YALE ENVIRONMENTAL NEWS

The Yale Peabody Museum of Natural History, the School of Forestry & Environmental Studies, and the Yale Institute for Biospheric Studies

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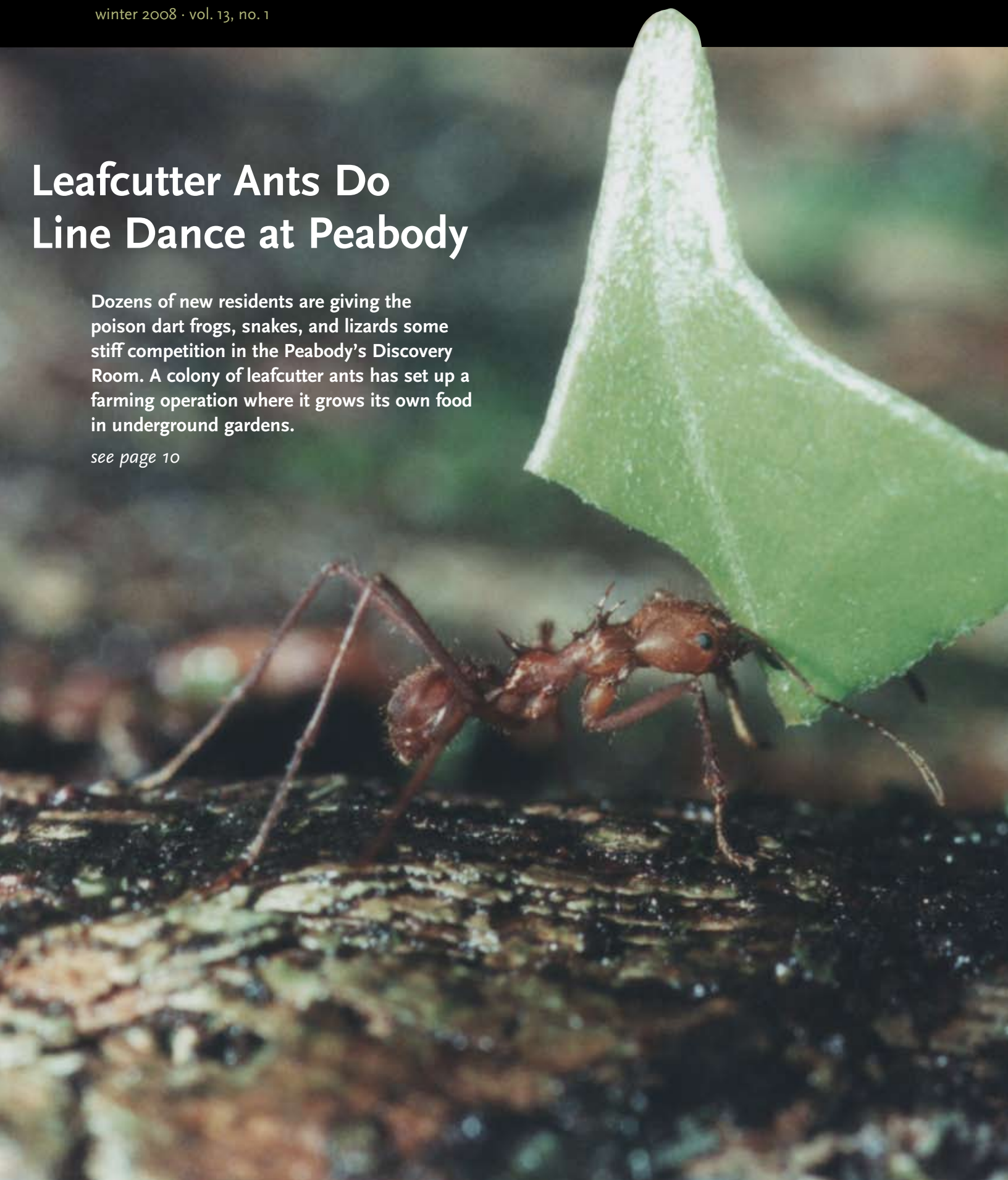

Leafcutter Ants Do Line Dance at Peabody

Dozens of new residents are giving the poison dart frogs, snakes, and lizards some stiff competition in the Peabody's Discovery Room. A colony of leafcutter ants has set up a farming operation where it grows its own food in underground gardens.

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Yale Must Take Lead in Promoting a 'Green' Future, Says Levin

By Susan Gonzalez, Associate Editor, Yale Bulletin & Calendar
Reprinted from the Yale Bulletin & Calendar, October 26, 2007

By modeling responsible environmental practice on its own campus, Yale can demonstrate to other universities, the nation's political leaders and even the rest of the world that efforts to stop global warming are both "feasible and affordable," President Richard C. Levin said at the Oct. 18 conference on The Greening of Yale and Beyond.

Levin was one of five speakers at the event who discussed current and developing initiatives to protect the global environment. The four-and-a-half hour conference, which drew a large crowd to Battell Chapel, was presented by the Yale Institute for Biospheric Studies (YIBS) and sponsored by the Edward P. Bass Distinguished Lecture Series.

Levin focused his presentation, titled Creating Sustainable Campuses, on the threat of global warming and the University's initiatives to reduce its carbon emissions (believed to be the primary cause of global warming). He began by noting that global warming is no longer a matter of debate, saying that scientific evidence of the rise in the Earth's average temperature is now considered conclusive and that this increase is caused by greenhouse gas (GHG) emissions from human activity.

While the United States is the world's largest source of GHG emissions, Levin said, it is unlikely that the nation will enact legislation that is "sufficiently ambitious" to change that status. Yet, he warned, global warming cannot be stopped unless the United States—along with China and India, also top producers of GHG emissions—reduce their amounts. Levin cited one report, the 2006 Stern Review, which concluded that in order to prevent global warming in excess of two degrees Celsius—a level, scientists believe, that would have dramatic environmental and ecological repercussions—carbon emissions worldwide must be reduced by 45% to 55%.

Given the lack of comprehensive action on the part of the United States and rapidly developing China and India, institutions like Yale must take the lead in demonstrating that a major reduction of GHG is possible and that it is relatively inexpensive to do so, Levin told his audience.

Levin noted that in 2005 the University announced its goal of reducing GHG emissions by 2020 to 10% below its 1990 level, a 43% decrease. The University, the president said, has already achieved a 17% reduction from the 2005 level, and projects that are currently planned will create an additional 17% reduction. Yale has made progress by installing more efficient heating, ventilation and air conditioning systems (HVAC) in 90 buildings; replacing windows throughout the campus with thermally efficient ones; introducing new and modified energy-saving equipment in its power plants; using renewable fuel in buses and turbines; ensuring that all new buildings and major renovations on campus can receive a LEED rating of "Silver" or better (LEED is a nationally accepted benchmark for "green" building design and construction); using ground water for cooling; and achieving a 10% yearly reduction in electricity use in the residential colleges. Yale students and others on campus have also been engaged in boosting the campus waste that is recycled, Levin noted.

In addition, other initiatives are in progress at the University, including the installation of a 14 megawatt cogeneration plant at the medical center; the adoption of sustainable building design and construction standards for Yale projects; the purchase of hybrid vehicles; and the placement of thin film photovoltaic cells on certain buildings to convert light to energy. In addition, by next summer a windmill project in a windy corridor of Science Hill will be launched, according to Levin.

The University will also upgrade or make renovations to buildings and systems that are part of its newly acquired West Campus, the former Bayer pharmaceutical complex in West Haven and Orange, Levin said during his presentation. A key goal, he pointed out, is to minimize "the carbon footprint of transportation" between the two campuses, mentioning bicycle paths as one alternative.

In addition to reducing Yale's ecological footprint, most of the University's initiatives have "positive economic returns," said Levin. While he acknowledged that green building construction and increased use of renewable fuels are expensive, he told his audience that the estimated cost to meet Yale's GHG emissions goal is about 1% of the University's operating budget—and by some estimates only half of that amount.

"Would you pay one-half of 1% of your income to halt global warming?" Levin asked his audience. "I think so."

Beyond these measures, Yale also plays a role in creating a more environmentally friendly Earth by educating its students—the next generation of leaders—about sustainability issues across a wide variety of fields; advancing scientific and policy research, across disci-

plines, that will have an impact on the future of the environment; and by influencing other universities in the United States and across the globe to pursue similar efforts to reduce their carbon footprints.

Since the University created its Office of Sustainability in 2005, Yale has been engaged in conversations with other Ivy League schools and with universities abroad to share sustainability practices and work toward a common GHG emissions reduction goal, Levin said, noting that these alliances help to create a global network of universities focused on thinking about and working toward sustainability.

In the future, if the University reaches its GHG emissions goal, its next step would be to "raise the bar," said Levin.

"We are going to make our own contribution," Levin said of Yale's efforts, which he hopes will also encourage "meaningful U.S. and global policy solutions" to the problem of global warming. The ultimate goal, he said, is to forestall the dangerous two-degree rise in global temperature.

