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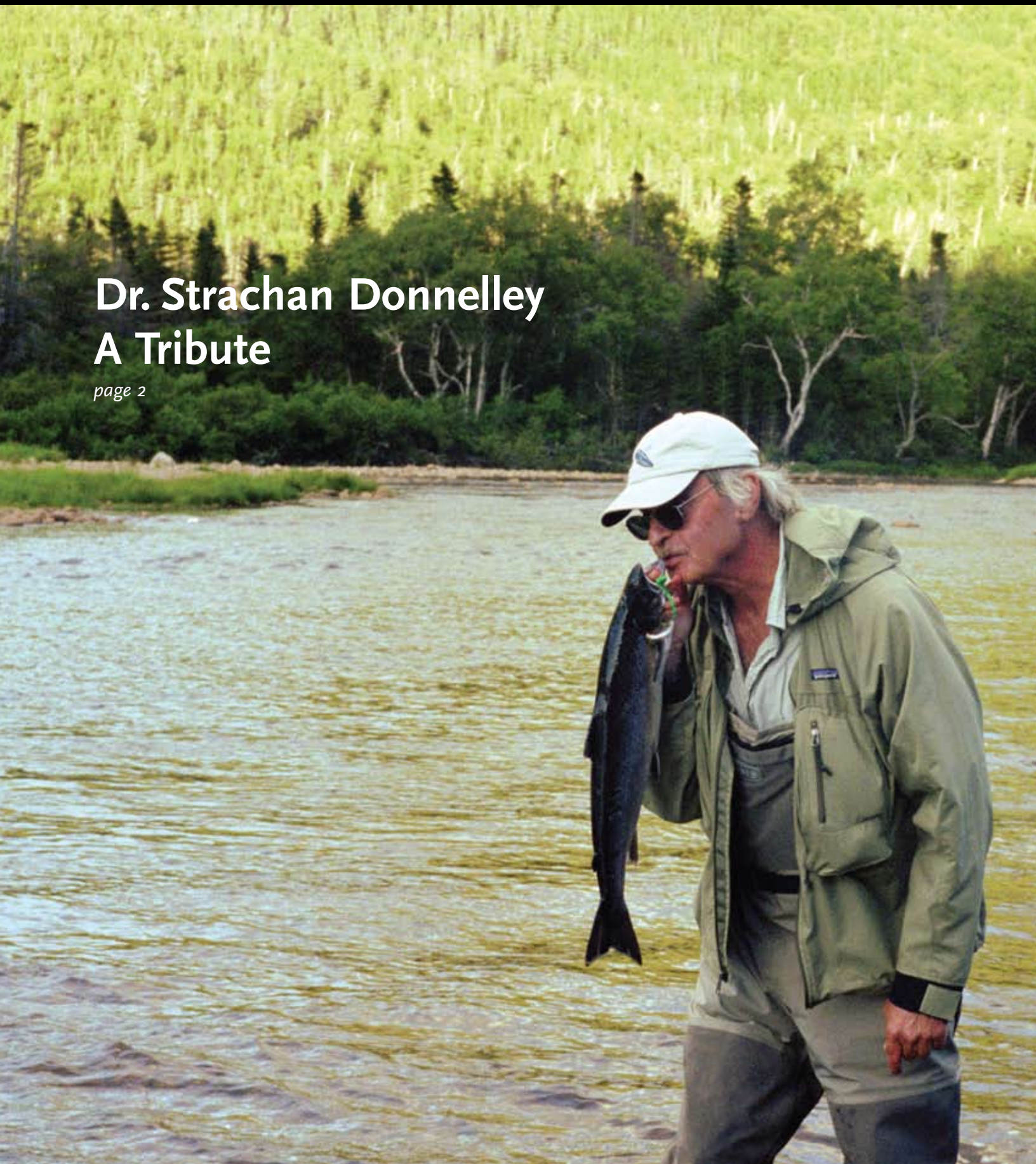

Dr. Strachan Donnelley
A Tribute

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A TRIBUTE TO

Dr. Strachan Donnelley

Strachan Donnelley was bigger than life—literally and figuratively. When he entered a room, his presence was projected by his rambling, handsome, towering stature, and by his broad smile and gregarious personality. He was a self-professed philosopher—a student of life—of human nature and how we humans relate to the natural world. He melded these aspects of living into a lifelong quest to join nature in wondrous splendor.

Strachan loved Yale, and as I listened to his friends and colleagues recalling their friend during his memorial service held in New York City on September 5, 2008, I realized that he was a friend to all the people and places that brought him joy—in the various learning institutions and environmental agencies and boards that he belonged to, and supported not only financially, but by giving of himself, his time and his wisdom. His constant quest was to live in harmony with nature.

We shall miss his presence as a member of the Yale Institute for Biospheric Studies External Advisory Board, as a benefactor of the Gaylord Donnelley Postdoctoral Environmental Fellows program, the Environmental Studies Program, of the School of Forestry & Environmental Studies, and the Peabody Museum of Natural History.

After the spring meeting of the YIBS External Advisory Board, I penned the following thoughts that I share as a tribute to Strachan:

May 2, 2008
The meaning of life

It doesn't matter what has gone before us, or what will come ahead. What really matters–what's most important–is for us to savor what we have at this very moment and appreciate the people who we have relationships with and who we can commiserate with, spend time with, and love and laugh and explore with.

Today I spent 6 hours in a room filled with YIBS External Advisory Board members and various faculty and friends of YIBS, and there was one vacant chair. The man whom I've admired over the years–a philosopher by nature, an environmentalist by choice, and who always provoked us all to think deeply about our connectedness to each other and with Nature–Dr. Strachan Donnelley–was not here. I always sat next to him at these meetings and enjoyed the private dialogue we had, and even contemplated moving to New York City to work at his Center for Humans and Nature because I embraced his philosophy enough to think that I could somehow make a difference in the world–probably a very small difference, but at least a difference.

I perhaps will never have the honor to sit next to him again and enjoy quiet conversation. I don't think I savored our time enough–we were always in hurry–he to his next meeting, me to making sure of the details of our meeting so it would run smoothly.

These are the things in life that

make me pause and think of what is really important.

By the standards that have been set by society, our two days of meetings and events went extremely well –the conversations were lively, Jeffrey Park as the new YIBS Director did a spectacular job. Attendance was up from previous meetings, and the two guests who attended are interested in joining our board. But the vacant chair of Strachan Donnelley will never be filled in my mind. I shall miss him, not because he was a member of the board, or as a Yale Alum, or for any of the outward characteristics that he manifested when he participated in his life's work. I'll miss him because he was a genuine, caring soulful human being who cared for everyone he interacted with–and it showed, and he made an impact on me and the way I choose to live my life.

We as an Institute are planning a tribute to Strachan–to support a position either in the form of a visiting scholar or postdoctoral fellowship in his memory that will bring to Yale a person dedicated to his philosophy–the philosophical connection between humans and nature.

By Rose Rita Riccitelli, Assistant Director, Yale Institute for Biospheric Studies

Photos courtesy of Ansell Bray

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, and have continued to be a popular offering for students and faculty. The Fall 2008 seminars featured the following list of speakers and topics:

Jeffrey Park, Director, Yale Institute for Biospheric Studies; Professor in the Department of Geology & Geophysics, *Water of Love, Deep in the Ground: Hunting for the Mantle Hydrologic Cycle using Earthquake Waves* ■ **Zhengrong Wang**, Assistant Professor in the Department of Geology & Geophysics, *Mg Isotope Distribution in Terrestrial Materials* ■ **David Skelly**, Professor at the School of Forestry & Environmental Studies, *Hermaphrodites in Your Backyard: The Landscape Ecology of Amphibian Intersex* ■ **Jon Moore**, Associate Professor of Biology, Harriet L. Wilkes Honors College, and Visiting Professor in the Department of Ecology & Evolutionary Biology, *Biology and Conservation of the Threatened Gopher Tortoise* (Gopherus polyphemus) *in Florida* ■ **Matthew Brandley**, Gaylord Donnelley Postdoctoral Environmental Fellow in the Department of Ecology & Evolutionary Biology, *A Farewell to Arms (and Legs): Rates and Patterns of Body-form Evolution in Squamate Reptiles* ■ **Katy Prudic**, Gaylord Donnelley Environmental Postdoctoral Associate in the Department of Ecology & Evolutionary Biology, *What Gets You Noticed? The Ecology and Evolution of Conspicuous Signals in Insects* ■ **John Haffner,** Senior Advisor, Strategic Planning, Ontario Power Generation and member of the Yale World Fellows Program, *Nuclear Energy Prospect* ■ **Joseph Pignatello**, Professor of Chemical Engineering at Yale, *Black Carbon–Its Complex Role as an Adsorbent in the Availability of Organic Chemicals in the Environment* ■ **Marcello Canuto**, Assistant Professor in the Department of Anthropology, *The Impact of Drought on Classic Maya Civilization: New Evidence from Biomarker Climate Proxies* ■ **Gaboury Benoit**, Professor of Environmental Chemistry, School

YIBS CENTER FOR THE STUDY OF GLOBAL CHANGE–TOPICS IN GLOBAL CHANGE SEMINARS

The YIBS Center for the Study of Global Change presented their weekly seminar series, Topics in Global Change, during the fall 2008 semester. Center Director Karl K. Turekian, Sterling Professor in the Department of Geology & Geophysics, organized the seminars with an emphasis on climate proxies over time.

Speakers and topics for the Fall 2008 seminars were: **David Battisti**, University of Washington, who gave three Flint lectures, *Climate and Landscapes, El Nino/Southern Oscillation: Past, Present and Future*, and *A New Hypothesis for Dansgaard Oeschger Events* ■ **Miryam Bar-Matthews**, Geological Survey of Israel, *The Paleoclimate of the Eastern Mediterranean and North East Sahara Region Based on Multiple Speleothem Proxies* ■ **Zhengrong Wang**, Yale University, *Magnesium Isotopes as Paleothermometers in Calcareous Organisms* ■ **Sujoy Mukhopodhyay**, Harvard University, *Tracking Mineral Dust Emission from the Sahara-Sahel Region Using Corals as Dust Archives* ■ **Andrew Scott**, Royal Holloway University of London, *Global Wildfires at the K-P (K-T) Boundary–Fact or Fiction?* ■ **Ellen Thomas**, Yale University, *Evolution from Benthos to Plankton: Rare, Common, or a Reaction to Mass Extinction?* ■ **J. R. (Robbie) Toggweiler**, Geophysical Fluid Dynamics Laboratory (GFDL), Princeton University, *Myth of the Lysocline and the 100,000-year Sawtooth in Atmospheric CO_2* ■ **Ann Cohen**, Woods Hole Oceanographic Institution, *From Crystals to Climate* ■ **Rosemary Came**, University of Texas, *Application of Carbonate 'Clumped Isotope' Thermometry to Marine Brachipods from Icehouse and Greenhouse Periods in the Paleozoic Era* ■ **Justin B. Ries**, University of North Carolina, *Secular Variation in Seawater Mg/Ca: Impacts on Biotic and Abiotic Carbonates* ■ **Timothy Herbert**, Brown University, *Insights into Plio-Pleistocene Climate Change from Long Records of Tropical Sea Surface Temperature* ■ **David Beerling**, University of Sheffield, *Towards the Development of a New Paleo-CO_2 Proxy*; and **Gavin Foster**, University of Bristol, *Reconstructions of Past pCO_2 and Ocean pH Using Boron Isotopes Measured by MC-ICPMS in Foramin*

of Forestry & Environmental Studies and Chemical Engineering; Associate Dean, School of Forestry & Environmental Studies, *Green Sprawl: Can Land Be Developed Sustainably?* ■ **Helen Mills Poulos**, Doctoral Student in the School of Forestry & Environmental Studies, *Predicting Tree Wind Risk Along Connecticut Utility Rights-of-way* ■ **Peter Perdue**, Professor in the History Department, *China's Environmental Crisis in Historical Perspective* ■ **Chad Vecitis**, YIBS Environmental Postdoctoral Associate, Environmental Engineering, *Sonochemical Destruction of Persistent Organic Pollutants*

For the winter/spring 2009 schedule, please visit the YIBS web site *www.yale.edu/yibs/ESC_Seminar.html*

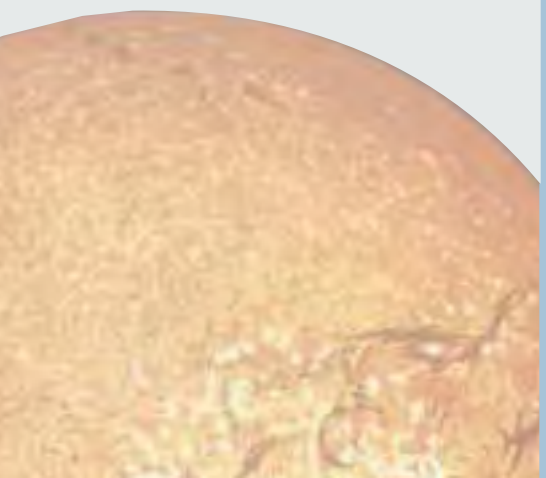
Kanani K. M. Lee Joins Faculty in Geology & Geophysics

Kanani K. M. Lee joined the faculty in the Yale Department of Geology & Geophysics in July of 2008 as an assistant professor. She received her Ph.D. in Geophysics from the University of California, Berkeley, after which she was an O.K. Earl Postdoctoral Fellow at the California Institute of Technology and then an Alexander von Humboldt Fellow at the Bayreuth Geoinstitut in Germany. Before coming to Yale, she was an assistant professor in physics at New Mexico State University.

