanford’s Aurora Forum will hold a free and open public conversation the evening of September 5 on the critical topic of clean, secure and efficient energy. The event will feature a panel of visionaries including former Secretary of State George Shultz, Pamela Matson, dean of Stanford’s School of Earth Sciences, and J.B. Straubel, Chief Technology Officer of Tesla Motors.
- More information about the SEJ conference: www.sej.org

Research

Ethics, University Role Critical to Climate-Change Strategies

Addressing climate-change impacts is often more about ethics than economics, and universities have a key role to play in helping humans ensure the planet's sustainability, said Stanford environmental researchers participating in the annual AAAS conference.

Stephen Schneider, Melvin and Joan Lane Professor for Interdisciplinary Environmental Studies, and Paul Ehrlich, Bing Professor of Population Studies, addressed the Feb. 19 session, "The Science and Ethics of a Culture of Sustainability." Other speakers were Jane Lubchenco, Oregon State University and founder of the Leopold Leadership Program, now housed at the Woods Institute; Elliott Norse, Marine Conservation Biology Institute in Redmond, WA; Richard B. Norgaard, University of California, Berkeley; J. Ronald Engle, University of Chicago; and Mary Evelyn Tucker, Yale University. Paul Reitan, University of Buffalo, moderated the session.

"Twenty percent of the world—the developed countries such as the U.S. and Japan—generates 80 percent of the carbon contributing to rapid climate change. Cost-benefit analyses alone, which often focus only on markets, cannot address global inequities around carbon generation and mitigation," Schneider said.

"Yet a ton of carbon emitted in Beijing does the same thing as a ton of carbon produced in Boston or Brussels. If we are to have a sustainable planet, everyone must be engaged in reducing emissions," he added. Schneider is also a professor in biological sciences, co-director of Stanford's Center for Environmental Science and Policy and a senior fellow at the Woods Institute for the Environment.

Schneider acknowledges that economists "are essential to the debate," but that traditional cost-benefit analyses and the focus on goods and services are "in my personal judgment" inadequate to address climate-change impacts. "To make reasoned and equitable decisions, policymakers need to look not just at the market impact, but at other factors such as loss of human lives and biodiversity, and quality of life," he said.

Those same policymakers need to understand "and exploit" human behavior to "close the gap between the sorts of behaviors recommended by scientists, based on extensive climate research, and the actual conduct of society. It is clearly a time for action," said Ehrlich, who also is president of Stanford's Center for Conservation Biology. Ehrlich's topic was, "Ethics, the Stanford Pilot MAHB, and the Role of Universities in Solving the Human Predicament."

Ehrlich emphasized the critical role universities must play in developing "a more coherent approach to the functioning and evolution of societies." In recent years, he has proposed a follow-on to the Millennium Ecosystem Assessment and other



► Paul Ehrlich, Bing Professor of Population Studies

climate-change efforts, with a specific focus on human behavior, "the Millennium Assessment of Human Behavior," or MAHB. A pilot MAHB project in 2006, led by Stanford's Woods Institute, focused on climate change in California, with special emphasis on social science and ethical dimensions of climate policy discussions in the state.

These interdisciplinary efforts represent progress in transforming the academic landscape, but Ehrlich cautioned that much more needs to be done. "...I hope that one day soon the leaders of some university will recognize the challenge and dramatically reorganize their institution into the first true twenty-first century university. ...If members of American university faculties persist in largely ignoring the need to transform the system of higher education, they will not be in much of a position to help the human predicament," Ehrlich also added. ■



► Woods Institute Director Jeff Koseff, right, accepts congratulations from Engineering colleague Dick Luthy, left, while School of Engineering Dean Jim Plummer looks on. The occasion marked Koseff's receiving the William Alden and Martha Campbell Professorship of Civil and Environmental Engineering

Environmental Law Clinic Files Amicus Brief in Congressional Climate-Change Suit

The Environmental Law Clinic at Stanford Law School has filed an amicus brief on behalf of U.S. Senator John Kerry (D-MA) and U.S. Representative Jay Inslee (D-WA) in support of environmental groups that are suing the Bush administration for allegedly suppressing scientific research about climate change that is required by Congress under the Global Change Research Act of 1990 (GCRA). This is a rare instance where members of Congress have supported a lawsuit filed by environmental groups

against the executive branch for failing to provide Congress with accurate scientific data necessary to enact appropriate legislation to address global climate change.

The amicus brief was filed in the U.S. District Court in the Northern District in California in the case *Center for Biological Diversity v. Brennan* and argues that the Bush Administration has failed to ensure that rapidly evolving scientific information about global climate change and other international environmental crises would

promptly reach the public and those government policymakers in a position to act upon it, as required by the GCRA. The brief was filed by the Stanford Environmental Law Clinic. The clinic's director, Deborah A. Sivas, a lecturer at Stanford Law School, is the attorney of record, and Craig Segall, a third-year Stanford law student, is one of the key student authors of the brief. ■



► Mark Jacobson, an associate professor of civil and environmental engineering, co-authored a study on the effects of aerosolized particles on wind speeds over land. Photo by L.A. Cicero.

Aerosol Pollution Slows Winds, Reduces Rainfall

The winds that blow near the surface of the Earth have two beneficial effects: They provide a renewable source of clean energy and they evaporate water, helping rain clouds to build up. But aerosolized particles created from vehicle exhaust and other contaminants can accumulate in the atmosphere and reduce the speed of winds closer to the Earth's surface, which results in less wind power available for wind-turbine electricity and also in reduced precipitation, according to a study by Stanford and NASA researchers.