Other speakers at the symposium included Professor Derek Briggs of the Yale Institute for Biospheric Studies, an organizer of the event, who emphasized the critical nature of the conference topics in his opening and closing remarks; Paul Anastas, director of the Yale Center for Green Chemistry and Green Engineering, who discussed how efforts by scientists at Yale and elsewhere to design chemical products and processes that are not harmful to humans or the environment impact nearly every aspect of life, including our food supply; Yale alumnus Howard Berke, chief executive officer of Konarka Technologies, Inc. and an executive at Good Energies, who spoke about current and emerging solar energy technologies; Professor James Axley of the Yale School of Architecture, who examined the issue of green building design; and Professor Marian Chertow of the Yale School of Forestry & Environmental Studies, who explored the ways in which corporations are successfully (and profitably) adopting sustainability as a part of their overall business strategy.

The full program can be viewed online at *www.yale.edu/yibs*.

New Directors Named

DEREK BRIGGS

JEFFREY PARK

RoseRita Riccitelli

DEREK BRIGGS NAMED DIRECTOR OF THE YALE PEABODY MUSEUM OF NATURAL HISTORY

President Richard C. Levin has announced the appointment of Derek E.G. Briggs, Frederick William Beinecke Professor of Geology & Geophysics, as the director of the Yale Peabody Museum of Natural History. His five-year term will begin on July 1, 2008.

Briggs, a distinguished paleontologist whose primary research interest is the preservation and evolutionary significance of exceptionally preserved fossil biotas, joined Yale in 2003 and is currently the Curator-in-Charge of Invertebrate Paleontology at the Museum. He has written extensively, especially on life in the Paleozoic Era, and has served as the director of the Yale Institute for Biospheric Studies since January 2004.

Since 2006, he has been president of the Paleontological Society, and previously served as president of the Paleontological Association from 2002 to 2004.

Briggs has been honored with numerous distinctions, including being elected in 1999 as a Fellow of the Royal Society, the independent scientific academy of the United Kingdom, and becoming a member of the Royal Irish Academy in 2003. In addition, in 2000 he was awarded both the Italian prize for paleontology (Premio Capo d'Orlando) and the Lyell Medal of the Geological Society of London. He received the Boyle Medal from the Royal Dublin Society/Irish Times in 2001.

Briggs served a one-year term from 2001 to 2002 as a visiting professor at the University of Chicago. From 1985 to 2002 he was in the Department of Earth Sciences (formerly Geology) at the University of Bristol, serving as chair from 1997 to 2001. From 1977 to 1985, he was at Goldsmiths' College, University of London, in the Department of Geology. He earned his BA at Trinity College, Dublin, and his MA and PhD from the University of Cambridge, where he was a Research Fellow from 1974 to 1977.

JEFFREY PARK NAMED DIRECTOR OF THE YALE INSTITUTE FOR BIOSPHERIC STUDIES

President Richard C. Levin has announced the appointment of Jeffrey Park, Professor of Geology & Geophysics, as the director of the Yale Institute for Biospheric Studies. His 3 ½ year term began on January 1, 2008.

Park is a distinguished geophysicist whose research interests include earthquakes, plate tectonics, and time-series of data pertaining to Earth's past climate variations. Park joined Yale in 1986 and is currently the co-chair of the Environmental Studies Program, an undergraduate major within Yale College. He has authored or co-authored numerous articles in scientific journals, ranging from Earth's seismic oscillations following the great 2004 Sumatra-Andaman earthquake to detecting correlations between clouds and sulfate aerosols in Earth's atmosphere. In 2002 Park co-authored the fifth edition of *Dynamic Earth*, a textbook in physical geology. His research currently focuses on the relationship between tectonic plate collision and mountain-building in Italy.

Since 2004, Park has chaired the Standing Committee for the Global Seismographic Network of the IRIS Consortium, and previously served as president of the Seismology Section of the American Geophysical Union (AGU). Park has been honored by election in 2006 as a Fellow of the AGU, as well as appointment to the Governing Board of the American Institute of Physics (2002-2004). Park served as the chairman of the Incorporated Research Institutions for Seismology (The IRIS Consortium) from 1992 to 1994. Park earned his AB degree at Princeton University, and his PhD from the Scripps Institution of Oceanography of the University of California, San Diego.

CONFERENCES, SEMINARS, SYMPOSIA

YIBS/ESC FRIDAY NOON SEMINARS

The Yale Institute for Biopsheric Studies' (YIBS) continues its sponsorship of the weekly YIBS/ESC Friday Luncheon Seminars. The seminars are held in the Class of 1954 Environmental Science Center (ESC) during the fall and spring semesters. The Fall 2007 featured the following list of speakers and topics:

Oswald Schmitz, Oastler Professor of Population and Community Ecology and Associate Dean for Academic Affairs, Yale School of Forestry & Environmental Studies, *From individuals to ecosystem: predator identity determines ecosystem function* ■ **Andrew Hill**, Clayton Stephenson Class of 1954 Professor of Anthropology, *Astronomically forced pliocene climate change in the Kenya Rift Valley* ■ **Margaret Evans**, Gaylord Donnelley Environmental Postdoctoral Associate, *Developing hierarchical Bayesian models of demography: population viability of the rare plant* Dicerandra frutescens (Lamiaceae) ■ **Chou Loke Ming**, Professor, Department of Biological Sciences, National University of Singapore**,** *Challenges of marine biodiversity research and management in the world's busiest port, Singapore* ■ **Paul Anastas**, Professor, School of Forestry & Environmental Studies; Sr. Research Scientist, Chemical Engineering; Lecturer, Chemistry, *Green chemistry, blue planet, black bottom line* ■ **Susan Butts**, Collections Manager, Division of Invertebrate Paleontology, Yale Peabody Museum of Natural History, *Altered states: how fossilization affects our interpretation of biodiversity through time* ■ **Hagit Affek**, Assistant Professor of Geology & Geophysics, *Plants and air pollution: Emission of isoprene from vegetation* ■ **Robert Bailis**, Assistant Professor, School of Forestry & Environmental Studies, *Energy, development, and environmental change; the social ecology of energy provision in sub–Saharan Africa* ■ **Shivi-Kalyanakrishnan-Sivaramakrishnan**, Professor, Anthropology and School of Forestry & Environmental Studies, *Civil society, higher courts, and environmental governance in India* ■ **Dror Hawlena**, Gaylord Donnelley Environmental Postdoctoral Associate, *The risk factor–ecological and evolutionary consequences of predation on prey populations* ■ **Jeffrey Townsend**, Assistant Professor, Ecology & Evolutionary Biology, *Rethinking local and global microbial diversity.*

For an updated schedule, please visit the YIBS web site *www.yale.edu/yibs/ESC_Seminar.html*

Science of Sustainability Focus of Hawaii Gathering

Marian Chertow (center), associate professor of industrial environmental management at the Yale School of Forestry & Environmental Studies, discussed her research in industrial ecology at a gathering of Hawaiian business leaders and 40 Yale alumni at the Pacific Club in Honolulu. The October event was sponsored by Connie Lau (right), president and CEO of Hawaiian Electric Industries and American Savings Bank and a Yale College graduate, and Matt Hamabata (left), executive director of the Kohala Center, a nonprofit academic research institute.

Chertow studies how businesses cluster together in places as varied as Hawaii, Puerto Rico and mainland China. She has recently proposed a new approach to encouraging

corporate greening: map the symbioses—the waste, water and power exchanges and other beneficial relationships—that exist among businesses. Show companies that they have already begun to build industrial ecosystems. Then help them to do more of the same. "Business people just want to know the rules of the game so that they can go out and play hard," said Chertow. "If we have green rules, then they can go play the green game hard."

While researching the Campbell Industrial Park near Honolulu, Chertow's team found that eight companies were trading seven different kinds of materials among themselves. Yet companies remained oblivious to the big picture: they weren't aware of what their neighbors were doing or how they might benefit even more from sharing resources. She has found similar exchanges taking place in a very different context, a large industrial complex in China, and now leads Yale's new Program on Industrial Ecology in Developing Countries.

OCTOBER 23RD SEMINAR AT F&ES

Ethanol Fuel: Energy, Food, and the Environment

David Pimentel, Professor Emeritus at Cornell University and renowned scholar of biofuels, spoke at the Yale School of Forestry & Environmental Studies as part of the Yale Sustainable Food Project's *Chewing the Fat* speaker and events series, sponsored by the George and Shelly Lazarus Fund for Sustainable Food and Agriculture at Yale. Professor Pimentel's presentation, *Ethanol Fuel: Energy, Food, and the Environment*, was also co-sponsored by the Yale Institute for Biospheric Studies (YIBS), the Yale Center for Environmental Law and Policy, and the Interdisciplinary Center for Bioethics.

Pimentel is Professor Emeritus of Insect Ecology and Agricultural Science at Cornell University, and his research spans the fields of basic population ecology, ecological and economic aspects of pest control, biological control, biotechnology, sustainable agriculture, land and water conservation, natural resource management, and environmental policy. He has published more than 600 scientific papers and 24 books, and most recently released the third edition of his book, *Food, Energy, and Society*, an examination of the interdependency of food, energy, water, land, and biological resources. Pimentel has served on many national and government committees, including the National Academy of Sciences, the President's Science Advisory Council, the U.S. Department of Agriculture, the U.S. Department of Energy, the U.S. Department of Health, Education and Welfare, the Office of Technology Assessment of the U.S. Congress, and the U.S. State Department. Pimentel's controversial opinions on the energy efficiency of biofuels was the subject of this lecture.