Professor Lee investigates the interior of Earth as well as other planetary interiors using a number of high-pressure techniques: laser-heated diamond-anvil cell, laser-driven shock waves on precompressed samples and ab-initio quantum-mechanical computations. For her most recent research endeavor, she has investigated the pressure and chemical dependence on the half-lives of electron-capture radioactive isotopes, including ^{40}K and ^{26}Al, two isotopes that are important in understanding Earth's heat budget. This effort brings together state-of-the-art ab-initio computations of electron density with that of high-pressure diamond-anvil cell experiments. Experiments and computations are combined jointly to investigate how chemical composition and pressure affect the electron-capture portion of their half-lives. Professor Lee also investigates the partitioning behavior of potassium within Earth's mantle and between the mantle and core in hopes of better understanding this important heat source.

Professor Lee's research interests include investigating the physical properties of natural rock assemblages that are good estimates for the composition of Earth's mantle. Earth's mantle comprises 85% of Earth's volume, thereby its physical and chemical makeup are necessary to understand the observations that are made on Earth's surface, including earthquake waves, volcanoes, geodetic measurements and so forth. Ironically, due to the nature of high-pressure experiments, in trying to understand the "big" picture of Earth's accretion and evolution, her samples are tiny: individual grains as small as 10 to 20 nanometers, with total sample dimensions of 100 micrometers. Because of their small size, Professor Lee uses a number of techniques to probe the samples both while at high pressure and temperature (synchrotron-based X-ray diffraction) as well as on quenching from extreme conditions (Scanning Electron Microscope, Electron-Probe MicroAnalysis and Focused Ion Beam).

Professor Lee's interests also extend beyond Earth's rocky and metallic interior to the outer reaches of the solar system and beyond. Together with colleagues at University of California, Berkeley, Lawrence Livermore National Laboratory and France's Commissariat a l'Energie Atomique, she found that water becomes metal-like under extremely high pressures and temperatures. Water, although ubiquitous on Earth as a vapor, liquid and solid, becomes reflecting under extreme conditions. Water's newly discovered reflectivity indicates that water becomes electronically conducting and metal-like under the very high pressures and temperatures in the interior of a planet like Neptune or some of the extra-solar planets that have been recently discovered, hinting at the possibility that conducting water is the source of these planets' magnetic field.




ALLEN


BROTHERTON


HARMS


INHORN

Anthropology Welcomes Four New Faculty

The Department of Anthropology recently welcomed four new faculty—Doctors Jafari Sinclaire Allen, P. Sean Brotherton, Erik L. Harms and Marcia C. Inhorn. The research interests of doctors Brotherton, Inhorn and Harms particularly intersect with the mission of the Yale Institute of Biospheric Studies as they represent research and education that address fundamental issues of relevance to the biosphere.

JAFARI SINCLAIRE ALLEN

Dr. Allen, Assistant Professor of Anthropology, received his Ph.D. at Columbia University in 2003. He has a joint appointment with the Department of African American Studies and works at the intersections of sexuality, gender and blackness—in Cuba, the United States, and transnationally. A recipient of fellowships from the National Science Foundation, Social Science Research Council Sexuality Research Program, and Rockefeller Foundation (Diasporic Racisms Project), he teaches courses on the cultural politics of race, sexuality and gender in Black diasporas; Black feminist and queer theory; critical cultural studies; ethnographic methodology and writing; subjectivity, consciousness and resistance; Cuba and the Caribbean.

P. SEAN BROTHERTON

P. Sean Brotherton (McGill 2004), Assistant Professor of Anthropology, has research and teaching interests that include the critical study of health, medicine, the state, subjectivity, and the body. His theoretical references draw on contemporary social theory and postcolonial studies. His ethnographic research is carried out in the Caribbean, particularly Cuba and Jamaica. Brotherton is currently completing a book-length manuscript, tentatively titled *Machinations of the State: Macroeconomic Change, Emergent Capital, and the Biopolitics of Health in Post-Soviet Cuba*. The book is an ethnographic examination of how Cuba's shifting state policies and external global factors have interacted to change the course of health and medicine in the socialist island nation. Using individual practices relating to the body and health as an ethnographic starting point, the book examines multiple pathways through which political subjectivities are created and transformed in contemporary Cuba.

Brotherton is also working on new two projects. The first is an ethnographic account of Cuba's recent export of medical doctors throughout the world for hard currency. This research focuses on several case studies, including the *Barrio Adentro* (*Inside the Barrio*) program, where over 20,000 Cuban physicians are working in Venezuelan communities providing medical care in exchange for hard currency and subsidized petroleum, popularly known as "the oil-for-aid deal." This research will explore how the moral legitimacy of the state is both challenged and maintained by the Cuban government's foreign aid policies, commonly referred to as "international proletarianism." This research aims to further examine the state's recent mobilization of biomedicine as a technology of politics and the effective integration of medical expertise into its strategies of corporate governance under the banner of the "struggle for socialism." The second project, based in Jamaica, examines how popular conceptions of the "infected body," produced through intersecting discourses of colonization, biomedicine, and traditional medicine, anchor notions of psychological, national, and racial health. Taking both an historical and contemporary approach, this project examines how various forms of power have "managed" epidemics using preventive, therapeutic, and diagnostic practices to differentiate and regulate subjects' bodies within the larger social order. The objective of this research is to challenge the perceived division between colonial and post-colonial medical discourses, as well as to question the epistemological foundations of biomedicine as an outcome of modernity.

Prior to joining the faculty at Yale, Brotherton held an appointment at Michigan State University (2006–2008) and was a SSHRC Postdoctoral Fellow (2004–2006) in the Anthropology of Medicine Program at the Universitat Rovira I Virgili in Spain. He teaches courses on medical anthropology, anthropology of the body, subjectivity and the state, and contemporary social theory. Brotherton's recent articles appear in *American Ethnologist* and the *Journal of Latin American Anthropology*. He is also the co-editor of a special issue of *Anthropologie et Sociétés,* focusing on issues of socialism/post-socialism.

ERIK L. HARMS

Erik L. Harms has been appointed Assistant Professor of Anthropology. Dr. Harms received his Ph.D. from Cornell University in 2006, and is a social-cultural anthropologist specializing in Southeast Asia and Vietnam. His ethnographic research in Vietnam has focused on the social and cultural effects of rapid urbanization on the fringes of Saigon–Ho Chi Minh City. This research appears in his book, *Saigon's Edge: Space, Time, and Power on Ho Chi Minh City's Rural Urban Margin* (University of Minnesota Press, Fall 2008), which explores how the production of symbolic and material space intersects with Vietnamese concepts of social space, rural-urban relations, and notions of "inside" and "outside."

More recently, his work has focused on the uses and abuses of "culture" and "urban civility" in urban Vietnam, and how this civilizing discourse entwines with spatial action in ways that legitimize broad-scale privatization. This new research explores how the study of social space can reveal unspoken relationships of power and ideology in post reform-era Vietnamese cities. While grounded ethnographically in Vietnam, his research and teaching seeks at all turns to connect his work with larger world-historic processes, unraveling the interaction between culture and politics, and the ways in which everyday acts are informed by larger political agendas. In his teaching, he will offer a rotating mix of courses on Southeast Asian area studies, postwar Vietnam, urban anthropology, as well as theories of space, time, and social action.

He is currently in the early project-design phase of an anticipated long-term collaborative ethnographic project designed to develop a comprehensive ethnographic map of the Saigon–Ho Chi Minh City Metropolitan Region. This project, tentatively entitled *Spatial Divisions of Labor in Ho Chi Minh City*, seeks to develop a set of interlinked ethnographies and urban studies that will highlight the way that unique urban spatial forms articulate with different modes of production and concomitant modes of social organization and cultural practice.

MARCIA C. INHORN

Marcia C. Inhorn (Ph.D., University of California, Berkeley, 1991; M.P.H, University of California, Berkeley, 1988) is the William K. Lanman, Jr. Professor of Anthropology and International Affairs and Chair of the Council on Middle East Studies (CMES) in the MacMillan Center for International and Area Studies. As past president of the Society for Medical Anthropology (SMA) of the American Anthropological Association, Inhorn is the Program Chair of the SMA conference on "Medical Anthropology at the Intersections: Celebrating 50 Years of Interdisciplinarity," which will be held at Yale from September 17–20, 2009.

Inhorn's research interests revolve around science and technology studies, gender and feminist theory (including masculinity studies), religion and bioethics, globalization and global health, cultures of biomedicine and ethnomedicine, stigma and human suffering. Over the past 20 years, Inhorn has conducted multi-sited research on the social impact of infertility and assisted reproductive technologies in Egypt, Lebanon, the United Arab Emirates, and Arab America. She is the author of three books on the subject, *Local Babies, Global Science: Gender, Religion, and In Vitro Fertilization in Egypt* (Routledge, 2003), *Infertility and Patriarchy: The Cultural Politics of Gender and Family Life in Egypt* (University of Pennsylvania Press, 1996) and *Quest for Conception: Gender, Infertility, and Egyptian Medical Traditions* (University of Pennsylvania Press, 1994), which have won the American Anthropological Association's Eileen Basker Prize and Diana Forsythe Prize for outstanding feminist anthropological research in the areas of gender, health, science, technology, and biomedicine.

Inhorn is also the primary editor or co-editor of six volumes, including *Anthropology and Public Health: Bridging Differences in Culture and Society* (Oxford University Press, 2009), *Reconceiving the Second Sex: Men, Masculinity, and Reproduction* (Berghahn Books, 2009), *Reproductive Disruptions: Gender, Technology, and Biopolitics in the New Millennium* (Berghahn Books, 2007), and *Infertility around the Globe: New Thinking on Childlessness, Gender, and Reproductive Technologies* (University of California Press, 2002).

As a Middle Eastern scholar, Inhorn has been a visiting professor at the American University of Beirut, Lebanon, and the American University of Sharjah, United Arab Emirates. With research support from Fulbright-Hays and the National Science Foundation, she has been at work on two related research projects, "Middle Eastern Masculinities in the Age of New Reproductive Technologies" and "Globalization and Reproductive Tourism in the Arab World." Currently, she is writing a book entitled *Reconceiving Middle Eastern Manhood: Islam, Assisted Reproduction, and Modern Masculinities,* which serves as an ethnographic challenge to received wisdoms and neo-orientalist stereotypes in a post-9/11 world.

Inhorn is the founding editor of *JMEWS (Journal of Middle East Women's Studies)*, the professional journal of the Association of Middle East Women's Studies (Middle East Studies Association); associate editor of *Global Public Health*; and co-editor for the Berghahn book series on "Fertility, Sexuality, and Reproduction."

Inhorn comes to Yale from the University of Michigan (2001–2008). She has also taught at Emory University (1994–2000) and the University of Arizona (1991–1994).

A TRIBUTE TO WILLIAM BURCH

A Career Devoted to Finding Environmental Solutions in Ordinary People's Lives

By Alan Bisbort

This spring, William Burch, Frederick C. Hixon Professor of Natural Resource Management, told a gathering of School of Forestry & Environmental Studies (F&ES) alumni that he had, during his career, tried to "carry out the words, if not the music, to the song 'I did it my way!'"

Burch, who is retiring this year from Yale after 40 years on the faculty, was on hand to receive a distinguished service award, along with former Dean John Gordon and Robert Pyle (Ph.D. '76). When it was time for him to give the keynote address to the alumni, Burch—never one to flinch from sharing his passion—offered remarks that have become his trademark: part instructional, part inspirational, all from the heart. He, in short, did it his way by presenting the talk "Back to the Future: Lessons From Pulaskis, Peaveys, Porcupine Sex and Maine Lupines."

In it, he called himself "a preindustrial exchange scholar, whose rant is that society is nature and nature is social" and "a professor at a fancy school who thinks that the most effective learning for natural resource professionals can only come through getting your hands dirty by being involved in activities useful to others." He offered his audience advice such as: "always question authority—especially if you have now become one" and "meaning well or even being right seldom excuses a large failure done in public and with all the bright stage lights on."

Burch has had few "large failures" in his career, though he has felt the bright lights on such stages as Nepal, Bhutan, China, Costa Rica, Argentina, Bolivia, Paraguay, India, Bangladesh, the Philippines and Peru, as well as the inner cities of the United States. At each stop, he has hammered home the one idea that has animated his research: "Urban areas are ecological systems, and humans should be studied from ecological and spatial perspectives."