"These aerosol particles are having an effect worldwide on the wind speeds over land; there's a slowing down of the wind, feeding back to the rainfall too," says civil and environmental engineering Associate Professor Mark Z. Jacobson, co-author of the study with the late Yoram J. Kaufman from NASA Goddard Space Flight Center, who died in May 2006. "We're finding a reduction of rain, and that can lead to droughts and reduction of water supply." The study was published online Dec. 27 in *Geophysical Research Letters*. ■

[Editor's Note: The original article was written by Marie Jose Viñas, a science-writing intern with Stanford News Service. See the full article: <http://news-service.stanford.edu/news/2007/january24/slowwind-012407.html>]

Stanford Makes the Grade (A-) in Sustainability

Stanford University was one of four universities earning an overall grade of "A-" in the first report card issued on campus greening practices and endowment policies in the United States and Canada by a Massachusetts research institute. In a 118-page report released by the Cambridge-based Sustainable Endowments Institute, Stanford shared top honors with Dartmouth College, Williams College and Harvard University.

The report analyzed sustainability practices at 100 institutions—large and small, public and private—with the largest endowments. According to the institute, the schools have combined holdings of more than \$258 billion, about 75 percent of all higher education endowment investments.

The institute graded each school in seven categories. Stanford received an "A" in five subjects: administration, food and recycling, green building, investment priorities and shareholder engagement. The university received a "B" in climate change and energy and a "C" in endowment transparency. For the full report, visit the web at <http://www.endowmentinstitute.org/sustainability>. ■



Three staff members have joined the Woods Institute:

—**PATTY ROSEWATER**, associate director for operations and chief operating officer, came on board in November. She is responsible for managing staff and day-to-day operations at Woods. She brings with her more than 20 years of management, finance, planning and strategy experience from Hewlett-Packard.

—**ASHLEY SIMONS** is the new assistant director for training and outreach with the institute's Leadership Training Program. She will spearhead efforts to develop new Woods training modules and programs and serve as an adviser for the Leopold Leadership Program. Simons has been a visiting scholar at Woods, and brings eight years of experience working in policy and science communication, most recently with the Communications Partnership for Science and the Sea (COMPASS). She holds a B.S. and an M.S. from Stanford's Earth Systems program.

—**PATTI HINES** serves as assistant to Woods Institute directors Jeff Koseff and Buzz Thompson, and assists with the Woods Institute Advisory Council. Most recently Hines spent five years at American Leadership Forum-Silicon Valley, where she was executive assistant/program manager and also served in roles in development and office management.



► Craig Criddle and Sarah Billington

Engineers Seek a More Sustainable Building Material

[Editor's Note: This research project was funded through the Woods Institute's Environmental Ventures Project program. For full text of this story, from the School of Engineering's David Orenstein, please see http://soe.stanford.edu/research/profile_energy_billington.html. More information on the EVP program: <http://environment.stanford.edu/research/evp.html>.]

A home builder can use a wide variety of materials to build a house that is durable, but virtually none of those choices will build a house that is sustainable. At a time of bulging landfills, record construction and enormous third-world needs for housing, a group of Stanford engineers is rethinking the lifecycle of today's building materials. They are demonstrating how new "biocomposite" materials could cycle through landfills much more quickly than wood, minimizing waste, providing energy, preserving perhaps thousands of acres of trees, and maybe even helping slow global warming.

"Materials that are used in a building are often eventually

sent to a landfill, not just the structural materials but the non-structural ones as well," said Sarah Billington, an associate professor of civil and environmental engineering (CEE). She leads a team of five professors and three graduate students who think the solution might be in developing biocomposites: strong but quickly biodegrading sheets of natural resins reinforced by fibers, such as hemp or jute.

Changing the landfill landscape

When lumber and plywood go to the landfill—tons did after Hurricane Katrina destroyed about 200,000 homes—they biodegrade in an anaerobic process that emits methane. If not collected, this gas can seep into the atmosphere, contributing to the greenhouse effect and global warming, said CEE Professor Craig Criddle, who is working with Billington on the project. Although methane is useful as an energy source, it just isn't economical for small landfill owners to invest in harvesting it, because decaying wood and other landfilled materials release methane so slowly. Biocomposites,

by contrast, degrade much faster than wood and could therefore make recapturing methane a profitable energy practice.

Open questions, open future

While the biocomposites and a sustainable process for making them, using them and then reusing them, seem promising, Billington and Criddle readily acknowledge questions remain to be studied. One is whether the material would biodegrade at an undesirable pace while it is still "in service." Clearly no one wants structural elements of their house to start breaking down.

For all the open questions, the researchers are optimistic that they are on to something that could lessen the environmental costs of the vital human need for shelter. The team is composed of Billington, Criddle, aeronautics and astronautics Professor George Springer, chemical engineering Professor Curt Frank, CEE Professor Emeritus Perry McCarthy and CEE graduate students Molly Morse, Alison Pieja and Sarah Christian. ■

The mission of the Initiative on the Environment and Sustainability is to create a sustainable world in which human needs are met at the same time that Earth's life systems are protected and restored for people today and generations yet to come. At the core of the initiative, the new Ward W. and Priscilla B. Woods Institute for the Environment at Stanford is a unifying force and interdisciplinary hub for research, teaching, and problem-solving that draws on the experience, expertise, and passion of faculty and students from all seven schools. The initiative leverages Stanford's historic strengths in disciplinary and interdisciplinary research, teaching, outreach, and technology transfer and carries out its mission in three ways:

- Seeking solutions to major challenges through innovative research
- Educating and training environmental leaders
- Moving ideas into action by collaborating directly with decision makers

Working Solutions is published three times a year by the Woods Institute for the Environment.

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