Sean Fraga

The Yale Sustainable Food Project was founded in 2001 by Yale students, faculty, and staff, Yale University President Richard Levin and Alice Waters, owner of Chez Panisse Restaurant. It was established with the understanding that many of the world's most important questions regarding health, culture, the environment and the global economy are deeply connected to what we eat and how it is produced. The Sustainable Food Project seeks to foster a culture that draws meaning and pleasure from the connections among people, land and food.

For more information on the Project or on the Chewing the Fat speaker series, go to *www.yale.edu/sustainablefood* or contact Anastatia Curley at 203.432.2084 or anastatia.curley@yale.edu.

More Poor Countries Gain Access to Scientific Research

Thirty-six countries have been added to a roster of developing nations that have access to one of the world's largest online collections of environmental science research.

In the past 12 months, more than 500 public institutions and local nongovernmental organizations have enrolled in a free program called Online Access to Research in the Environment (OARE). Institutions enrolling in the program receive international scientific literature that has an annual retail subscription value of over $1.5 million and that represents 75% of the world's most prestigious and highly cited scientific research in the environmental sciences.

When it began in October 2006, OARE offered access to scientific literature to 70 of the world's poorest nations with a gross national income per capita below $1,250. With the launch of the second phase of the program, the following countries, areas and territories with gross national income per capita between $1,250 and $3,500 have been added: Albania, Algeria, Belarus, Boznia-Herzegovina, Bulgaria, Cape Verde, Columbia, Cuba, Dominican Republic, Ecuador, El Salvador, Federated States of Micronesia, Fiji, Guatemala, Iraq, Jamaica, Jordan, Kazakhstan, Serbia and Montenegro, Maldives, Marshall Islands, Morocco, Namibia, Paraguay, Peru, Romania, Tunisia, Western Samoa, Republic of Serbia, St. Vincent and the Grenadines, Suriname, Swaziland, Syrian Arab Republic, The Former Yugoslav Republic of Macedonia, Tonga, Vanuatu, and West Bank and Gaza.

Yale University, the United Nations Environment Programme (UNEP), the International Association of Scientific Technical and Medical Publishers and over 340 international publishers and prestigious scientific societies and associations administer OARE, whose goal is to reduce the great disparities in scientific resources between developed and developing nations.

Gus Speth, dean of the Yale School of Forestry & Environmental Studies, said, "In an age characterized by rapid globalization and exponential expansion of scientific knowledge, it is not surprising that the scientific gap between the developed and developing countries has assumed great importance in the international development community. Thanks to advances in information and communication technologies and the generosity of many publishers, there is now an unprecedented opportunity to provide less-developed countries intellectual capital that we in the developed world take for granted."

In addition to receiving a remarkable quantity of research from around the world, enrolled institutions are also provided access to international scientific search engines (A&I Databases), intellectual tools that leading scientific and professional communities use to identify research on specific topics within thousands of scientific publications from around the world.

"Providing practitioners, researchers and scientists with online access to scientific research on the environment has been a long-held dream and desire by institutions around the world," said Achim Steiner, executive director of UNEP. "OARE is contributing greatly to the reduction in the North-South scientific gap and digital divide, and to the intellectual foundation of environmental institutions in many developing nations."

After a free three-month trial, the institutions in these countries are asked to pay an annual enrollment fee of $1,000. Representing less than one-tenth of one percent of the annual retail subscription value of resources in OARE, all fees will be reinvested to support training in enrolled institutions.

OARE is also launching a new technological infrastructure designed with help from top programmers at Microsoft Corporation–its new technology partner–and introducing Ex Libris SFX software to the program, a new tool that allows developing countries to open full-text articles directly from within international research databases, dramatically reducing the time required to search for and access international research.

"Ex Libris will provide its SFX linking solution to enable scientists in developing countries to access the critical information needed for their research," said Robert Mercer, Ex Libris President of North America.

OARE aims to contribute to the development of expert professional and academic communities and an informed public, encourage scientific creativity and productivity, and build the capacity of environmental professionals to manage fragile ecosystems, protect human health and manage natural renewable resources sustainably. Support for the coordination of the project is provided by the John D. and Catherine T. MacArthur Foundation and the William and Flora Hewlett Foundation.

Enabled by technology and guided by shared vision, the OARE consortium is increasing the number and diversity of its participating organizations and its richness of scientific holdings. The partners encourage organizations in developing countries to explore the resources available in OARE, and encourage institutions interested in joining the consortium to contact them to learn more about how they might contribute to the OARE mission. Institutions can enroll in OARE by completing the online registration form available on the website at www.oaresciences.org or writing to oare@oaresciences.org.

For more information, contact OARE coordinators Paul Bendiks Walberg, 203-314-7576 or paul.walberg@yale.edu; Kimberly Parker, 203-432-0067 or kimberly.parker@yale.edu; and Constant Serge Bounda, (254-20) 762-3105 or serge.bounda@unep.org.

Poll: Majority of Americans Want Local Action on Global Warming

Nearly three in four Americans would pay more to their own city or local government to reduce the heat-trapping gases that cause global warming, according to a telephone survey conducted in September.

"City and local leaders are critical players in the effort to reduce global warming, and it's clear that their constituents want action," said Anthony Leiserowitz, director of the Yale Project on Climate Change. "The public is on board and willing to help foot the bill. All that's left to do now is act."

The GfK Roper/Yale Survey on Environmental Issues is the first of its kind to measure public opinion of local government-led green initiatives. The survey was conducted by GfK Roper Public Affairs and Media, a division of GfK Custom Research North America, and Yale School of Forestry & Environmental Studies (F&ES). The results are available at *http://environment.yale.edu/news/5323/*.

According to the survey, 74% of Americans would support local regulations requiring all newly constructed homes to be more energy efficient, even if it would increase the initial cost of a new home by roughly $7,500. Saving energy and money on utility bills is also what motivated 72% of Americans to say they support local subsidies to encourage homeowners to install electricity-generating solar panels on existing homes, even if it would cost households an extra $5 per month in property taxes.

The survey also found that:

- 71% would pay $5 a month more in property taxes to support a local subsidy to encourage homeowners to replace old furnaces, water heaters, air conditioners, light bulbs and insulation.
- 69% would pay $8.50 more a month for local regulations requiring electric utilities to produce at least 20% of their electricity from wind, solar and other renewable energy sources.
- 68% would support changing their city or town's zoning rules to decrease suburban sprawl and concentrate new development near the city or town center.
- 65% would support changing their city/town's zoning rules to require neighborhoods to have a mix of housing, offices, industry, schools and stores close together.
- 53% would back city or local fees added to electricity bills to encourage people to use less electricity.

Fifty-seven percent of Americans, however, oppose changing city zoning rules to promote construction of apartments rather than single-family homes, and 64% oppose a 10-cent city or local fee on each gallon of gas sold to encourage people to use less fuel.

Program to Encourage 'Green' Industry in Developing Countries

A Yale research team is introducing a program that will encourage the adoption of environmentally friendly industrial activity in developing countries.

The new program, Industrial Ecology in Developing Countries, will examine the flow of energy, materials and water through industry and the natural environment. The first studies are being conducted in China and India, whose rapidly industrializing economies are putting a strain on natural resources. The program's ultimate goal is to encourage ecologically sustainable industrial production that is fueled by firms that share resources and waste.

"Industrial ecology is especially critical for developing countries, where large, poor populations are urbanizing rapidly and depleting key resources," said Marian Chertow, Yale PhD'00, director of the program at Yale's Center for Industrial Ecology. "Resource productivity and eco-efficient industry are urgently needed to address these challenges to sustainable development."

The Chinese government has already created 16 eco-industrial park projects that are intended to serve as prototypes for ecologically sustainable production. China has been seeking a new industrialization model that will reconcile rapid economic growth and environmental degradation through the proposed Circular Economy Promotion Law, which would require an evaluation of the environmental friendliness of products before they enter the market.

In India, the Yale team will work with regional planners and the nonprofit Resource Optimization Initiative in Bangalore to identify the flow of resources through local economies and what is being used and wasted.

YALE PEABODY MUSEUM OF NATURAL HISTORY

EVENTS

TRAVELS IN THE GREAT TREE OF LIFE

Opening February 16, 2008

This multimedia and family friendly exhibition explores how we discover the complex relationships that link all living organisms together.

Supported by the National Science Foundation.

FIESTA LATINA!

March 8, 2007

Our annual celebration of Latin American cultures! This daylong festival features performances of traditional and contemporary Latin American music and dances, along with storytelling, face painting and mask making.

LAS ARTES DE MEXICO

On view March 22 through July 19, 2008

The Museum's latest traveling exhibition celebrates the rich and diverse artistic traditions of Mexico, examining over 3,500 years of art and culture and of tradition and change across the broad spectrum of Mexican life.

Information and updates at (203) 432-5050 and www.peabody.yale.edu

Forum Examines Sustainability Issues in New Haven

As part of Yale's efforts to foster sustainability, on October 4, 2007, the Yale Peabody Museum recently hosted a community forum to examine the question, "Can New Haven Become A Sustainable City?" The event drew over 130 attendees. Concerned citizens were able to learn more about sustainability issues and to engage with leaders from Yale and the local community to help map out a future for a sustainable New Haven.