In other words, you can't take the human out of the environment. "Environmental solutions can't be outside the scale of daily human life," he says. "The Cedar Hill neighborhood group in New Haven honored the work of our students from the Urban Resources Initiative and the ecosystem management class by planting a birch tree near the basketball court, making a connection between playing basketball and the natural world. This group, like many others in the city, has demonstrated that local people can take charge of their own environment. They just need modest resources, technical backup and some optimism that our students bring to such challenges."

In addition to the classes he has taught at F&ES in forest management and urban ecology, Burch has also held social science research and management appointments with the U.S. Forest Service, National Park Service and Connecticut Department of Environmental Protection. His work on wildland recreation behavior was among the earliest, and expanded to include parks, biosphere reserves and ecotourist regions in Asia, South America and Europe.

He was the first director of Yale's Tropical Resources Institute and the Urban Resources Initiative. He has been a grantee on numerous projects—sponsored by USAID, the Ford Foundation, the MacArthur Foundation and the World Wildlife Fund—in Asia and Latin America. He was awarded the John Eadie Fellowship by the Scottish Forestry Trust to advise British Forestry on community-based forestry research and training needs. And since 2001, he has been an adjunct professor in the School of Economics and Management at Beijing Forestry University.

"The best class I ever took was his six-credit monster on managing protected areas," says Marc Stern '92 (Ph.D. '06), whose advisor was Burch. "I was hesitant to take it, because I just wanted to be away from people in a forest studying the ecosystem. But he convinced me that local studies in New Haven were just as fascinating as forests in Nepal, that it didn't matter where you are, New Haven or Nepal; the same theories and realities applied. His message has always been that unless you can reach to that village level, it won't work. We can think up brilliant ideas and theories and plans, but it makes no difference if they don't reach ordinary people."

Graeme Berlyn, E. H. Harriman Professor of Forest Management and Physiology of Trees, is the longest-serving member of the F&ES faculty, in his 48th year. "Even though he used to jokingly say his expertise was 'the sociology of leisure,' Bill got so many things done. He deepened and broadened the school, but his biggest gift to his students may be his broadening of their imaginations. I'm terribly sad to see him go."

For Stern and his wife, Kim Thurlow ('02), Burch wasn't just a teacher; he took a paternal interest in their lives. Burch flew to speak at their wedding despite being weak from a bout of dysentery.

Equally memorable was the conference on rainforest protection that Stern organized at the school and at which Burch was the keynote speaker.

"People had been pontificating all day about various forest issues," recalls Stern. "Bill got up in his torn jeans, tweed coat and cowboy belt buckle and slammed his fist on the podium. He was angry, telling the crowd, 'You are arguing over tiny things. What you're forgetting about ... is love.' Then he cited a Puccini opera to make a point that 'every time we lose a species we cry together.' By the time he was through, there were people weeping in the audience behind me."

When asked later about the talk, Burch laughs and says, "It was the usual stuff, people talking in grandiose ways, not connecting to the assumed clients—the villagers in Guatemala or whomever. Not asking, 'What

do they need? How do they perceive the problem?' I sensed an unwillingness to get down and find out for themselves."

Like Stern, Gary Machlis (Ph.D. '79) had a close relationship with Burch. "After I had done my master's, I came across Bill's first book, *Daydreams and Nightmares* [originally published in 1971 by Harper & Row and republished by Social Ecology Press in 1988], which was a revelation to me," says Machlis, now a professor of conservation at the University of Idaho. "He found connections between the social and biological sciences that no one, to my knowledge, had found, and he stated them for the first time. I thought, 'I want to go study with him,' contacted him at Yale and went there as a doctoral student. I had never been east of Bozeman before that."

Machlis recalls a conference at which Burch was speaker: "The hall was filled with peace and optimism, and to stir things up and connect the event to the subject of forests, Bill pulled out the largest chainsaw I'd ever seen and cranked it up. It spewed blue smoke and made a noise like an atomic explosion. You see that as a graduate student and you think, 'Anything is possible.'"

Generous to a fault and accessible to an extreme, Burch is also given to solitary wanderings in the forest. Tireless in his dedication to his job, he is equally devoted to his family, and his Branford home was open to F&ES students over the years. "Bill had students from all over the world and treated them as an extended family," notes Machlis.

His worldview was shaped during a boyhood in eastern Oregon, when his father, then employed by the Depression-era Works Progress Administration, took the family on extended camping trips. "It was a good childhood," he says. "My brother and I grew up out of a tent." While attending college at the University of Oregon, Burch could not resist getting involved in the trade union movement and found himself at the center of a campus workers' strike. Later, working for the U.S. Forest Service, Burch struggled with like-minded scientists to save the virgin forests from timbering and dam building before the Wilderness Act was passed in September 1964. The act protected 9 million acres of federal

Generous to a fault and accessible to an extreme, Burch is also given to solitary wanderings in the forest.

land and created the legal definition of wilderness: "an area where the Earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain."

Burch fondly recalls how he was, at that time, part of a "coalition of nature lovers, pacifists and workers' rights activists."

"We had diversity before anyone even knew what the term meant," he says. "Even though the unity fell apart in the late 1960s, I still think that three-legged paradigm of nature-peace-labor was a good one and will return to the fore."

After his time with the Forest Service, Burch taught at Victoria University of Wellington in New Zealand and Syracuse University, before hearing about what he called "interesting developments" at Yale.

"The Yale Forestry School was looking for noneconomist social scientists," he recalls. "That's when Francois Mergen was dean. He knew that changes had to be made to broaden the forestry school, so he brought Herb Bormann, Rick Miller and me in."

Burch went on to author, co-author or edit 14 books on community development, natural resources and the environment, as well as 100 peer-reviewed journal articles. "The great benefit at Yale is that I didn't have to do esoteric, peer academic work," he says. "I could do other work."

Among this "other work" was the reorganization of the state's environmental protection department. In addition to the state government work, Burch was retained by the National Park Service as a researcher from 1984 to 1996. As such, he's left his mark around the country and the world.

Machlis took such teachings to heart.

"Bill emboldened me in my research by instilling in me that you don't have to go toward conventional acclaim. It has been 30 years and even though I am now his colleague [Burch and Machlis are collaborating on a book to be published in 2009 by Yale University Press], I am still his student. I bought a place on Vieques, Puerto Rico, near his place just to keep learning from him. In my 35 years in academia, he is the one intellectual who is most capable of continued learning. Bill is the exemplar of lifelong learning."

RESEARCH AND PROGRAM HIGHLIGHTS

David A. Vasseur Joins Department of Ecology & Evolutionary Biology

David Vasseur has been appointed Assistant Professor of Ecology & Evolutionary Biology, arriving at Yale in July 2008. Dr. Vasseur received his B.S. in Biological Science from the University of Guelph (Ontario, Canada) in 1999 and his M.S. from the same university in 2002. He received his Ph.D. from McGill University (Quebec, Canada) in 2006 in Theoretical Ecology, and was awarded the Dean's Honour List Distinction. From 2006 to 2008, he was a postdoctoral fellow at the University of Calgary (Alberta, Canada).

Dr. Vasseur seeks to understand how fluctuations in environmental conditions (e.g., temperature) influence quantitative characteristics of populations, communities and ecosystems. Within this conceptual theme, his research falls into three overlapping areas: 1) understanding how the indirect effects of environmental fluctuations propagate through food webs; 2) the causes and consequences of spatial population synchrony; and 3) the influence of spatial and temporal scale on the expression of environmental fluctuations in population dynamics. To address questions in these areas he links ecological theory to empirical work by using a combination of mathematical modeling, data analysis, and laboratory microcosm experiments. Dr. Vasseur believes that improving our understanding of these three core areas will enable us to anticipate how changes in local and global climate will alter Earth's natural biota.

Testing the Limits of Tiny

By Melinda Tuhus

Most people buy clothing to fit their bodies, but not too many build houses to fit their bodies—literally.

Elizabeth Turnbull ('10) is building her dream house—all 132 square feet of it. And the frame of the sleeping loft measures six feet one inch from the floor, giving her, at almost six feet tall, a tiny bit of head room as she walks to her study space below it.

Along with her laptop, Turnbull brought her tiny house with her when she matriculated at the School of Forestry & Environmental Studies. A 2004 graduate of Colby College, she packed a lifetime of experiences into the years before starting graduate school: leading cross-country bike trips; toiling on the 2004 Kerry presidential campaign in West Virginia, where she grew up; backpacking and doing farm work in New Zealand; working for a natural resources consulting company, a high-end travel company and a building design firm in Boston.

When she conceived the idea to actually build her own house, she took a two-week home design class offered by yestermorrow.org, which was founded by a group of architects "exploring the very fertile junction of design/build/sustainability," Turnbull says. The hands-on project that she and her classmates undertook was a 10-foot by 14-foot chicken coop, coincidentally almost the same size as her house. "It was a little chicken palace," she says, laughing heartily—something she does often.

Turnbull is studying for a master's degree in environmental management, focusing particularly on the intersection between business and the environment at F&ES, with the goal of learning more about greening the built environment. "It's the best school for what I want to do," she says. "The [environment] school has a great connection to the business school, and it's forward-thinking and solutions-oriented."

She readily acknowledges that building the tiny house was based more on excitement than expertise. She asked administrators at her high school alma mater, Governor's Academy in Byfield, Mass., whether she could build her house on-site, and they readily agreed. "It's been a very public design and building process, and the house is much more interesting, much better designed and much more creative than it would have been if I'd been building in a vacuum," she says. "There's been great volunteer support, donations, curiosity, interest and ideas."

The house was hauled by a trailer to Yale in October. It uses passive solar heating, so Turnbull says she can position the high wall to the south in the winter for maximum solar heat and then rotate it 180 degrees in the summer, turning the high wall to the north to keep her home cooler.

Her desks fold down Murphy-style, enabling a maximum workspace of 18 square feet, which is massive for the size of the interior space. And she's euphoric about her combination stove and oven, which is smaller than a two-foot cube. "It's just a tiny little thing; it's so cute!" She also has a lot of shelf space and a 3-foot by 7-foot storage loft above the door, as well as the bathroom and a closet wardrobe that she built. "So I had to be thoughtful about what I brought, and it turns out that there's enough room." She uses a marine cooler now but hopes to get a solar-powered refrigerator down the road.

The bathroom is the tiniest room in the tiny house. It measures 3-feet by 3-feet, but will eventually host a yacht-style wetbath.

The house is located near F&ES, and she'll have close access to a bathroom in a host house. She has water for cooking and drinking but not for washing. The siting would determine whether she would be able to put in a composting toilet and a sustainable gray water management system. "Waiting for a ruling from zoning boards and [figuring out] legal issues, like how to insure it, was a big part of the learning process for me."

Not only does the house use minimal construction materials, but Turnbull says she paid a lot of attention to the kind of materials she used. Most of the wood is FSC (Forest Stewardship Council) certified, which added

about $250 to the cost of the wood she purchased. "To know that it came from a forest that was well-managed and supported regeneration," she says, "I felt great about it." The exterior paint was low on volatile organic compounds (VOC), and the interior paint didn't have any VOCs. "I used only four gallons of paint on the outside," she says, "so I could afford to go with one of the more expensive paints."

The insulation was donated by a company that uses post-industrial waste soy oil in place of 30% of the petroleum in standard insulation, creating a foam that's highly energy efficient.

Turnbull says she held five building parties on summer weekends, and spurred by the first in a series of articles in a local Massachusetts newspaper, the majority of people who showed up at the first one were strangers. She gives special credit to a young man, Andy Vecchione, who came to check out the project and returned almost every day to help convert Turnbull's dream into reality. She says he had a lot more building and design experience than she did, adding, "There were four hands working on the house most of the time, and the other two belonged to someone who's way more capable and has a significantly better three-dimensional brain than I do. I joke with Andy that without him the house would be basically ashes and tears."

Americans Willing to Pay More for Eco-friendly Products

Half Willing to Pay 15% More for Cars; Most Want More Eco-labeling

Many Americans, including those who are enduring financial hardship, are willing to pay more for environmentally friendly products, according to a survey conducted in July by GfK Roper Public Affairs & Media and the Yale School of Forestry & Environmental Studies.

"Many American consumers, even in the face of economic uncertainty, express a willingness to pay more for environmentally friendly products," said Anthony Leiserowitz, director of Yale Project on Climate Change. "Toyota can't make the Prius fast enough to meet consumer demand, to cite just one example, and many see 'green' products as the wave of the future."

Half of the respondents to the survey said they would "definitely" or "probably" pay 15% more for eco-friendly clothes detergent (51%) or for an automobile (50%). Forty percent said they would spend 15% more on "green" computer printer paper and 39% would do the same for green wood furniture.

Americans who said their current financial situation is "fair" or "poor" were just as willing to spend 15% more on environmentally friendly detergent or wood furniture as those Americans more confident of their current financial situation.

Moreover, a majority of Americans said it is important to them that a number of products they purchase be environmentally friendly —automobiles (66% say it is "important" or "essential"), clothes detergent (62%) and computer printer paper (51%).