Described as "a forum...with some answers," the event covered a wide range of topics relevant to making New Haven more sustainable: economic development; the role of culture and a sense of place in sustainability; smart growth and urban planning; the urban ecosystem; and how large institutions, such as Yale, have the capacity to influence the creation of sustainable communities.

Panelists included Karyn Gilvarg, Director, New Haven City Plan Department; Heidi Green, President, 1000 Friends of Connecticut; Bill Hosley, Executive Director, New Haven Museum and Historical Society; Colleen Murphy-Dunning, Director, Urban Resources Initiative at the Yale School of Forestry & Environmental Studies; Julie Newman, Director, Yale Office of Sustainability; and Jerome Ringo, President, The Apollo Alliance, and former chair of the board of the National Wildlife Federation.

Following short presentations by the panel, participants joined breakout groups organized around the topic area of each panelist and were able to ask questions directly of each panelist. The groups generated excellent lists of some of the challenges and solutions to creating a sustainable New Haven. Each group also had a facilitator who helped guide the discussion toward constructive action. Many participants committed to meeting monthly to continue the conversation. Havens for the Future (formerly Network for a Sustainable New Haven) will organize and support this exciting outcome. The first event to follow, entitled "Building Our Future: Falling Apart or Rising Together in Greater New Haven," took place at the Yale Divinity School on December 8, 2007. Starting in January 2008, regular conversations, each with a special area of focus and a guest speaker, will lead to the next steps for the community to realize sustainability.

Sponsored by the Yale School of Forestry & Environmental Studies, the Yale Peabody Museum, the City of New Haven and Clean Air-Cool Planet, and moderated by Peabody Museum Director Michael Donoghue, the October forum was one of 70 events held nationwide, as part of the National Conversation on Climate Action (*http://www.climateconversation.org/*).

For more information on these events, or to join the conversation on making New Haven a sustainable city, visit *www.sustainablenewhaven.org*, or contact Nathan Bixby at (203) 887-2598 or nathan@sustianablenewhaven.org.

David Heiser (3)

TOP Director Michael Donoghue welcomed participants to the community forum on behalf of the Peabody. **MIDDLE** Jerome Ringo captivates the audience—and the panel. **BOTTOM** The panelists listen to the audience responses.

Courtesy of Nancy Herzig

Thomas Whiteley (2)

LEFT Archival photograph of geologists at Beecher's Trilobite Bed (most likely taken in 1892), recently donated by Nancy A. Herzig, the great-granddaughter of Charles E. Beecher. A notation on the back of the photograph reads: "Property of Mrs. Charles E. Beecher. Seated left-right: Mr. Henry Downer (Grandma B.'s brother), Charles Emerson Beecher, Coleman Beecher. Collecting fossils at rear: 'Doc' Randalf."

TOP *Triarthrus eatoni,* **from the original Beecher's Trilobite Bed, showing limbs and antennae preserved in pyrite.**

BOTTOM At the Beecher's Trilobite Bed locality in the summer of 2007. From left to right: Thomas Whiteley, Stanley and John Koziarz (landowners), and Una Farrell.

Revisiting Beecher's Trilobite Bed

By Una Farrell, Yale PhD '09, Yale Department of Geology and Geophysics

Adapted for living in different parts of the Paleozoic ocean, trilobites came in a variety of shapes and sizes. However, although we can learn much about lifestyle and diversity from their readily preserved calcitic exoskeleton, it is only by seeing the soft tissues that we can understand in detail how these fossil arthropods functioned.

Soft-tissue preservation is rare in the fossil record, requiring very particular circumstances to prevent the loss of delicate structures shortly after death. There are only a handful of sites worldwide where trilobite soft tissues are preserved. As part of my doctoral research in Yale's Department of Geology and Geophysics, I am examining the ecology and preservation of one of the more spectacular of these sites, the Beecher's Trilobite Bed locality and related sites in New York State. These localities are Ordovician in age (about 450 million years old) and the trilobite fossils (mainly one species of olenid trilobite, *Triarthrus)* are preserved by pyritization, in which even delicate structures such as gill filaments were replicated by pyrite, giving the fossils the striking look of gold.

The olenids were a large group of trilobites, found generally in deep-water, low-oxygen environments. Richard Fortey of the Natural History Museum in London has proposed that they may even have harbored symbiotic bacteria on their gills, enabling them to live in very inhospitable conditions. I am investigating whether the environmental conditions in this basin, and the morphology of *Triarthrus* in particular, would have been suitable for such a mode of life. I am also examining in more detail the conditions necessary for the pyritization of soft tissues.

Beecher's Trilobite Bed has a long association with Yale. William S. Valiant discovered the locality in 1892 and brought it to the attention of Yale professor O. C. Marsh, who gave the project to his student, Charles Emerson Beecher. Beecher undertook an extensive excavation and concentrated on describing the morphology of *Triarthrus.* For decades afterwards the site was thought to be "mined out" and the location was lost. It wasn't until the 1980s that the site was rediscovered by avocational paleontologists Tom Whiteley and Dan Cooper. Subsequently, there was a joint excavation by the American Museum of Natural History and the Smithsonian Institution, also involving Derek Briggs (before he joined Yale) and others. Most previous work, however, concentrated on the one "Trilobite Bed" and many of the collected samples lie unexamined in museum collections.

In 2005 we reopened the excavation at Beecher's Trilobite Bed. I started by measuring detailed sedimentological sections, which showed fine-grained deposition in quiet, deep waters that had been frequently disturbed by influxes of rapidly deposited, slightly coarser sediment. The geochemistry of the rocks shows that conditions at the bottom of the water column fluctuated, and oxygen levels in the basin had become very low at times. The paleontology is clear: the diversity and abundance of the organisms are low and many lived in the water column (such as graptolites and straight cephalopods), thus avoiding conditions at the sea bed. This nasty environment may have been suitable for chemosymbiosis, but adaptation to low oxygen may also have sufficed to allow organisms to live there.

The Beecher's Bed trilobites are preserved whole in some of the rapidly deposited beds, and fieldwork has revealed at least four new horizons with exceptionally preserved specimens. The geochemical signatures are similar in each of these beds, but further analyses will help to test models for pyritization and explain why such spectacular preservation occurs at this famous locality.

Jim Sirch

Leafcutter Ants Harvest Fungus, Do Line Dance at Peabody

by Melanie Brigockas, Public Relations and Marketing Manager

The Discovery Room at the Yale Peabody Museum of Natural History has always been a favorite destination for children. Now dozens of new residents are giving the poison dart frogs, snakes, and lizards some stiff competition. A colony of leafcutter ants has set up a farming operation where it grows its own food in underground gardens.

Practicing a very sophisticated form of agriculture, these ants create and cultivate gardens of miniature mushrooms belonging to the fungus kingdom. Some of their most fascinating activities occur in plain view of Museum visitors who can witness the creatures at work in their plexiglass terrarium.

And what a sight it is! Using their sharp mandibles, worker leafcutter ants slice leaves into sections about the length of their body, then hoist the fragments onto their back to carry them in a long foraging line to their underground nests. Because the ants are often hidden under their colorful loads, a parade of leafcutters at first glimpse might easily look like an animation of marching leaves.

As the leaves are deposited at the nests, smaller worker ants chew them into a pulp, which is deposited by the smallest ants among enzyme-rich ant fecal droppings and fungus spores. The pulp decomposes and eventually produces strands of fungus that the ants use to feed their larvae.

Leafcutter ants are native to the tropical rainforests and semi-tropical forests of South, Central and North America. In nature, they live in huge underground colonies of up to many millions of ants. The colony at the Peabody should grow to several thousand strong within a few years.

Entomologist E. O. Wilson equates the speed and activity of a worker ant to a person running a four-minute mile for 30 straight miles while carrying 500 pounds on his shoulders. A leafcutter ant is actually capable of carrying almost 10 times its own weight, the equivalent of a 200-pound adult carrying a 2,000-pound car up in the air.

Leafcutter ants have been farming for at least 50 million years; humans have been doing so for only some 10,000. The leafcutters use a complex caste system in which everyone has a job, everyone gets along, and no one goes hungry. The queen is the reproductive female of the colony. She mates only once, after which she is kept busy laying eggs for the rest of her long life. Rarely visible, she is about the size of a newborn mouse.

Ants are very important members of our planet and even critical to man's survival. Without ants, in E. O. Wilson's words, "The earth would rot." Ants help create soil and keep it fertile. Without them, most animal populations would become extinct for lack of food.

Leafcutter ants, in particular, also play a potentially invaluable role in our quest to stem antibiotic resistance, in that they have acquired an antibiotic that harmful parasites cannot resist. Because this ant system seems to have unique ways of dealing with disease, we stand to learn a lot from understanding it.

The exhibit is the gift of Michael Maloney and Macdara MacColl of Madison and their children Tara, Sawyer and Craigin. To see the ants at work and learn more about their unique talents and capabilities, head to the Discovery Room at the Yale Peabody Museum.

TOP A young visitor to the Peabody's Discovery Room enjoys a view of the leafcutter ants.

Richard Seaman

Biodiversity and Global Change Program Expands

The innovative Peabody Fellows Biodiversity and Global Change Program, which uses research on the 1999 lobster die-off in Long Island Sound to teach about science and global change, is now reaching hundreds of middle and high school students on New York's Long Island.

"It is logical that after piloting activities with many students here in Connecticut, we would go across the Sound to the north shore of Long Island and work with teachers there," says Project Director Jim Sirch. "The program has established a very helpful partnership with New York Sea Grant, which has helped recruit teachers and disseminate resources," Sirch explains.

Two of the program's BioAction Lab kits to be housed at the New York Sea Grant office in Stony Brook will be available for loan to teachers. Combined with an inquiry- and place-based educational approach, these resources will form the basis for a curriculum guide to be completed by Spring 2008. Accompanied by a DVD of invasive plants and animals found in and around Long Island Sound, the guide will be widely disseminated. These materials will enable teachers and students to delve into such topics as land use patterns, sea level rise, global warming, excess run-off and pollution, habitat loss, and invasive and endangered species. It will also enable them to undertake integrated science activities that include science process skills.

Scientists conducting current research spoke with teachers during two recent teacher training institutes held in Smithtown and Kings Park, New York. Carmela Cuomo, a marine benthic biogeochemical ecologist who heads up the marine biology program at the University of New Haven, discussed the many factors that contributed to the Long Island Sound lobster die-off. Kathy Castro and Barbara Somers, two researchers from the University of Rhode Island and Rhode Island Sea Grant, showed how important inquiry-based science is to their work with lobster shell disease. "Teaching students about real work issues and events really gets them excited to learn about science," observes Laurie Sweeney, a 6th grade teacher from Smithtown.

Laurie Sweeney

Peabody Fellows teachers seining in the Nissequogue River at Sunken Meadow State Park, New York.

The program content lends itself well to science training at the middle and high school level and serves as a springboard for the development of basic science skills. The theme encompasses the many scientific disciplines taught: biology (species variation, relationships and extinction), geology (climate change), mathematics (statistics), agriculture (crop and resource issues) and chemistry (water and air issues). "Students who have a better understanding of a complex scientific issue will hopefully become stewards of their local environment, motivated and empowered to protect it," explains Sirch.

Shae Trewin

Historical Scientific Instruments Attract World Scholars

By Shae Trewin, Collections Manager, Division of Historical Scientific Instruments

Scientific instrument specialists from around the world gathered at the Yale Peabody Museum in September to explore the instrument collections at Yale University. The visit was part of the Scientific Instrument Commission's (SIC) annual symposium, which, for only the second time in a decade, was held in the United States.

Approximately 80 SIC members traveled from hosting institutions Harvard University and the Massachusetts Institute of Technology to visit the Yale Leitner Family Observatory, the Harvey Cushing/John Hay Whitney Medical Library and the Yale Peabody Museum.

At the Leitner Family Observatory, SIC members viewed a permanent display of 19th century astronomical apparatus and a fully operational 1882 Grubb refractor. Yale Professor of Geology and Geophysics Robert Gordon also gave a presentation of his metallurgical analysis of a 16th century astrolabe made by Georg Hartman. Studies of the brass used by Hartman revealed that manufacturing technologies in Germany at the time were different than those used elsewhere in the world. More significantly, however, was Professor Gordon's conclusion that markings and tool lines on the astrolabe indicate that Hartman's workshop applied a unique division of labor that pre-dates the Industrial Revolution. Afterwards, SIC members were treated to a rare opportunity to handle the astrolabe and inspect the markings featured in Professor Gordon's talk.

The Hartman astrolabe was donated in 1972 along with a copy of Peter Apian's 1540 work *Astronomicum Cæsareum,* which was featured in the exhibit *Of Books and Things* at the Cushing/Whitney Medical Library. Curated by SIC member and Yale graduate student Alistair Kwan, the exhibit explored the often incomprehensible relationship between objects and books housed in libraries. Though less well known than the instrument collection at the Yale Peabody Museum, the Streeter Collection of Weights and Measures and a noteworthy assortment of scientific and medical apparatus at the Cushing/Whitney Library are some of the most significant such collections in the world. Included in the exhibit were rare scientific works and previously unseen objects, such as a 17th century marble sundial and early 18th century American surveying compasses.

Also featured was one of the bound books of herbarium specimens known as the Fenn Flora, on loan from the Yale Peabody Museum's Division of Botany. These volumes were compiled in 1822 by Horatio Nelson Fenn, a Yale medical student who collected specimens from around New Haven. Displayed with packets of 19th century medical herbs collected from abroad, the Fenn Flora is a perfect example of an overlap between object and book.

The SIC visit concluded at the Yale Peabody Museum with a special exhibit on highlights from the history of science at Yale. SIC members were treated to a display of Yale's most valued scientific objects, including the first microscope purchased by Yale College, in 1735, and a plaster thermodynamic surface model for water made by physicist James Clerk Maxwell and sent to Josiah Willard Gibbs in 1896. Also on display was a sextant used by Elias Loomis, a wave apparatus designed by Chester Smith Lyman and a multiple-choice apparatus designed and made in 1913 by Yale primatologist Robert Yerkes.

Most of the instruments on display were collected by Derek de Solla Price in the 1960s, when he was appointed Yale's first professor in the history of science and established the Division of Historical Scientific Instruments at the Yale Peabody Museum. Price's efforts to collect and secure Yale's instruments is indicative of the passion that many members of the SIC have for preserving the world's scientific heritage.

The Scientific Instrument Commission is a constituent organization of the International Union of the History and Philosophy of Science. It seeks to encourage scholarly research on the history of scientific instruments, and the preservation and documentation of collections of instruments, as well as their use within the wider discipline of the history of science. The presence of the SIC at Yale has significantly enhanced both a local and global awareness of the Yale instruments collections and will contribute to the growth of research activity associated with them.

The opportunity for the Yale instrument collections to be part of the SIC annual symposium could not have been possible without the cooperation of organizers Sara Schechner of the Harvard Collection of Scientific Instruments and Debbie Douglas of the MIT Museum. This occasion was made possible by the local support of Peabody Deputy Director Jane Pickering, Leitner Family Observatory Director Michael Faison, Yale Geology and Geophysics Professor Professor Robert Gordon, Medical History Librarian Toby Appel and Alistair Kwan.

Visit the Peabody's Division of Historical Scientific Instruments at *www.peabody.yale.edu/collections/hsi/* and read our newly launched blog "Beyond the Basement" at *http://blogs.yale.edu/roller/page/HSI*.

Shae Trewin (3)

LEFT A book from the Fenn Flora displayed with a set of 19th century apothecary jars and packets of medicinal herbs collection from abroad as part of the exhibit *Of Books and Things.*

BOTTOM Oxford University assistant keeper Stephen Johnston (right) and president of the SIC Paolo Brenni (left) inspect the Hartman astrolabe.

MIDDLE David P. Wheatland Curator Sara Schechner of the Harvard Collection of Historical Scientific Instruments looks over a display of Yale's scientific instruments in the Yale Peabody Museum.

TOP Professor Robert Gordon giving a talk on the Hartman astrolabe to members of the SIC in the Leitner Family Observatory, where various 19th century astronomical instruments from the Yale Peabody Museum are on permanent display.

Undergraduate Summer Fellowships at the Peabody: Student Reports

This summer the Yale Peabody Museum once again funded undergraduate students in semi-independent research projects using the Peabody's diverse collections. The laboratory of Assistant Professor Thomas Near, Assistant Curator in the Peabody's Division of Vertebrate Zoology, hosted Jordan Garner (Yale '08), Evan McCartney-Melstad (Yale '08) and Jillian Pennington (Yale '08). Dr. Larry Gall, Entomology Informatics Manager and Head of the Peabody's Computer Systems Office in the Peabody's Division of Entomology, hosted undergraduate Derek Zhao (Yale '10).

Speciation and Diversification of North American Endemic Darters

By Jordan Garner, Yale '08

My two projects as an intern in the laboratory of Dr. Near involved research on a clade of North American freshwater fishes known as the barcheek darters (Percidae: *Etheostoma: Catonotus*). For my first project, I used AFLP markers (amplified fragment length polymorphisms) to determine whether hybridization had historically occurred between two very closely related barcheek darter species, *Etheostoma derivativum* and *E. smithi*. *E. derivativum* and *E. smithi* are found in the Cumberland River Drainage of Kentucky and Tennessee. Specifically, I looked at whether introgression had occurred at the interfaces of a particular interdigitated and allopatric distribution of the two species in Tennessee.

If introgression had indeed occurred in the past at the interfaces of the populations, then the individuals inhabiting the areas at the interfaces should have a genome that is a blend of alleles derived from both *E. derivativum* and *E. smithi*. As such, grouping individuals from the distribution into clusters based on genetic data would predict that they would best fit into three clusters (one cluster would be *E. derivativum*, another would be *E. smithi,* and the third the introgressed individuals). If introgression had not occurred, then the individuals would best fit into just two genetic clusters (*E. derivativum* and *E. smithi*).