The survey also reveals that Americans want additional information about the environmental impacts of products to appear on labels. Solid majorities say that it is either "important" or "essential" to have eco-labels that describe the environmental impacts caused by product manufacture (73%), use (73%) and disposal (79%).

When asked to rate the trustworthiness of various eco-label sponsors, 75% of respondents said environmental groups are "very" or "somewhat" trustworthy, while 55% said government agencies and 51% said industry groups are trustworthy.

"These results suggest that manufacturers who offer high-quality and credibly labeled eco-friendly products will have opportunities to gain a competitive edge," said Graeme Auld, an F&ES doctoral candidate.

Yale Prize to Support Eco-ventures

An annual $25,000 Sabin Environmental Venture Prize at Yale has been established to stimulate entrepreneurial environmental ventures by Yale faculty and students.

The Sabin Prize will support the creation of new nonprofit and commercial organizations, business models or other innovations that address pressing environmental challenges. Examples of proposed ventures could include a new technology for desalination, a startup created to distribute existing technologies such as solar-powered lanterns to rural villages lacking electricity or a venture arising out of an existing Yale center or program.

The first Sabin Prize will be awarded in April by the Center for Business and the Environment at Yale. Yale faculty and students interested in competing for the Sabin Prize submited a letter of intent by January and must attend a training session on starting new ventures in February.

Forestry & Environmental Studies Dean Gus Speth said the Sabin Prize will provide a new intellectual challenge for the Yale community to elevate environmental innovation in society. "This prize will jump-start new ideas, practices and products toward a better environment and a more sustainable future," he said. "I am grateful for the support of the Andrew Sabin Family Foundation in sponsoring this new prize at Yale."

The Sabin Prize was made possible through a generous gift from the family foundation of Andrew Sabin, who said he decided to sponsor the prize because of his concerns about today's environmental threats to the planet and its consequences for future generations. "Everyone has a moral obligation to protect our natural world for our children and those who follow," he said.

Sabin noted that he chose Yale as the host of his sponsored prize because he felt it was the most appropriate institution to field such an undertaking. "Yale is widely recognized as one of the leading institutions in the world on environmental and sustainability issues, and I am confident that the ideas arising from this competition will spur many exciting new ventures," he said.

The Center for Business and the Environment at Yale will also host the Sabin Prize Speakers Series, a public lecture series on environmental entrepreneurism that will feature several highly successful entrepreneurs. Each speaker in the series will be recorded, and their remarks will be made available on YouTube through a link from the Center's web site at *www.yale.edu/cbey*.

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Extinction May Not Be Forever

The rediscovery of an extinct species is a rare and inspiring event, especially when it involves a large terrestrial vertebrate. Yet, advances in genetic technology combined with long-term study of a system can create new opportunities to identify the living remnants of extinct taxa in the wild. This is certainly true for the giant tortoises that once inhabited the island of Floreana in the Galápagos archipelago.

Charles Darwin himself provides us with a firsthand account of the intense exploitation of these animals by local settlers, and this species (*Geochelone elephantopus*) is thought to have been wiped out within 15 years of his historic visit to the Galápagos.

Museum specimens and current molecular technology, coupled with 15 years of field work studying the tortoise population present now on the Galápagos archipelago by Gisella Caccone, Director of the YIBS Molecular Systematics and Conservation Genetics laboratory and a group of Yale and non-Yale scientists, has painted a new picture of the origins and future of some of Darwin's tortoises. They report that genetic traces of extinct species of Galápagos tortoises exist in descendants now living in the wild, a finding that could spur breeding programs to restore the species.

Hybrids of the extinct Floreana tortoise line theoretically now could be bred, the researchers say, and over a long span, revive this species. With this in mind, an expedition on Volcano Wolf planned for December 2008 will look for tortoises bearing the Floreana lineage.

An interview with Caccone and Powell is available on iTunesU and online at Yale at *http://streaming.yale.edu/opa/podcasts/audio/schools/science/caccone_091508.mp3*

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A. A giant Galápgos tortoise in the highlands of Volcano Wolf on Isabela.

B. Nikos Poulakakis examining a museum sample from the extinct Floreana species of giant Galápagos tortoises.

C. Yale undergraduates Jeery Guo (left, in white shirt) and Chaz Hyseni (in blue shirt) and Yale graduate student Scott Glaberman (center, green T-shirt), together with a Galápagos National Park ranger and Cruz Marquez (left, in blue hat), a scientist from the Charles Darwin Research Station, taking a blood sample from a giant Galápagos tortoise in 2006.

Fund to Address Downside of China's Boom

By Jon Luoma

In the weeks leading up to the pageantry and athletic triumph of the 2008 Summer Olympics in Beijing, one troubling image predominated: air so polluted it looked like cumulonimbus had descended on the city. Thanks to a temporary government shutdown of some regional industries, along with severe restrictions on driving, air pollution decreased and cleaner skies arrived in time for the Games in August. But the pre-Olympic images remain as reminders of what James Fallows, writing in *The Atlantic Monthly*, has called "the environmental damage that is the most shocking side effect of China's economic miracle."

To help address the troubling environmental downside of China's economic boom, an anonymous donor has awarded Yale a $2 million dollar gift to help create an Asia Environment Fund at the Yale School of Forestry & Environmental Studies (F&ES). The fund will support research, policy, exchange and outreach efforts aimed at some of China's most pressing environmental problems. At the urgent center of that focus will be the crisis that is not only China's, or Asia's, but the entire world's—global warming.

"The enormous expansion of the human enterprise in Asia has brought us to the threshold of a new era in which environmental management must quickly emerge as a top priority of governments and citizens everywhere," said F&ES Dean Gus Speth. "The importance of focusing extensively on environmental issues as they relate to China cannot be overstated, both for the health of the Chinese people and the health of the planet."

In 2008, China moved past the United States as the single largest carbon dioxide emitter in the world, with coal consumption there soaring at a rate of 20% per year and reports of new coal-fired power plants going up at a rate of one every week or two. But power plant emissions are only a piece of a larger and still incompletely understood puzzle about the best way to address China's contribution to global warming.

"Farming is the single most important land use type in China, and it plays a huge role in the future trajectory of the Chinese greenhouse gas portfolio," says Xuhui Lee, Professor of Meteorology at F&ES.

With support from the fund, Lee's research team will expand studies aimed at finding the best ways to minimize climate change while sustaining food production. They will compare, for example, greenhouse gas emissions from traditional farming practices and those from industrialized approaches.

According to Lee, traditional ecological field studies—sampling soils and vegetation—will provide some answers. But although these methods can detect changes over longer periods of time—months or years—they cannot measure responses over shorter time frames, such as weeks or days or an event as brief as a rain shower. So Lee and his colleagues are deploying arrays of state-of-the-art instruments, including tunable diode laser analyzers. These devices can measure short-term changes not only in carbon dioxide, but also in methane and nitrous oxide, which are also greenhouse gases. The researchers have already deployed their analyzer arrays in fields of wheat, maize, cotton and soybeans on the plains of northern China, and they plan to add at least one additional array on a rice paddy, an agricultural landscape vital to Asian agriculture.

Marian Chertow (Ph.D. '00), Associate Professor of Industrial Environmental Management, is researching energy and resource use and exchange among companies located in large Chinese industrial parks. This work focuses on how diverse industries can better use and exchange energy, raw materials and water and process wastes in ways that provide both financial and environmental benefits. For instance, a refinery's sulfur waste might become raw material for an agricultural company's fertilizer. Or waste heat from a power plant might provide space heating for a nearby factory. Ideally, an entire network of industries can be linked for optimal benefits. The idea could be compared with the symbiosis and other mutual benefits that organisms enjoy in natural ecosystems, notes Chertow.

Anthony Leiserowitz, director of the Yale Project on Climate Change, points out that not only is booming China now the leader in carbon dioxide emissions, booming Asian neighbor India is fourth. Combined, he says, the two nations now generate one-quarter of all the world's carbon dioxide emissions, "a proportion," he says, "that is only projected to rise." (Second place United States, with a smaller population, still holds the dubious title of leader in per capita emissions.)

And yet, he notes, little is known about public perceptions about global warming among the 2.5 billion people in the two countries, including the degree to which the public understands the great risks—ranging from flooding from rising seas to agricultural damage from drought—that this global problem poses to their own nations. Nor is much known about the degree to which people in the two nations would favor government policies to address the global problem or be willing to make sacrifices themselves. To find answers, the Project on Climate Change plans to collaborate with local pollsters to conduct "large, nationally representative surveys" about global warming in both nations, the first of their kind, says Leiserowitz.

The Yale Center for Environmental Law & Policy will be compiling a subnational "Environmental Performance Index" (EPI) spe-

cifically tailored for China. Collaborating with Columbia University, the Center in 2008 issued the latest international EPI, which ranked the nations of the world based on how they scored on a wide range of environmental protection issues, from the provision of sanitary water to protection of agricultural land and biodiversity. Climate change-related issues constituted 25% of the total score. (Of 149 nations ranked, wealthy Switzerland, Norway and Sweden were on top; the African nations of Sierra Leone, Angola and Niger came out at the bottom. The United States was 39th and China was 105th.)

According to Christine Kim, project manager for the EPI, the analysis now under way for China will break down environmental performance province by province. One major thrust is to provide provincial and federal governments with information that can help them tailor environmental policies to fit specific needs.

"Different areas have somewhat different problems and can't employ the same solutions," says Kim. For example, she says that air pollution sources can differ widely from region to region. A performance index could guide strategies for allocating resources or for setting suitable air quality policies or emission regulations.

The donors who provided the gift at the core of the Asia Environment Fund said they were motivated in part by Yale's history of international exchange, education and "catalysis and influence." They cited the "opportunities for scholarship, learning and debate" in Yale's World Fellows Program, which brings young leaders from around the globe to the University. In that spirit, Xuhui Lee has developed a lecture series for the current academic year at Yale featuring Chinese environmental experts, who will explore environmental ramifications of their nation's economic boom, with a focus on carbon emissions, as well as on the protection of biodiversity and natural resources.

The fund has also provided three years of support for an environmental leadership education program that will bring political leaders and local officials to Yale for intensive study of urban planning and development. This project is administered by the Environment and Sustainable Development Leadership Program (ESDLP), a joint venture of F&ES and China's Tsinghua University.

In terms of public outreach, the new magazine *Yale Environment 360*, published online and aimed at an international audience, has been able to expand its coverage of China and Asia as a whole. The web magazine, which covers the gamut of environmental issues, got off to a rousing start with nearly 1.5 million "hits" in the first 11 weeks after its July 2008 launch.

By early September, the magazine had already published several articles focused on China. Correspondent Christina Larson, who is based part of the year in Beijing, had filed two of four reports focusing on Chinese environmentalists. Orville Schell, director of the Center on U.S.-China Relations at the Asia Society, had authored a detailed opinion piece, "The U.S. and China: Common Ground on Climate," on why the United States and China must become partners on global warming.

"Several of our articles have already been linked to or cited by Chinese web sites and publications," says editor Roger Cohn. And he notes that *Yale Environment 360* has established an ongoing relationship with the Chinese web publication *China Dialogue*, which has republished several *Yale Environment 360* pieces in both English and Mandarin.

"We're commissioning articles written by Chinese journalists as well," says Cohn. "*China Dialogue* will be acting as the intermediary, translating the articles into English and handling the journalists' interactions with editors here at Yale."

This sort of cooperation with Chinese and other Asian entities permeates the entire array of programs that will benefit from the fund. Chertow's industrial-symbiosis project, for instance, is being conducting in collaboration with China's Tsinghua University, National Center for Innovation Research on Circular Economy at Nankai University, as well as the National University of Singapore. The Chinese Academy of Environmental Planning is a key collaborator on the EPI project.

China expert Orville Schell's *Yale Environment 360* commentary on global warming highlights the urgency of just the sort of collaboration the new Asia Environment Fund is spurring. Of the United States and China, he writes: "The consequences of rapidly escalating emissions from both nations are now beginning to be increasingly evident in such phenomena as melting glaciers, changing weather patterns and the loss of Arctic sea ice. Whatever else may divide us, and there is much, we will be unable to escape the consequences of each other's actions on climate change."

YALE PEABODY MUSEUM OF NATURAL HISTORY

EVENTS

13TH ANNUAL CELEBRATION OF MARTIN LUTHER KING, JR. DAY

January 18 & 19, 2009

The Yale Peabody Museum's renowned two-day festival in honor of Dr. Martin Luther King, Jr., and his efforts to ensure environmental and social justice among all people.

FIESTA LATINA

March 14, 2009

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

SUSTAINABLE CHOICES

On view March 28 through August 23, 2009

This interactive exhibition encourages visitors to rethink the effect of their daily activities on Earth and its resources.

DARWIN: 150 YEARS OF EVOLUTIONARY THINKING

On view April 25 through August 23, 2009

The Peabody commemorates the occasion of the bicentenary of Charles Darwin's birth and the 150th anniversary of *The Origin of Species* with a new original exhibition that places Darwin in the context of his times—including the influence of his contemporaries at Yale, James Dwight Dana and Othniel Charles Marsh—and explores how Darwin's ideas, and the concept of natural selection in particular, continue to support critical discoveries by scientists today.