My second project focused on the *Etheostoma basilare* species complex. Although currently considered a single species, unpublished research by Dr. Hollingsworth and Dr. Near indicates that *E. basilare* contains five diagnosible genetic clusters that correspond to five distinct geographic regions of the Caney Fork River Basin. This suggests that the *E. basilare* complex contains multiple cryptic species. In their phylogenetic analysis, Dr. Hollingsworth and Dr. Near used DNA sequences from two mitochondrial genes and a single nuclear gene. To determine the relationships within the complex and to further test the prediction that there are multiple cryptic species within the complex, I began work on a phylogenetic analysis based on DNA sequence data sampled from six nuclear genes. I was able to get a good start on sequencing the six genes for 120 individuals in the complex and plan to finish in the upcoming academic year.

The Timing of Divergence and Reproductive Isolation in North American Endemic Sunfishes and Black Basses

By Evan McCartney-Melstad, Yale '08

My summer internship in Dr. Thomas Near's lab involved laboratory and field research on the fish family Centrarchidae, the black basses, and focused on a comparative study of ontogenetic diversification. I asked whether developmental disparity was strongly correlated with position on a phylogenetic tree. A strong correlation between ontogenetic differences and phylogenetic position would suggest that changes in the developmental processes could be creating reproductive barriers and thus driving biodiversity.

To address my research questions I needed two main types of data. First was the ontogenetic data. Luckily, this data had already been gathered by Paula Mabee in a 1993 paper, which included a large matrix of scored developmental characters that could be used in statistical analyses. Mabee attempted a study similar to ours, in which she applied the scored developmental characters to a phylogeny to understand how development evolves and what role it plays in speciation and biodiversity.

However, Mabee's study suffers from the inadequacies of phylogenetic methods in the early 1990s. For instance, many of the characters she was investigating were also used to create the phylogeny itself.

My project used improved phylogenetic methods to test Mabee's conclusions with a better tree. Over the summer I isolated DNA from hundreds of centrarchids and sequenced several genes from each of them, creating a new tree using Bayesian methods. We now have a much more likely phylogeny for the Centrarchidae. What remains to be done in this project is the relatively simple process of character mapping. We will also be mapping ancestral characters to determine the probabilities of the presence of certain characters in hypothetical ancestors.

I will continue these studies for my senior research project and plan to address some questions posed during the collection and analysis of sequence data during the summer, including investigating a strange relationship between two species in which one animal contains a mitochondrial haplotype of what we believe to be an extinct species. This summer I joined Professor Near for a month of field research in the southeastern United States, where I collected many specimens from specific areas where the fish could contain the interesting haplotype.

I also accompanied Professor Near to the American Society of Ichthyologists and Herpetologists conference in St. Louis, Missouri, where I had the opportunity to give a presentation on another project, a molecular clock divergence time estimate of the two extant coelacanths. There I met with ichthyologists from across the country and listened to their presentations (including that of Paula Mabee). For me, this was the highlight of a great summer.

The Phylogenetics of Antarctic Notothenioid Fishes

By Jillian Pennington, Yale '08

My research as a summer intern in Dr. Thomas Near's lab has focused on a group of Antarctic fishes, the notothenioids, which represent the vast majority of biomass and species richness in the icy Southern Ocean. In particular, I have been studying the population dynamics and phylogenetic relationships of two families, the Channichthyidae, or icefishes, and the Bathydraconidae, or dragonfishes. The icefishes are the only vertebrates that lack hemglobin and, as such, their blood is white. To explore this bizarre adaptation, I began collecting DNA sequence data from sampled individuals of both icefish and dragonfish species.

I began by focusing on the nuclear gene lactate-dehydrogenase, LDH. Unlike more cooperative mitochondrial genes, LDH proved problematic. Initially, I found that the primers I was using to amplify an LDH intron were binding nonspecifically, and amplifying many regions of DNA. With some tweaking of the protocol, I was able to produce clean PCR products, but sequencing of those products revealed that roughly three-quarters of the individuals were heterozygous. To separate the two alleles, I began cloning individuals, but because of the large size of the sequence I was attempting to recover (about 1,500 base pairs), and the presence of other, smaller fragments in the genome to which the primers were able to anneal, I was only able to recover two distinct alleles from a single individual. Faced with these poor results, I set about trying to optimize the cloning protocol for LDH and found that changing the annealing temperature and the timing of the initial, high-fidelity PCR produced much better results. I am currently using this modified protocol to finish cloning about 100 icefish and dragonfish individuals.

From the data already gathered, however, I have discovered a surprising polymorphism between the two main LDH alleles in a single species of dragonfish, *Parachaenichthys charcoti*, including a large 200 base pairs deletion. Attempting to create haplotype networks from the individuals sequenced thus far yields two unconnected webs—one for the larger allele, and one for the smaller—which indicates a significant level of genetic divergence between the two. Faced with this perplexing polymorphism, I considered the likelihood that there might have been a gene duplication in the past, but the presence of homozygotes for both the large allele and the small allele refutes this possibility. Likewise, the sequences include small sections of an LDH exon, all of which are identical in the sampled individuals, which indicates that I am indeed amplifying the same region. Currently, I am attempting to sequence several other nuclear genes for some of the same individuals to determine whether this level of differentiation between alleles is unique to the LDH intron.

I am also particularly interested to see whether the sister species to *P. charcoti*, *Parachaenichthys georgianus*, shows a similar polymorphic pattern, and I have begun cloning *P. georgianus* individuals. Preliminary data indicates that one allele in this species is an intermediate between the two major alleles recovered in *P. charcoti*. Further sampling and cloning will help to determine whether any such intermediate allele might be lurking in heterozygote *P. charcoti* individuals, but its presence in *P. georgianus* is certainly intriguing, and may have unforeseen implications for our study of speciation in notothenioids.

Digitization and Documentation in the Entomology Collections

By Derek Zhao, Yale '10

This past summer I had the opportunity to work on several digitization projects in the Yale Peabody Museum's Division of Entomology with Dr. Larry Gall, Entomology Informatics Manager and Head of the Peabody's Computer Systems Office. In addition to its approximately one million insect specimens, the Division also has a library and substantial associated documentation, such as letters and field notes, assembled over 60 years by former curator Charles Remington and his associates. Converting this material to an electronic format would make it much more accessible and manageable as a resource for research and collections management.

My first focus was on the Division's loan papers, which are an important historical record of specimens that have traveled for research, identification, exhibition and other purposes. The invoices for both incoming loans made to the Division and outbound loans made to other institutions describe what was loaned and for how long. These date back to the 1940s, with some even earlier. Information is difficult to extract from paper records, and makes managing the loans laborious and prone to error. Before creating electronic loan records for the invoices in the Peabody's KE EMu® collections management database, I resolved as many documentation problems as possible by referring to

the Division's correspondence archives of more than 15,000 letters, which had been recently reorganized by Dr. Gall, volunteer Barbara Beitch, and Katie Kazimer (Yale '09). Each invoice usually had some related correspondence, but many required a hunt through the archives to piece together the complete story of a loaned specimen. The end result was a fully searchable database of the Division's loan history, complete with digital scans of each invoice.

For another project, I helped organize the Division's collection of the silk moth family, the Saturniidae, which contains some of the largest and most colorful moth species, including Luna Moths, Cecropias, Hickory Horned Devils, and their relatives. I was part of a four-student team that sorted each species by collector, locality and collection date to form "specimen lots" that shared identical label data and then catalogued each lot as a single entry in the EMu database. After finishing this phase of the project, however, the drawers and cabinets still needed new labels, and common species required further drawer level sorting by geographic region to make them more visually searchable. To achieve this, I developed templates using Adobe Acrobat® that can be readily adapted for future labeling needs as digitization proceeds through the Division's holdings.

This summer I also had the opportunity to accompany Dr. Gall, Entomology Senior Collections Manager Dr. Raymond Pupedis and other Peabody staff on a field trip to Horse Island with middle school students who were participating in the Museum's Biozone! youth camp. I had a fantastic time roaming the island with the kids looking for insects and helping them to make their own collections.

I am continuing to work in the Peabody's Division of Entomology as part of a six-student team. We are now applying our newly acquired skills to the butterfly family Nymphalidae, and also providing digital photography of selected specimens. The digital images and specimen data will also be used in a bioinformatics project on the Nymphalidae being developed by Assistant Curator Antónia Monteiro, assistant professor in Yale's Department of Ecology & Evolutionary Biology, in her study of the evolution, development and phylogenetic origin of eyespot patterns on butterfly wings.


GREEN


MOORE


SPERLING

The 2007 Simpson Prize Awards

Each year the Yale Peabody Museum of Natural History awards the George Gaylord Simpson Prize to a Yale University graduate student or recent doctoral candidate for a paper concerning evolution and the fossil record. The prize is named for George Gaylord Simpson (1902–1984; Yale Ph.D. '26), the most influential paleontologist of the 20th century and a major proponent of the modern evolutionary synthesis.

The co-recipients of the George Gaylord Simpson Prize for 2007 are Walton Green (Yale Ph.D. '07), Brian R. Moore (Yale Ph.D. '07) and Erik A. Sperling.

Walton Green is a Connecticut Yankee who has assiduously avoided acquiring marketable skills in 12 years spent collecting degrees from universities on two continents. His recently completed doctoral dissertation presented to the Yale Department of Geology and Geophysics of the Sheffield Scientific School proposes a new palaeoecological method for analyzing forests based on architectural attributes of the leaves they produce. In addition to plant palaeoecology, leaf architecture, and the graphical display of quantitative information, his research deals with evolutionary theory, Mesopotamian archaeobotany, and R. Don't ask him what R is unless you have several free hours. His avocational interests include amateur drama, squash racquets, tree-climbing, sailing, old novels, and doggerel rhyming. Green was co-author of the article "Leaf architectural profiles of angiosperm floras across the Cretaceous/Tertiary boundary," published in the *American Journal of Science* 305(10):983–1013.