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

Peabody Senior Conservator Receives Archaeological Institute of America Award

Catherine Sease, Senior Conservator at the Yale Peabody Museum of Natural History, has received the Archaeological Institute of America's Conservation and Heritage Management Award for 2008. The Archaeological Institute of America is North America's oldest and largest organization devoted to archaeology. The award was presented at a ceremony at the 109th AIA Annual Meeting in Chicago last January.

The Conservation and Heritage Management Award is made to an individual or institution that has shown exceptional achievement in archaeological conservation. Catherine Sease is one of the world's leaders in the field of archaeological conservation and has worked on archaeological sites throughout the Mediterranean and Middle East. She is the author of *A Conservation Manual for the Field Archaeologist,* the most influential guide of its kind.

Sease received a Bachelor of Arts degree from Bryn Mawr College and a Bachelor of Science degree in conservation from the Institute of Archaeology, University College, London, where she also taught in the Conservation Department. She later held positions at the Metropolitan Museum of Art in New York and at the Field Museum of Natural History in Chicago. In 1995 she served as the first chair of the Conservation and Heritage Management Committee of the AIA. She has also been a consultant for the U.S. State Department, and was one of four specialists sent to Baghdad in October 2003 to assess the condition of Iraq's National Museum following the looting crisis there.

The Conservation Laboratory (*www.peabody.yale.edu/databases/cons/*) at the Yale Peabody Museum actively supports and promotes the Museum's mission to preserve and protect the collections entrusted to its care. Sease became the Peabody's Senior Conservator in 2000. Building on an earlier conservation plan, she has undertaken detailed condition surveys of the Museum's collections, laying the groundwork for a new long-range conservation plan. Current conservation projects include conserving and rehousing microscope slides in the Peabody's vertebrate and invertebrate zoology collections, supported by a grant from the Institute of Museum and Library Services, and the conservation of the Division of Paleobotany's five Zittel wall charts depicting paleobotanical landscapes in different geological periods, supported by a grant from the Peck Stacpoole Foundation. Sease is also involved in the move of some of the Peabody's collections to facilities at Yale's West Campus.

Students Explore the Geosciences with GEODES

By Jane Pickering, Assistant Director for Public Programs and Deputy Director

Jamie Alonzo (4)

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On June 17, 2008 the special exhibition *GeoWhiz: An Exploration of the Geosciences* opened at the Yale Peabody Museum. Curated, designed and fabricated by the New Haven high school students in the Peabody's EVOLUTIONS after school program, the exhibition is an introduction to topics in the earth sciences. *GeoWhiz* explains the subfields of geology, including vulcanology, planetary geology, paleontology and glaciology, using a mixture of illustrated panels, objects and specimens, hands-on activities and (occasionally) some interesting lighting effects! Designed to evoke a cave-like atmosphere, the exhibition is very popular with Museum visitors. A special part of each section includes an interview with a Yale faculty member on how he or she became a geologist.

The exhibition was the major end-of-year project for GEODES—Gearing Educational Opportunities toward Diversity in the Earth Sciences—a program run during the 2007–2008 academic year that, under the direction of principal investigator Derek Briggs, Frederick William Beinecke Professor of Geology & Geophysics, aimed to interest students in the geosciences. The GEODES program, funded by a grant from the National Science Foundation, was a collaboration between EVOLUTIONS and four Yale faculty: Associate Professor Ruth Blake, Professor Leo Hickey and Associate Professor Mark Pagani in the Yale Department of Geology & Geophysics, and Associate Professor of Ecosystem Ecology Peter Raymond in the Yale School of Forestry & Environmental Studies.

Some of the students had the opportunity to intern with these scientists in their Yale laboratories. Department of Geology & Geophysics graduate student Tom Hegna coordinated laboratory tours and conducted hands-on classroom demonstrations for the students on geologic dating, paleoecology and something called "ammonite bowling."

GeoWhiz: An Exploration of the Geosciences will be on view at the Peabody through early 2009.

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A. The finished *GeoWhiz* exhibit is on display at the Yale Peabody Museum through early 2009.

B. The display on glaciology explains what it takes to be a glaciologist.

C. The oceanography display showcases specimens from the Peabody collections.

D. EVO students gather in front of the *GeoWhiz* exhibition at the official opening. More than 100 guests were there!

Peabody Anthropology Division Receives Grant for Restoration of Samurai Collection

By Roger Colten, Senior Collections Manager, Division of Anthropology, and Robert G. Wheeler, Harold Hodgkinson Professor Emeritus Engineering and Applied Physics, Yale Department of Applied Physics

The Yale Peabody Museum's Division of Anthropology was recently awarded a $40,000 grant from the Rhodes and Leona B. Carpenter Foundation to support the restoration of the Museum's significant collection of Japanese samurai armor and weapons. The E. Rhodes and Leona B. Carpenter Foundation is a private foundation whose grant-making guidelines include support for Asian art.

The Japanese Collection in the Division of Anthropology is a large and varied collection of 2,500 objects that have rarely been on display. Ranging from ancient archaeological materials to 20th century lacquerware food serving sets, the holdings in the collections were donated to the Yale Peabody Museum mostly in the 19th century. The collection includes about 20 swords that range in quality from rare 15th-century blades made by known artisans to 19th-century specimens produced for the tourist trade. Seven of the swords are of outstanding quality and importance. Also in the collection are five different sets of armor and many other objects associated with the Japanese warrior class.

The samurai made up a hereditary ancient warrior class comprising about 6% of the male population. This group had evolved during the millennium of civil strife and civil war that preceded Japan becoming a nation state around 1600, when the Tokugawa shogunate prevailed and brought peace to the islands for the next 250 years. After Commodore Perry's opening of Japan to the West in 1854, vast changes occurred in the Japanese economy and society. New leadership after the political upheaval of 1868 adopted policies intending to westernize the country. The samurai were stripped of their status and hereditary stipend, and were no longer allowed to carry their twin swords. In the years that followed, American collectors sought items from "old Japan," made before 1868, and from "new Japan." This was a period of economic turmoil for the artisans who had serviced the samurai. Swords and sword accoutrements were no longer made and personal containers lost their utility in the adoption of western style dress. In response, they designed new wares of interest, as well as converting older items in imaginative ways, to appeal to Western visitors.

Most of the samurai materials in the Division's collection, especially the swords and lacquer-coated armor, are in desperate need of conservation and restoration. For proper treatment these objects will be sent to Japan, where specialized conservation is available. To assist in assessing the collections, the Peabody brought in Morihiro Ogawa, Special Consultant for Japanese Arms and Armor at the Metropolitan Museum of Art in New York. The restoration will take about one year. The Peabody will also purchase archival storage cabinets to properly house the objects.

This funding will not only preserve these rare and historically significant artistic objects for generations to come, but will provide expanded opportunities for scholars to study the Peabody's Japanese Collection. In time the Peabody hopes to produce an exhibition that will bring to public attention this little known portion of the Museum's anthropology treasures.

Robert G. Wheeler (7)

This one-handed, 29-inch sword (YPM 55519) from the collection has a shark skin handle and a wooden scabbard carved with black and white mosaic. It is signed Hoshu ju Fujiwara Masayuka and dates to the late 17th or early 18th century.

This 22-inch samurai sword has a sheath of lacquered wood. Dated 1861, it was made by Oshuju Nagamichi, who lived in Oshu (now Fukushima Prefecture).

This fine 16th-century sword is signed by Bishu Osafume Nori Mitsuj from the Ostfume school. Its edge is very sharp and hard, and the thicker part of the blade is very tough, so as not to break in use. The metallurgy of the steel is different in these two regions of the blade.

Designed for a horse rider and used by the Sakai family, this mid-18th-century samurai armor (YPM 13329) is distinguished by the attributes of its helmet. Its leather visor with stenciled cherry blossoms pierced with *toge* (spikes) and the applied sea urchin decoration make it probably unique among all Edo-period helmets. The stirrups are signed Kashu Ju Kunitsugu Saku. Othniel C. Marsh, nephew of George Peabody, acquired this armor in 1889 from one S. Morikami & Company, Denver, Colorado, for 32 dollars.
Photo: Harold Shapiro

Italianestro/Dreamstime.

Natural History...Natural Future:
Biodiversity and Sustainability at the Yale Peabody Museum

Susan Butts, Collections Manager, Division of Invertebrate Paleontology

The 12 million specimens in the Yale Peabody Museum's collections paint a picture of the diversity of life and changes in the environment over nearly two billion years of Earth's history—our oldest specimens are Precambrian algal structures in the Division of Paleobotany's holdings. Our collections are used by scientists to track the emergence and evolution of the millions of species that have inhabited our planet. Unfortunately, museums are sometimes a record of the extinction of species, but even this is an opportunity to determine the factors that led to extinction and learn from the past.

Part of the Peabody's mission is to teach about the incredible cultural and biological history of life on Earth. The Museum is well-positioned to educate the public on the importance of biodiversity, environmental change and sustainable practices that promote a healthy future for people and the planet. "Lobster Die-off!," a curriculum by the Peabody Fellows Biodiversity and Global Change Program developed for middle and high school students, discusses local biodiversity and the effects of changes in the environment in the context of the recent lobster die-off in Long Island Sound. The Yale Peabody Museum Education Department also offers curricula, workshops and seminars for educators on population ecology, ecosystems and energy conservation.

Jeff Ingraham

The periodical cicada *Magicicada septendecim*.

The Museum's annual events include celebrations of Earth Day and the *Dr. Martin Luther King, Jr.'s Legacy of Environmental and Social Justice* two-day festival. In the process of getting people excited about natural and cultural history, we hope to convince them of the importance of protecting our precious, limited natural resources—clean water, clean air and clean soil—for *all life*. With programs such as these we hope to encourage the citizens of Connecticut, and visitors from beyond, to appreciate the natural world and consider the effect their daily activities have on the environment.

So in keeping with our role as stewards and promoters of natural history, we at the Peabody have analyzed the efficiency of our own operations. The Peabody Museum building, opened in 1926, recently received a facelift to improve energy conservation. The original windows were replaced with double-glazed windows with thermal breaks, and all window air conditioners were removed. The building is now cooled by fan coils that use Yale's centrally produced chilled water system. Other improvements, such as motion-activated lighting and new roof insulation, help to reduce our energy use. The Peabody is also working with the Yale Office of Sustainability to participate in Yale's new shared-use bicycle program, which will provide a bicycle for use by staff for local work-related errands; this effort will cut down on fuel use, not to mention provide a refreshing break from New Haven's traffic congestion. The Peabody Graphics Lab and Construction Shop strive to use renewable and recyclable products when designing and building exhibits, and are gradually replacing incandescent bulbs with alternative, low-energy lighting options.

In April 2008 the Peabody participated in the Yale's Sustainability Summit with an event at the Museum. Several staff members gave presentations to inform and fire-up their colleagues about the concept of sustainability and the resources available to achieve sustainability within the workplace and at home. Building operations, strategies for reducing our carbon footprint, recycling, use of the Yale Shuttle and University carpooling incentives, using the University's purchasing web site to search for high recycled content paper and products, and local New Haven resources were among the topics covered. The presentations were followed by a group discussion about sustainability at the Peabody, Yale, and in the world.

To promote sustainability to a broader audience, the Yale Peabody Museum will host *Sustainable Choices* from March 28 to August 23, 2009. This interactive exhibition encourages visitors to rethink how they go about their daily activities and to realize their effect on Earth and its resources. It will also highlight Yale's many initiatives in this area.

Every 17 years, in late May or June, *Magicicada septendecim*, the periodical cicada, emerges from the ground for a frenzy of reproductive activity. The larvae eventually make their way into the soil for another 17 years of quiet. The Peabody's entomology collections document the 17-year cycle of the emergence of these broods starting in 1843. This precise locality data reveals an unfortunate pattern: the loss over time of local cicada sites to urban development.

Historical Scientific Instrument Blog Ranks in Top 20

Bill McDonald

Blogger Shae Trewin among the boxed scientific instruments being moved to Yale's West Campus.

Keeping up with trends in the museum world, the Division of Historical Scientific Instruments at the Yale Peabody Museum now has a blog! Begun by Collections Manager Shae Trewin in September 2007 and titled "Beyond the Basement" (*http://blogs.yale.edu/roller/page/HSI*), the blog is an experiment aimed at giving the collection a virtual presence and making it accessible in a format familiar to contemporary student culture. The blog is also designed not only to explain the resources of an instrument collection, but provide a unique insight into the activities and challenges of collection management.

Despite its small audience, "Beyond the Basement" was ranked number five in MuseumPods.com's Top 20 Best Museum and Educational Blogs of 2008 (*http://museumpods.blogspot.com/*). Coming in fifth behind the Victoria and Albert Museum blog and just ahead of the blog by Powerhouse Museum in Sydney is a surprising achievement considering both these museums have well-established reputations and extremely large visitor numbers. The blog's popularity may be attributable to the novelty of an instrument collection, along with Trewin's frank perspective on issues in the history of science and on dealing with the very different challenges posed by managing a collection of scientific instruments.

For the past six months, however, most of the blog's posts have been about the Division's move out to its new space at Yale's West Campus and how simple procedural tasks, like learning how to format a barcode, can spiral into week-long technological sagas or humorous events. Taking advantage of the popularity of books such as *Overheard at the Museum* by Judith Henry (St. Martin's Press, 2000), the blog also posts (nameless) quotes as overheard in the collections. These quotes give a glimpse of the working environment at the Yale Peabody Museum and sometimes provide needed humor, especially when moving collections. The blog also includes a regular "Instrument of the Week" feature, usually a historiographic or philosophical discussion of a particularly unusual object in the collection.

Visit *www.peabody.yale.edu/collections/hsi/* to learn about some of the approximately 2,000 items in the Yale Peabody Museum's Division of Historical Scientific Instruments.

Peabody Guide to *The Age of Reptiles* Receives NEMA Awards

The Yale Peabody Museum's guide to Rudolph Zallinger's *The Age of Reptiles* mural received awards for "Best in Show" and First Place in its category in the New England Museum Association's 2008 Publication Competition.

The full-color illustrated guide, *The Age of Reptiles: The Art and Science of Rudolph Zallinger's Great Dinosaur Mural at Yale,* describes the making of the mural and the animals and plants depicted in the 110-foot painting. The wire-bound book also includes a fold-out 63-inch full-color poster of *The Age of Reptiles.*

The New England Museum Association's annual Publication Awards Program recognizes excellence in design, production and effective communication in all aspects of museum publishing. Entries are judged by a panel experienced in publication, design, marketing and communications. This year there were 180 publications from 66 museums in 20 different categories.

The guide was designed by Maura Gianakos, Graphic Designer at Yale Printing & Publishing Services, and Sally H. Pallatto, Graphic Designer at the Yale Peabody Museum, with the assistance of Yale's Publishing Services Center. The guide's editor and project director was Peabody Publications Editor Rosemary Volpe.

The Age of Reptiles: The Art and Science of Rudolph Zallinger's Great Dinosaur Mural at Yale is available from The Museum Store at the Yale Peabody Museum by calling (203) 432-3740, or online at *www.peabodystore.com*. To listen to podcasts about *The Age of Reptiles* mural visit *www.peabody.yale.edu/explore/*.

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Scientific Art Display Aims to Educate and Inspire

A traveling exhibition of works illustrating the symbiotic relationship of members of the Class Insecta with the plants vital to their survival recently alighted at Yale's Class of 1954 Environmental Science Center. On view from June through October, the exhibition—*Butterflies, Moths & Pollinating Insects of the East Coast*—contains 42 giclée prints of paintings by 36 artists of the Greater New York Chapter of the Guild of Natural Science Illustrators. Each painting depicts all or part of the life cycle of a butterfly, moth or insect found on the East Coast—from egg to larva, to pupa or chrysalis, to adult —along with the host plant associated with each species and life stage. Every work is accompanied by an explanation of its subject written by the artist.

Many of the participating artists, including the show's curator, Mindy Lighthipe, have had their work featured in solo and group exhibitions in museums and galleries throughout the United States and abroad. These giclée prints, created with archival inks and printed on fine art paper, were produced from high resolution digital scans of the original watercolor, colored pencil, egg tempera, gouache and mixed media paintings. A slideshow of the exhibition and further information on the artists can be viewed online at *http://web.mac.com/mlighthipe/GNSI-GreaterNY/Exhibit.html.*

The Guild of Natural Science Illustrators (*www.gnsi.org*) is a professional nonprofit organization founded in 1969 at the Smithsonian Institution. Its mission is to encourage and maintain high standards of competence and professional ethics through education and to further the profession by assisting others interested in entering the field. Using tools ranging from pen and ink to digital drawing tablets, scientific illustrators deal with subjects ranging from anthropology to space exploration. Today the GNSI has grown to include illustrators and those interested in the field of natural science illustration in the United States, Canada, Europe and around the world. The work of Guild members can be seen at *www.science-art.com*.

The ESC is an ideal location to showcase works of natural history art and scientific illustration in the natural sciences. Future art shows are planned and the Yale Peabody Museum invites applications from artists willing to exhibit their work for up to six months.

For information and submission guidelines visit *www.peabody.yale.edu/collections/esc/esc_art.html.*

A. Cabbage White (*Pieris rapae*). © Lanis Monfried. Watercolor. Originally an African and Eurasian species introduced into Quebec Province in 1860, the Cabbage White is found in every part of North America. The larvae feed principally on members of the Brassicaceae family, which makes them unpalatable to birds, a reason that these butterflies are so prolific. This makes them unpopular with farmers, since many brassicas are food plants. The adults illustrated here are nectaring on blazing star (*Liatris spicata*). The larvae and a pupa are shown as observed on Tuscan kale (*Brassica oleracea*).

B. Cecropia Moth (*Hyalophora cecropia*) © Kathie Miranda. Watercolor. The adult Cecropia, a member of the Giant Silkworm family, does not have functioning mouthparts and does not feed. The caterpillar eats the foliage of many trees and shrubs, using nearby foliage to spin its complex "cocoon within a cocoon" double structure. This specimen was hand-reared on black cherry (*Prunus serotina*). It can vary its silk color to match the surrounding dried foliage or branches.

C. Red Spotted Admiral (*Limenitis arthemis astyanax*) © Jan Prentice. Egg tempera. The Red Spotted Admiral is one of two subspecies of *Limenitis arthemis*. The other is commonly called the White Admiral. These two butterflies are dissimilar and were once thought to be separate species, but they freely hybridize to produce fertile offspring. Shown here on a wild cherry (*Prunus serotina*), it also uses as host plants birches, willows or poplars. The caterpillar resembles a bird dropping, which makes it an unappetizing meal for a predator. The adult, while beautiful, mimics the Pipevine Swallowtail, which is distasteful and emetic to birds. It can be seen nectaring at flowers, but its preferred food source is aphid honeydew, carrion or dung.

D. Pipevine Swallowtail (*Battus philenor*) © Mindy Lighthipe. Watercolor. The Pipevine Swallowtail begins its life cycle as small batches of orange eggs on the underside of the leaves of the native Dutchman's Pipevine (*Aristolochia macrophylla*). The caterpillars feed in small groups when young, but are solitary when older. Both caterpillars and butterflies are unpalatable to predators and many other species mimic their appearance. To safely overwinter, the caterpillar wraps a silk thread (depicted here 22x actual size) around a twig for stability. Common in gardens, adults nectar on Honeysuckle (shown) as well as phlox, teasel, azaleas, lantana, petunias, verbenas, lupines and butterfly bush.

E. Question Mark (*Polygonia interrogationis*) © Beverly Simone. Watercolor. Female Question Mark butterflies lay eggs singly or stacked, not necessarily on the host plants, which include elms (*Ulmus* spp.), pictured, nettles and hackberries. Wing color differs between summer and winter forms, but both have a minute metallic question mark on the underside of the hind wing. Adults will nectar on milkweed (*Asclepias*), pictured, asters and clover if their preferred foods—dung, carrion, mud and rotting fruit—are unavailable. Males will perch during the afternoon, awaiting females, and will chase away other insects and even birds!

LEFT Ilia Underwing Moth (*Catocala ilia*) © Lauretta Jones. Watercolor. One of the most abundant of over 75 *Catocala* species in eastern North America, when disturbed, the moth flies off with a brilliant flash of its boldly patterned orange and black hindwings. The highly variable, cryptic coloration of its forewings disguises it against the trunk of its host plant, the oak (*Quercus* spp.). The final larval instar similarly has a camouflage pattern. This caterpillar also has a behavioral surprise: whipping violently from side to side, the larva may wriggle itself deep into leaf litter.

Patrick Sweeney

A

Peabody Partners with Zoo for Latest BioBlitz

By Patrick Sweeney, Collections Manager, Division of Botany, and Gregory Watkins-Colwell, Museum Assistant, Division of Vertebrate Zoology

A BioBlitz is a rapid, one-day biological inventory and outreach event that brings together scientists and the public.

A. ***Iris versicolor*** **growing in a Stratford cranberry bog.**

B. Students from Central High School in Bridgeport on a NOAA trawler surveyed for organisms living in Long Island Sound. From left to right: Christian Rivera, Tony Milites and Travis Johnson.

Erem Kazancioglu

B

Rosemary Volpe (5)


A


B


C


D


E

Imagine a scene in which passers-by are peering into microscopes to see rare invertebrates, are assisting scientists identifying biological specimens from nearby habitats, or are absorbed in educational biodiversity exhibits featuring live animals. All this happened during the second annual Stratford BioBlitz, held on May 30 and 31, 2008, organized by the Yale Peabody Museum of Natural History and Connecticut's Beardsley Zoo.

A BioBlitz is a rapid, one-day biological inventory and outreach event that brings together scientists and the public. These events have the dual goals of finding out what species occupy an area and educating people about conservation and ecological issues. The first Bioblitz was held in Washington, D.C., in 1996. Now scores of BioBlitz events are held each year in the United States and abroad.

During a BioBlitz researchers survey an area over a 24-hour period and attempt to tally all the species that are present in the habitats of that area. BioBlitz programs vary widely in their geographic focus and scope, as well in their degree of public outreach. Some may target a single 20-acre park, while others focus on all the habitats within a several-mile radius of a specific point, or even an entire town.

The 2008 Yale Peabody Museum–Connecticut's Beardsley Zoo BioBlitz focused on a broad set of organisms and diverse habitats throughout the town of Stratford, Connecticut. A team of scientists and high school students trawled for fish, algae and invertebrates in Long Island Sound, another group of scientists surveyed a forest for bats, and more high school students searched their school grounds for plants. Other groups surveyed beaches, a salt marsh, a cranberry bog, rivers, streams, ponds and a mixed hardwood forest for animals, plants and fungi.

Unlike last year's event, which was conducted in cold, driving rain, the 2008 Stratford BioBlitz was held under mostly sunny skies, and the level of participation and number of species found reflected this. More than 50 scientists from 14 institutions and dozens of students recorded 914 species, substantially more than the 637 recorded in 2007. Notable finds this year include: a rare water scorpion; an isopod that has not been reported in over 50 years; a federally listed bird, the piping plover; and two state listed species, the eastern box turtle and the eastern prickly pear cactus.

In addition to survey activities, a variety of educational and outreach activities were organized for the public. Visitors learned about invertebrate collecting at Short Beach, and at Roosevelt Forest there was a bird banding demonstration and a bug walk. Connecticut's Beardsley Zoo in Bridgeport hosted various demonstrations, educational displays and children's activities. As the BioBitz "base camp," the zoo also provided visitors the opportunity to talk with scientists and to observe them sort and identify the species being brought in by the BioBlitz teams.

Mark your calendars for next year's Stratford BioBlitz, to be held this time in the summer. While most BioBlitz programs occur in only a single season, or survey a different place during the same month every year, the Yale Peabody Museum and Connecticut's Beardsley Zoo plan to survey the same area in all four seasons. This will enable us to gain a more complete picture of the biodiversity of the Stratford site and a more complete understanding of how its biodiversity changes through the seasons.

For more information and to see photographs of past Stratford BioBlitz activities, visit *www.peabody.yale.edu/explore/bioblitz/*.

A. Visitors to the zoo get an explanation of the teams' finds from volunteer Walt Rode.

B. Entomology group members Gen Tauxe (left) and Anna Johnson (right) examine samples of aquatic insects.

C. Botany Collections Manager Patrick Sweeney presses fresh plant material for later processing at the Peabody.

D. Terry Stoleson of the Connecticut Valley Mycological Society creates labels for materials already identified.

E. Peabody entomologist Larry Gall identifies specimens brought in from the field.

Peabody Undergraduate Summer Internships: Student Reports

Each summer the Yale Peabody Museum funds undergraduate students in semi-independent research projects in the Peabody's diverse collections. Working with a mentor, interns participate in the rich variety of research taking place in the Yale Science Hill community and are required to submit an essay on their research experience. Interns may work with a host scientist as part of an ongoing research program, or may choose to design a project that investigates a topic of interest.

In 2008, Collections Manager Walter Joyce in the Peabody's Division of Vertebrate Paleontology hosted Ariel Revan (Yale '11). Amanda Feuerstein (Yale '09) worked in the Division of Invertebrate Zoology with Senior Collections Manager Eric Lazo-Wasem. Robert Tunney (Yale '11) worked in the lab of Assistant Curator of Entomology and Assistant Professor Antónia Monteiro of Yale's Department of Ecology & Evolutionary Biology. Jordan Garner (Yale '09) interned with Assistant Professor Thomas J. Near, Department of Ecology & Evolutionary Biology, and Assistant Curator in the Peabody's Division of Vertebrate Zoology.