While conducting fieldwork as an undergraduate in Costa Rica, **Brian Moore** became irrevocably fascinated by the patterns and generative processes of biodiversity. Episodes of explosive speciation, adaptive radiation, species selection, key innovation, and mass extinction are a few examples of biological phenomena involving differential rates of diversification. Moore's doctoral research has focused on developing and implementing phylogenetic methods to explore these evolutionary processes, and is applying these new methods to explore a number of specific empirical problems (including the geographic context of lineage diversification and the role of biogeographic history on rates of cladogenesis). Moore completed his doctoral research under Michael Donoghue at Yale and is pursuing postdoctoral research with John Huelsenbeck at the University of California at Berkeley. He is the co-author of the paper "Incorporating fossil data in biogeographic inference: a likelihood approach" (*Evolution*, in press).

Erik Sperling's research focuses on major events in the history of animal life, such as the Cambrian radiation and mass extinctions. His master's research involved a stratigraphic and sediment geochemistry study of two potential Permian–Triassic boundary sections in the western United States. A third year graduate student, Sperling's doctoral thesis will look at the various factors involved in the polyphyletic radiation of biomineralizing organisms near the base of the Cambrian. Originally from Seattle, Sperling did his undergraduate and master's studies at Stanford University, and worked at the South Australian Museum and Dartmouth College before coming to Yale. He is co-author of "A Permian–Triassic boundary section at Quinn River Crossing, northwestern Nevada, and implications for the cause of the Early Triassic chert gap on the western Pangean margin," published in *Geological Society of America Bulletin* 118(5–6): 733–746.

NEW PUBLICATIONS FROM THE YALE PEABODY MUSEUM

The Quito Manuscript:
An Inca History Preserved by
Fernando de Montesinos
By Sabine Hyland
YUPA 88, September 2007
Softcover, $28.00
171 pp., 3 tbls., 3 figs,. appendix, index
ISBN 978-0-913516-24-9

The Quito Manuscript, the newest title in the Yale University Publications in Anthropology series, examines a 17th century Andean chronicle that preserves a native history that is unique among the legends recorded in early Peru. Spanish priest Fernando de Montesinos spent 15 years traveling in Peru and wrote the five-volume *Memorias historiales,* one of the most remarkable collections of indigenous South American myths and history known to exist.

This edition corrects the alterations and errors found in previous editions and includes an accurate transcription of the original Spanish and Quechuan of Book II of this work, based on a 1644 manuscript now in the Biblioteca de la Universidad de Sevilla in Spain. Included also are a biographical sketch of Montesinos that incorporates new archival information about the chronicler's life, correcting common misperceptions about him; an extended discussion of the *stemma codicum*; an analysis of the other books of the *Memorias historiales* and their relationship to Book II; commentary on the structure of the Quito manuscript, including a consideration of the ideas of time in the narrative and the possible sources for the text; examination of the insistent theme of sexual mythology; and the relevance of the source to northern Andean ethnohistory, the Spanish and Quechuan linguistic subtleties, and the text's statements about native writing. This study and edition should facilitate continuing scholarship on this evocative and unique source of Andean mythology.

Sabine Hyland is Associate Professor of Anthropology at St. Norbert College. She has done extensive fieldwork and archival experience in Peru, Bolivia, Panama and Spain. Her research focuses on the intersections of history, race and gender among indigenous peoples of the Andes.

The Yale University Publications in Anthropology series publishes research conducted or sponsored by the Yale Peabody Museum's Division of Anthropology and the Yale Department of Anthropology. YUPA is supported by the Theodore and Ruth Wilmanns Lidz Endowment Fund for Excellence in Scholarly Publications, dedicated to the dissemination of scholarly research and study of the world and its cultures.

To order contact the Publications Office at (203) 432-3786 or peabody.publications@yale.edu, or visit *http://www.peabody.yale.edu/scipubs/*.

Peabody's *Bulletin* Joins BioOne Online Service

As of January 2008, the latest issues of *Bulletin of the Peabody Museum of Natural History* will be available through BioOne (*http://www.bioone.org*), a not-for-profit web-based collaboration of scientific societies, libraries, academia, and the private sector that provides online access to the full texts of more than 120 high-impact bioscience journals. Established in 2001, BioOne is available by institutional subscription through universities, government agencies and corporate libraries worldwide.

Bulletin will join BioOne.2, a new collection of titles launched in 2007, beginning with the articles in *Bulletin* 47(1-2), the first issue published in its new journal format. Participation in BioOne will provide the *Bulletin* with increased visibility and access, online services such as citation linking through CrossRef, and rights management of downloadable articles. All BioOne titles are fully indexed by the major search engines, including Google and Google Scholar, CSA Illumina, Yahoo and MSN Academic Live. In addition, BioOne deposits all of its titles in PORTICO, a new service developed by the scholarly archive service JSTOR and the Andrew W. Mellon Foundation that migrates all electronic journal content as technology evolves.

The October 2007 issue of the *Bulletin* includes 12 peer-reviewed papers resulting from the 2nd International *Metasequoia* Symposium, "*Metasequoia* and Associated Plants: Evolution, Physiology, Horticulture, and Conservation," held at Yale and Bryant University in August 2006. Both an update and a report of new progress, these papers cover a wide range of topics related to both the fossil and living representatives of *Metasequoia* and its associated plants.

Yale to Launch Online Environmental Magazine

Yale University and the School of Forestry & Environmental Studies (F&ES) are launching an online magazine that aims to become one of the world's leading sites for authoritative, cutting-edge opinion, commentary and in-depth reporting on the major environmental issues of the day.

F&ES Dean Gus Speth noted that the magazine, which will begin publication this spring, is coming online at a moment of unprecedented concern about environmental issues, sparked in large measure by growing evidence of the effects of global warming. That intensifying interest, coupled with the virtual nature of *Yale Environment 360 Online*, has created an opportunity to publish a journal that will appeal to an international audience of policy makers, scientists, journalists, environmental activists and general readers.

Speth said the online magazine will welcome op-ed-type articles from a wide variety of sources and will publish opinion and reported pieces written by some of the world's leading scientists and researchers, environmental journalists and writers. Taking advantage of the online format, the site will present multimedia content, including video and audio that will feature reports from the field and interviews, as well as panel discussions, blogs by guest writers and interactive graphics. *Yale Environment 360 Online* also will highlight noteworthy articles and documents from outside sources and will provide comprehensive background summaries of pressing environmental topics.

"We believe that there is a need for a dynamic Web publication, international in its reach, that will provide authoritative journalism, sound science and informed opinion and analysis on the environment," said Speth. "*Yale Environment 360 Online* will deliver first-rate reporting and commentary and will help make the science of environmental issues understandable and accessible to a worldwide audience."

The site will provide an important connection between the academic community and other communities working on environmental issues, but it will be written for a general audience. Using F&ES as a springboard, *Yale Environment 360 Online* will establish contacts with academics and environmental experts at universities and organizations around the world and will invite them to contribute to the site. The magazine also will seek contributions from leading thinkers in foreign affairs, international development, "green" business and the environmental movement.

Launching a global, online environmental magazine is in keeping with two major goals of Yale and President Levin: making the University an increasingly international institution and intensifying its focus on environmental issues. *Yale Environment 360 Online* is being funded in part by grants from the William and Flora Hewlett Foundation and from the John D. and Catherine T. MacArthur Foundation.

"Yale is working on many fronts to be one of the world's leading green universities," Levin said. "With *Yale Environment 360 Online*, it will move to the forefront of reporting on and finding solutions to the most pressing environmental issues of our time."

Cohn comes to *Yale Environment 360 Online* from a distinguished career in magazine and newspaper journalism, much of it focused on the environment. During his tenure as editor-in-chief at *Mother Jones*, from 1999 to 2005, he revitalized the magazine, focusing on in-depth investigative reporting and top-quality writing. In 2001, *Mother Jones* won the prestigious National Magazine Award for General Excellence. Under his editorship, *Mother Jones'* circulation rose to an all-time high, and the magazine frequently broke stories that received national attention, including an award-winning series on the Bush administration's environmental record.

Prior to that, Cohn was executive editor of *Audubon* from 1991 to 1998, helping lead the magazine during a period when it became nationally known for its cutting-edge environmental reporting. He had previously been a staff writer at *The Philadelphia Inquirer*, where he served as one of the nation's first environmental reporters.

Cohn, Yale College Class of 1973, has written widely for numerous publications, including *The New York Times Magazine*, *The Washington Post Magazine* and *Outside* magazine. He has also been a visiting professor at the Graduate School of Journalism at the University of California at Berkeley.

The web address to access *Yale Environment 360 Online* is www.E360@yale.edu.

The web publication,* Yale Environment 360 Online *will be edited by Roger Cohn, the award-winning former editor of* Mother Jones *and* Audubon *magazines. In announcing Cohn's appointment, Yale President Richard Levin said, "The time is right for a global publication that will serve as a forum for provocative writing and thinking on ways to tackle urgent environmental challenges."

FACULTY NEWS



DR. MARIA DIUK-WASSER
Appointed in Epidemiology & Public Health

Maria Diuk-Wasser has been appointed Assistant Professor in the Division of Epidemiology of Microbial Diseases. Professor Diuk-Wasser received her PhD from the University of California, Los Angeles (UCLA), in 2003. She was awarded the UCLA International Studies and Overseas Programs Fellowship in 2000, and the Brown-Coxe Fellowship, Yale School of Medicine, 2004,

Her current research projects include *A Spatial Risk Model for Ixodes scapularis-borne Borrelia*, which studies the effects of West Nile virus vectors host feeding behavior on transmission patterns; integrating earth observation and field data into a Lyme disease model to map and predict risks to biodiversity and human health; and birds as reservoirs of human pathogens.

Professor Diuk-Wasser is interested in modeling the environmental and ecological drivers of vector-borne and zoonotic diseases using intensive field and laboratory-derived data. Under the conceptual framework of landscape epidemiology and using the tools of geographic information systems, remote sensing and spatial statistics, she predicts human disease foci by modeling the distribution of pathogens, vectors and hosts. Within these areas of risk, she is currently focusing on environmental drivers of pathogen transmission dynamics, with the ultimate goal of generating spatio-temporal predictions of risk. Current areas of interest include generating a spatial risk map of Lyme disease in the United States and of West Nile virus in Connecticut and studying how climate, landscape and host diversity affect vector host-feeding behavior, in turn affecting transmission dynamics and pathogen genetic diversity. Her disease study systems are West Nile virus, Lyme disease and malaria. Other interests include landscape ecology and genetics, animal behavior and conservation biology.

HAGIT AFFEK
Appointed in Geology & Geophysics

Hagit Affek joined the Yale Geology & Geophysics faculty as an assistant professor in July of 2007. Her research interests are within the field of environmental geochemistry focusing on biosphere-atmosphere interactions and global climate change. Her BA in chemistry was obtained from the Technion in Haifa, Israel. Her MSc and PhD degrees were both obtained in the department on Environmental Sciences and Energy Research in the Weizmann Institute of Science, Rehovot, Israel. Her MSc research (in the labs of Dan Yakir and Daniel Ronen) dealt with CO_2 fluxes at the saturated–unsaturated interface of a phreatic aquifer. Her PhD research (in the lab of Dan Yakir) dealt with isoprene emission from plants, its physiological role and its isotopic composition. Her post-doctoral work (in the lab of John Eiler), in the division of Geological and Planetary Sciences at Caltech, dealt with developing a new isotopic tracer, mass 47 of CO_2, to be used both as a tracer for atmospheric CO_2 fluxes and as a temperature proxy in CO_2 extracted from carbonate minerals.

Dr. Affek's research interests progress in two parallel directions: In the first, she studies production and emission of volatile organic molecules from plants and how plants affect air quality. This includes hydrocarbons of the isoprenoid family that are emitted in large amounts from vegetation, and contribute, in the presence of NO_x (which is mostly of anthropogenic origin) and sunlight, to production of tropospheric ozone and therefore play a role in air pollution formation. Her past work showed that isoprene could protect plants from oxidative stress. It also showed, using carbon isotopic analyses, that, contrary to the common assumption, not all the isoprene is produced from fresh fixed carbon. Some is produced from stored carbon, allowing isoprene production under stress conditions when photosynthesis declines. She plans to expand her isotopic research of molecules of this family. She also plans to study emission of alkyl halides from plants. These molecules are important natural sources of chlorine and bromine atoms to the stratosphere, where they contribute to stratospheric ozone depletion.

Dr. Affek is also involved in developing a new isotopic tracer, termed the "clumped isotope" effect or mass 47 anomaly. Her work in atmospheric CO_2 showed that the mass 47 anomaly signature in some of the important CO_2 fluxes does not reflect the expected equilibrium values and therefore lead to seasonal variations in mass 47 anomaly in atmospheric CO_2, making it a potentially useful tracer in studying CO_2 fluxes. She plans to extend this work by studying the mass 47 anomaly values associated with the different CO_2 fluxes. "Clumped isotopes" are also used as temperature proxies for climate reconstruction studies, using carbonate minerals. This tracer has a significant advantage over the more common oxygen isotopes; that is, it provides a pure temperature signal, independent of the isotopic value of the water in which the carbonate was formed. Dr. Affek's current work focuses on glacial-interglacial temperature variations recorded in speleothems. She plans to expand this work to using other carbonate sources and additional time periods.

ZHENGRONG WANG
Appointed in Geology & Geophysics

Zhengrong Wang recently joined the Yale Geology & Geophysics faculty in July of 2007 as an Assistant Professor. His PhD is from the California Institute of Technology and before coming to Yale he was a postdoctoral fellow at the Woods Hole Oceanographic Institution in Massachusetts. His principal research focus

is to understand the nature and evolution of Earth's mantle, oceanic lithosphere, hydrosphere and biosphere, and their interaction over geologic time.

Dr. Wang's basic approach is to use the principles of stable isotope fractionation, in conjunction with various analytical and experimental techniques. Traditional stable isotopes (e.g., C, H, O, S and N) and non-traditional stable isotopes (e.g., Li, Mg, Fe, B and Ca) are significantly fractionated at a low temperature environment (e.g., oceanic environment and biosphere), whereas they are much less fractionated at elevated temperature (e.g., igneous system and mantle environment). Traditional stable isotope systems (e.g., O and C) have proven to be powerful complements to radiogenic isotope and trace element geochemistry in constraining the evolution of and interaction among Earth's major geochemical reservoirs. Non-traditional stable isotopes (e.g., Mg, B and Li), while more novel tools, are rapidly gaining attention, partially driven by advances in Multi-Collector Inductively Coupled Plasma Mass Spectrometry (MC-ICP-MS) instrumentation. These "new" stable isotopes have a variety of distinct geochemical properties that are advantageous over traditional isotope systems, and therefore offer promising new avenues for understanding mantle geochemistry, geochemical and biological fluxes and cycles, paleoceanography and paleoclimate changes.

Research projects that Dr. Wang is working on include: Mg and oxygen isotope composition in various mantle reservoir in the earth, and constraints on mantle dynamics; Mg isotope fractionation during biomineralization of carbonate and dolomitization; Mg isotope variation in hydrothermal systems; theoretical studies of isotope fractionation using quantum mechanics; and trace element partitioning between melt/fluid and minerals. Progress in these studies strongly relies on improved analytical facilities and advances in sampling and analytical technology. In the next few years, he will be building infrared laser fluorination equipment to study oxygen isotope composition of silicates, and a non-traditional stable isotope analytical center equipped with a state-of-the-art clean lab, MC-ICP-MS and ICP-MS.

Dean Speth Appointed Carl W. Knobloch, Jr. Dean

Gus Speth, who has led F&ES for the past eight years, has been appointed the inaugural Carl W. Knobloch, Jr. Dean.

Carl Knobloch, Yale College Class of 1951, said that his gift is a vote of confidence in the school's mission and a generous contribution to the $3 billion Yale Tomorrow capital campaign.

"My wife, Emily, and I consider F&ES to be the number one school of its kind in the world," said Knobloch, a Wyoming-based businessman and philanthropist, who founded and chairs the West Hill Foundation for Nature, a nonprofit corporation that supports environmental projects.

"The preservation of our natural ecosystems is critical to the continued economic strength of our country, as well as the health of all Americans," he said. "There is an impending crisis in the degradation of the world's environment, which we must prevent for the sake of our children and their children. F&ES is the finest training ground for those who will forge the way."

During his tenure, Dean Speth has played a key role in increasing national and international awareness of the world's most pressing climate issues. He has been credited, as well, with shepherding F&ES in a process of major change and expansion. "I am deeply honored to be the first to hold the Knobloch deanship," said Dean Speth. "Never has the need for enlightened stewardship of our natural resources been so urgent. At Yale, and in his efforts to save the land, Carl is providing outstanding leadership."

Knobloch added: "Gus is just as good as you can get as the head of this great school."

As a founder of both the Natural Resources Defense Council and the World Resources Institute, Dean Speth has held a number of influential posts, including administrator of the United Nations Development Programme and chair of President Carter's Council on Environmental Quality. In addition to numerous articles, his latest book, *Red Sky at Morning: America and the Crisis of the Global Environment*, has been widely recognized.

Prior to endowing the new deanship, Knobloch contributed funding to F&ES in 2005 to create the Carl and Emily Knobloch Environment Center. The center will be the premier gathering place for environmental activities at the University and will be located in Kroon Hall, a new sustainable home for the school that is scheduled to open in late 2008.

"The deanship will stand as a permanent tribute to Mr. Knobloch and his exceptional commitment to F&ES and its mission of safeguarding the health, integrity and beauty of the natural world," said Yale President Richard Levin. "We are also thrilled to be able to honor Gus and his extraordinary vision, dedication and accomplishments in this way."

Yale School of Forestry & Environmental Studies

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F&ES faculty, staff and students participate in exciting environmental projects each year, including innovative courses, conferences and applied research. The goal of the F&ES Publication Series is to capture some of the best of that work and make it available to a broad professional audience.

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