Sea Turtle Conservation and the Life History of Barnacle Settlers

By Amanda Feuerstein (Yale '09)

Alejandro Peña

A

Amanda Feuerstein (3)

B

C

D

A. Amanda with an average-sized female Olive Ridley sea turtle just after nesting.

B. Epibionts, organisms that live on a host animal, are visible on the shell of this nesting Olive Ridley sea turtle.

C. View of the Careyes shore from the field station.

D. Measuring the shell width of a nesting Olive Ridley sea turtle.

My research this summer focused on the life history of the barnacle species, *Stomatolepas praegustator*, which settles primarily on the Olive Ridley sea turtle, *Lepidochelys olivacea*. This project involved the collection and morphological analysis of *S. praegustator* specimens from the shells of nesting *L. olivacea*. The first four weeks of my project were devoted to the in-depth study of barnacle morphology under the supervision of Senior Collections Manager Eric Lazo-Wasem in the Division of Invertebrate Zoology at the Yale Peabody Museum.

My project then brought me to the Jalisco coast of Mexico, which borders the Pacific Ocean. Each night I searched the beach for nesting turtles, collecting the barnacles and other epibionts from their shells and skin. I observed that the attachment of *S. praegustator* is looser than the scientific literature or other collectors suggest. This may imply that the barnacles found on the Jalisco coast are actually a different species than the barnacles seen in Japan or Hawaii. I will be morphologically and genetically analyzing specimens from all locations to determine whether they are a different species or have morphologically diverged.

In Mexico, I also worked with the highly successful private group Sea Turtle Conservation Project. Over the 25 years of the project, the beach in this area has seen a rapid increase in sea turtle nesting population, from 11 turtles in 1983 to over 800 turtles in 2008. This species is less endangered than it was 25 years ago, thanks in large part to conservation projects like this along the Pacific coast of Mexico. On the beach volunteers dig up turtle nests and rescue and replant the eggs so that they are not found and destroyed by predators and human poachers. After 45 days, the eggs hatch and the turtle hatchlings can safely make their way to the sea.

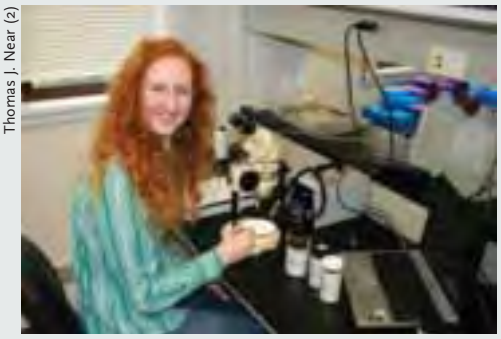
My next step will be to use my training in *S. praegustator* morphology to further investigate settlement patterns. By mapping the locations of barnacle settlement and turtle plate shell morphology I will be able to understand the differences between these barnacles and those collected in other Pacific Ocean locations. In Mexico, I assisted Eric Lazo-Wasem and Dr. Theodora Pinou, Assistant Professor of Biological and Environmental Sciences at Western Connecticut State University and a

curatorial affiliate in vertebrate zoology at the Peabody, on a project to attach satellite tags to the shells of five different turtles. These tags will transmit the location of the turtles for five months. This information is of interest because *S. praegustator*'s migratory pattern is unique; most barnacles simply settle on rocks or boats with erratic behavioral tendencies. Understanding this species as a migratory population could possibly explain some of the morphological plasticity witnessed in populations in Mexico, Japan and Hawaii. Perhaps the exposure to varied environments has enhanced this species' tendency to evolve, which would explain any differences I may find in my research.

Molecular Phylogeny Uncovers Morphological Diversity in *Etheostoma basilare*

By Jordan Garner (Yale '09)

Thomas J. Near (2)



A

B

A. Jordan Garner collecting data from darter specimens in Dr. Near's lab.

B. A male *Etheostoma basilare* (YPM 16751) in nuptial coloration. The standard length of the specimen, from Scott Creek in Warren County, Tennessee, is less than two inches (48 mm).

For the past two summers, the Yale Peabody Museum's undergraduate internship program has provided me with the opportunity to conduct research in Dr. Thomas Near's evolutionary ichthyology laboratory. This summer, I investigated morphological diversity within the cryptic species complex of *Etheostoma basilare*, a North American darter species endemic to the river system of the Caney Fork River, a tributary of the Cumberland River in Tennessee.

Previously thought to be a single species with minimal intraspecific variation, Dr. Near and Phillip Hollingsworth of the University of Tennessee have recently discovered through molecular phylogenetic analysis that *E. basilare* comprises five strongly supported clades that have very ancient divergence times. They also found that each of these clades is restricted to one of five tributaries of the Caney Fork River. Because the Caney Fork River is a very small river system of approximately 800 square miles (about 2,000 square kilometers), Hollingsworth and Near's study shows that allopatric speciation in North American freshwater fishes can occur at a much finer scale than formerly realized (such microendemic patterns were thought to be more characteristic of the tropics).

Using these phylogenetic findings as a guide, I looked for previously undiscovered morphological variation in *E. basilare,* specifically investigating whether morphological variation existed between the five Caney Fork tributary-endemic clades. After examining over 100 specimens from the ichthyology collections of the Peabody's Division of Vertebrate Zoology, I discovered substantial differences between the clades in characters traditionally used to describe and diagnose fish species, such as fin ray and scale counts. I still have a few specimens to examine, but on the basis of my findings thus far and the phylogenetic analysis done by Hollingsworth and Near, Dr. Near and I are planning to describe four new species from the species complex.

The two most interesting implications of my research are, first, that microendemism at extremely small spatial scales is diagnosable not only at the molecular level, but can be recognized at a phenotypic level as well. Second, morphological disparity is still the common standard for distinguishing species from one another and is still widely held to be necessary for species description. It is very uncommon for species to be described solely on the basis of molecular differences. My research shows, however, that morphological differences can be impossible to discover without the knowledge of molecular differences revealed by phylogenetic analysis. In 2003, a study of Barcheek darters was done that included a morphological analysis of *E. basilare* (L. M. Page, M. Hardman and T. J. Near, "Phylogenetic relationships of barcheek darters (Percidae: *Etheostoma,* Subgenus *Catonotus*) with descriptions of two new species," *Copeia* 2003(3):512-530). These authors found some marginal morphological variation within the species, but without the phylogeny available from the Hollingsworth and Near study analysis they were unable to detect morphological disparity between each of the five tributary-endemic lineages. The case of *E. basilare* shows that molecular phylogenies provide an indispensable tool for the discovery of phenotypic diversity and for the continued description of Earth's biodiversity.

From the Lab to the Field

By Ariel Revan (Yale '11)

Aleck Zhou

A

Alison Logan (2)

B

C

Ariel Revan

D

Walter Joyce

E

A. Taking a break at a site visited near the end of the trip.

B. The weathered remains of a large dinosaur, including several vertebrae, protrude from the bottom of a butte.

C. Looking for traces of bone on the side of a butte while prospecting a large section of land in Montana.

D. Storm clouds approaching the prospecting site bring distant thunder and rain.

E. Digging a near-complete fossil turtle out of the "Turtle Quarry," a fossiliferous butte that yielded several specimens, with Alison Logan.

This summer I had the opportunity to work as an intern in the Division of Vertebrate Paleontology at the Yale Peabody Museum, where I had a job as student collections assistant during my freshman year. I worked on an ongoing organizational project under Collections Manager Dr. Walter Joyce during the school year and applied for a Peabody Undergraduate Summer Internship with Dr. Joyce as my advisor. I proposed a research project involving the description of an unidentified fossil turtle, which might represent a new species, as well as a month of fieldwork in North Dakota and Montana. During my internship, which lasted from late May and to mid-August, I worked for about seven weeks on my descriptive paper of the new species of trionychid (soft-shelled) turtle and spent about four weeks in the field collecting fossils. This multifaceted experience exposed me to many aspects of a career in paleontology and gave me a solid foundation of research skills and basic field experience.

The premise of my project was to compose a scientific description of the fossil trionychid specimen number YPM-PU 16795, which had not been assigned to the proper genus and species. Because of novel features of the shell, this specimen could be an entirely new species of Paleocene turtle. My job was to conduct a detailed study of the features of the specimen itself, including photographs, illustrations, measurements and a descriptive paper. It was also necessary to compare my specimen with every other established species in the same genus and time period. To achieve this, I had to compile data and photographs of the type specimens for these other species.

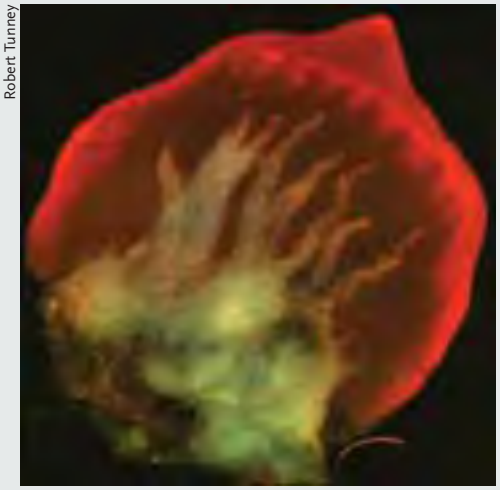
The part of my internship that taught me the most about myself and about my field of interest was the four-week expedition to the badlands of North Dakota and Montana. I have wanted to be a paleontologist since I was a child, and I have visited some sites where fossils can be easily collected, but I never had a true field experience until this trip. We drove out to North Dakota from New Haven, and after three days on the road arrived at the four-room house in the town of Marmarth, North Dakota, which would serve as home base for the next month. The town is near the Montana border of North Dakota and has a steady population of about 100 residents. In the summer the population rises to accommodate fossil hunters such as ourselves, who often make yearly pilgrimages to the same fossiliferous areas of the country.

There were eight members on the field team, all from different backgrounds and with different areas of expertise. I got to know a lot about the other members of the team throughout the trip, and they graciously shared everything from funny anecdotes of their previous field expeditions to helpful advice for getting into graduate school. Meeting a group of people who were so diverse and dedicated to their jobs and research affirmed my desire to follow my passion and become a paleontologist. I got to experience the thrill and awe that comes from prying a piece of bone out of the side of a butte and knowing that it belonged to an animal that ran around over 65 million years ago. I hiked more than I ever have in my life, learned what an angry rattlesnake sounds like, and came into contact with breathtaking landscapes and people that were as alien to me as I was to them. I grew up in Brooklyn, New York, where people never have to stop their cars to allow cattle to cross the road, and where the closest you come to seeing stars is the light of the Brooklyn Bridge at night. Life in the field was not easy for me to adjust to, but I think that the difficulties and differences made it the most important part of my internship. The experience helped me grow not only as a paleontologist, but also as a person.

The Developmental Evolution of Eyespots in Nymphalid Butterflies

By Robert Tunney (Yale '11)

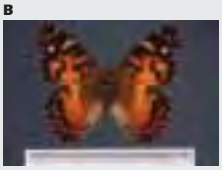
Robert Tunney



A

Yale Peabody Museum (3)

B



C

D

A. An assay for the distal-less gene, using anti-distal-less antibodies and red fluorescent secondary antibodies. Distal-less is clearly expressed in the margin of the developing wing and the chevrons (triangular regions) on the margin of the wing.

Nymphalid specimens in the Peabody entomology collection
B. *Vanessa atalanta* (YPM 408456)
C. *V. cardui* (YPM 412955)
D. *V. virginiensis* (YPM 409027).

This summer, as an intern at the Yale Peabody Museum, I conducted my first scientific research project as a Yale undergraduate. A sophomore majoring in the Department of Molecular, Cellular and Developmental Biology, I was able to work in the lab of Assistant Professor Antónia Monteiro. The Monteiro lab studies the evolution and development of wing patterns in butterflies, specifically in pierid butterflies, African satyrs in the genus *Bicyclus*, and saturniid moths.

I had unknowingly been a part of the lab's research program for quite a while. In the fall semester of last year, I worked for the Peabody's Division of Entomology helping to organize the nymphalid collection and enter data into the Museum's electronic catalog. This work, funded by Dr. Monteiro's lab, supported the lab's overall research program. The family Nymphalidae displays an extraordinary diversity in wing patterns, particularly for eyespots, which are the concentric circles of color along the margin of a butterfly wing. Much of the lab's work involves exploration of the genesis of this diversity in a developmental and evolutionary context.

My first task was to generate a list of all the species of Macrolepidoptera, or large butterflies and moths, in the Museum's entomology collection. For three weeks I sorted through the collection and listed each represented species. This information was compiled by my supervisor Dr. Larry Gall, Entomology Informatics Manager, and we discovered that the Peabody had over 1,100 different species of Macrolepidoptera. This information was used to support a grant proposal for the Monteiro lab for a project to create high quality digital photographs of representatives of each Lepidoptera species in the Peabody's collections.

I intermittently pursued a research project of my own, examining the expression of four candidate genes thought to be involved in the genesis of nymphalid eyespots. I raised 30 larvae of *Vanessa cardui* (common name: Painted Lady) to the fifth instar, the stage just before pupation. At this point I dissected the developing wing disks from the larvae and used a standard protocol to perform antibody stainings for the candidates Notch, Distal-less, Engrailed and Spalt. Using fluorescent secondary antibodies, I was able to see the spatial expression of these candidates in the fifth instar larval wings with a fluorescent microscope. I examined the presence and absence of these candidates in the larval wing cells, comparing them to adult phenotypes, and contributed the data I produced to the lab's collection of similar stainings.

Finally, I began a survey of some of the nymphalid species in the Yale Peabody Museum's collections and photographed representatives of the range of eyespot expression within each species. I took dorsal and ventral digital photographs of both sexes, which were then uploaded into the Museum's electronic catalog and associated with the entries for each specimen. These photographs will help the Monteiro lab and other researchers investigate the changes in wing pattern morphology in related species and to map these changes onto established phylogenetic trees.

I would like to thank the Yale Peabody Museum, Dr. Monteiro, Dr. Larry Gall, Peabody Director of Informatics Bill Piel, and all the members of the Monteiro lab, particularly Katy Prudic, Jeff Oliver and Andrew Stoehr, for helping me along in my research experience. This summer was invaluable in directing my scientific ambitions.

BASS SCHOLARS

Peabody Biologist Rediscovers Rare Fairy Shrimp

Fairy shrimp are small, graceful, pastel-colored crustaceans found in temporary freshwater ponds. Up to a half-inch (1.25 cm) long or longer, their distinctive forked tail can be seen by the naked eye. But one species, *Eubranchipus holmani*, had not been seen in Connecticut for five decades, until rediscovered this past spring by the Yale Peabody Museum's Eric A. Lazo-Wasem, Senior Collections Manager in the Division of Invertebrate Zoology.

Lazo-Wasem and Museum Assistant Daniel Drew found the rare invertebrate among a sample of the more common *Eubranchipus vernalis* collected from a vernal pool in an undisturbed area alongside a road in Groton, and will be reporting their discovery in the *Bulletin of the Peabody Museum of Natural History* this spring. Vernal pools are temporary shallow ponds that form in spring. Unique habitats for a set of species adapted to breed in these seasonal environments, such as invertebrates and amphibians, vernal pools are vital to the success of such species and often provide clues to the health of local wetland ecosystems. Discoveries like this one provide opportunities for further research and highlight the importance of local regulations enacted for the protection of wetlands.

Now that *Eubranchipus holmani* is part of the Peabody's invertebrate zoology collections, a criterion lacking before its rediscovery, the species can qualify for special state protection. Lazo-Wasem, a member of the Connecticut's Endangered Species Review Committee, hopes to have this rare fairy shrimp listed as an endangered species.

Eric Lazo-Wasem

***Eubranchipus holmani* (YPM 43015).**

PROFESSOR MICHAEL BENTON NAMED BASS DISTINGUISHED VISITING SCHOLAR

Yale Institute for Biospheric Studies (YIBS) Director Jeffrey Park is pleased to announce the appointment of Professor Michael J. Benton as an Edward P. Bass Distinguished Visiting Environmental Scholar during March, April and May of 2009. Professor Benton, who will reside in the Department of Geology & Geophysics, is a professor of vertebrate palaeontology in the Department of Earth Sciences at the University of Bristol. He also is head of the joint School of Geology and Biology, Head of the MSc in Palaeobiology, Outreach co-ordinator, and is a Fellow of the Royal Society of Edinburgh. His published work, some 200 papers in refereed journals, covers a broad range of paleobiological themes, from detailed descriptions of Triassic reptiles to overviews of the diversification of life through time, major extinction events, and the best ways to date the tree of life.

Professor Benton's interests include the diversification of life through time, quality of the fossil record, shapes of phylogenies, age-clade congruence, mass extinctions, Triassic ecosystem evolution, basal diapsid phylogeny, basal archosaurs and the origin of the dinosaurs. His current research projects focus on the end-Permian mass extinction, the greatest mass extinction of all time, and especially its effects on terrestrial organisms. This involves fieldwork in Russia. He is also working on large-scale aspects of dating the tree of life, and the use of phylogenetic means to assess the quality of the rock and fossil records. His third current project is to use novel numerical approaches to explore the origin and radiation of major clades, offering possible insights into the origins of biodiversity and the role of novelties in driving diversification.

PROFESSOR DAVID BEERLING SERVING AS THE EDWARD P. BASS DISTINGUISHED ENVIRONMENTAL SCHOLAR

Jeffrey Park, Director of the Yale Institute for Biospheric Studies (YIBS) is pleased to announce the appointment of Professor David Beerling of Sheffield University as an Edward P. Bass Distinguished Visiting Environmental Scholar during the Fall of 2008 and Winter/Spring of 2009. Professor Beerling is residing in the Department of Geology & Geophysics, and is at Yale in October, November and December of 2008 and January, February and March in 2009.

Following a Royal Society University Fellowship in Sheffield (1994–2002), Professor Beerling was appointed to a personal chair in 2002 and leads a major innovative interdisciplinary research group with a prominent international reputation for addressing fundamental questions concerning the co-evolution of plants and the Earth system over the Phanerozoic (past 540 Myr). This group's goal is always to elucidate process-based understanding of the evolution of plants and their feedbacks on climate, global biogeochemical cycles and atmospheric chemistry. They utilize an integrated research framework that includes experimental studies with extant plants, geochemical and morphological analyses of fossil materials, and theoretical modeling of biological and physical systems. Experimental investigations allow separation of correlation from coincidence and identification of mechanistic function that deepen the interpretation of the fossil record. Theoretical models are recognized as critical scientific tools for scaling up observations, in space and time, to investigate their broader implications for the Earth system. The group has a particular emphasis on the nature of biotic feedbacks on biogeochemical cycling of

Professor Benton also leads the Palaeobiology and Biodiversity Research Group (PBRG) at Bristol, which uses the fossil record to study the history of life and how ancient organisms lived. The Bristol group consists of eight faculty members, five postdocs and fellows, twenty doctoral students, and twenty masters students. A key focus is on the tree of life, establishing its shape and calibration against geological time scales. They also work on mass extinctions, diversifications, and the links between taxic and morphological change through time in a range of organisms, from foraminifera to fishes, pteridosperms to pterosaurs. Establishing links between the shape of the history of life and climatic and environmental change is another key field.

The group has pioneered many research and educational initiatives. The Bristol Dinosaur Project focuses research on the Late Triassic prosauropod dinosaur *Thecodontosaurus*, the oldest plant-eating dinosaur. The work is yielding new information on the early evolution of dinosaurs, and it is the subject of a major open-access educational initiative.

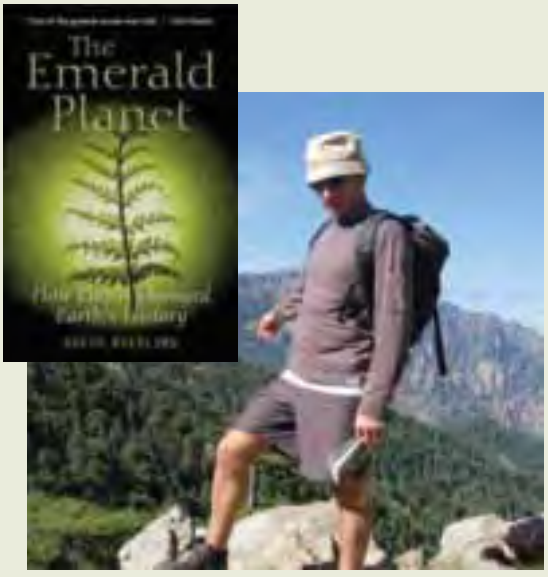
A further key focus is on the origin of major animal groups in the Precambrian and Cambrian—to determine the interaction of palaeontological with molecular and developmental data. Several students and staff work on trace fossils, ancient tracks and burrows, as evidence of ancient behavior. Others work on the history of biodiversity, the tree of life, mass extinctions, and the relationship between evolution and animal development.

Michael Benton is the author of several palaeontology textbooks (*Vertebrate Palaeontology*) and children's books, and has also advised on many media productions, including *Walking with Dinosaurs*, a six-part television series produced by the BBC, and narrated by Kenneth Branagh, that first aired in the United Kingdom in 1999. The series was subsequently aired in North America on the Discovery Channel, narrated by Avery Brooks. The series used computer-generated imagery and animatronics to recreate the life of the Mesozoic, showing dinosaurs in a way that previously had only been seen in feature films. The series used paleontologists such as Peter Dodson, Peter Larson and James Farlow as advisors; their influence in the filming process can be seen in the documentary *Walking with Dinosaurs—The Making Of* (*http://uk.youtube.com/watch?v=X5yN8f2gpcY*). At the time, many paleontologists complained about inaccuracies, but Benton and others have argued this was a well-researched series that helped bring ancient life to the widest possible audience.

carbon and the chemistry of the atmosphere, and their portfolio of research activities has received funding to date in excess of £3.5 million from the Natural Environment Research Council, with additional support from the European Union, the Leverhulme Trust, the Gatsby Foundation and other charitable organizations.

Professor Beerling has published over 160 scientific journal publications, two books, and serves on several international advisory committees and editorial boards of leading international journals, including *Geobiology* (subject editor), *PLoS ONE* and *New Phytologist*. Recent keynote lectures at international meetings and universities in the United Kingdom include: Gordon Research Conferences (keynotes in 2004 [USA], 2006 [Italy]), Eight Annual Venn Lecture, Hull University, Tskuba University, Tokyo, Southampton University, School of Geosciences University of Newcastle and University of Edinburgh, University of Oxford and University of Cambridge.

He is regularly invited to present public science lectures, including the Hay Literary Festival (2007, 2008), Edinburgh International Science Festival, and the Cosmo-Caxia lecture at the Natural History Museum, Barcelona. He has written extensively about his research on the co-evolution of plants and climate for non-specialist audiences, notably in his popular science book, *The Emerald Planet* (Oxford University Press) and occasionally for the Times Higher Education Supplement.



POSTDOCTORAL APPOINTMENTS


BRANDLEY


DODD


GILBERT


LIN


VECITIS

GAYLORD DONNELLEY AND YIBS POSTDOCTORAL ENVIRONMENTAL FELLOWSHIPS

Jeffrey Park, Director of the Yale Institute for Biospheric Studies (YIBS) is pleased announce the appointment of five environmental postdoctoral associates:

Dr. Matthew Brandley is serving as a Gaylord Donnelley Environmental Postdoctoral Associate in the Department of Ecology & Evolutionary. Dr. Brandley received his Ph.D. from the University of California, Berkeley, in integrative biology and is working with Professor Thomas Near in the Department of Ecology & Evolutionary Biology (EEB). His work has been directed towards understanding the interaction of divergent datasets in phylogenetic analyses (data partitioning), resolving species relationships for specific clades of lizards and snakes, and investigating patterns of limb loss and reduction in lizards. This work has resulted in "high impact" publications and his work on phylogenetic data partitioning strategies has generated attention from the scientific media. As a Donnelley Postdoctoral Associate in EEB, Matthew will investigate the evolutionary diversity of limb reduction and loss in lizards by bringing together broad and fine-scale phylogenetic patterns with developmental genetics and an attempt to further investigate the ecological context of this repeated phenomena.

Dr. Michael Dodd is serving as a Gaylord Donnelley Environmental Postdoctoral Associate in the Department of Chemical Engineering. Dr. Dodd received his Ph.D. in Environmental Chemistry from the Swiss Federal Institute of Technology-Zurich and will be working with Professor William Mitch. His research will address the global significance of marine DOM (Dissolved Organic Matter) processing by reactive halogen species (RHS) generated during penetration of solar radiation into the ocean surface. Several major objectives of this work are to identify and characterize mechanisms of RHS generation following photo-excitation of marine organic matter, to investigate kinetics and mechanisms of consequent photo-bleaching and possible halogen incorporation by organic matter, as well as to assess the effects of DOM reactions with RHS on the bioavailability of organic carbon. Ultimately, it is anticipated that this work may provide a number of important insights into the role of photochemically generated RHS in global oceanic carbon cycling.

Dr. Christopher Gilbert is serving as a Gaylord Donnelley Environmental Postdoctoral Associate in the Department of Anthropology. Dr. Gilbert received his Ph.D. from Stony Brook University in Anthropological Sciences and will be working jointly with professors Andrew Hill and Eric Sargis in the Department of Anthropology. Dr. Gilbert's dissertation was on the systematics and biogeography of African papionin primates (baboons and mangabeys), a group that includes monkeys of markedly different body size. Prior to his study, results from morphological phylogenetic analyses were not congruent with those from molecular studies. To assess the phylogenetic relationships of these taxa, Chris compiled the largest morphological data set (more than 150 craniodental characters) known for this group. He also developed a new methodology for coding characters influenced by body size, a narrow allometric approach (published in *PNAS*). When he employed this novel method for coding characters, his morphological phylogenetic analysis produced a tree that was congruent with the molecular phylogenetic tree. This demonstrated that properly scrutinized morphological data can be reliable in phylogenetic analyses, which is a critical conclusion for studies of fossil taxa. In his research at Yale, Chris will work on paleoenvironments and the biodiversity, biogeography, and phylogenetic history of the African cercopithecoid monkeys, including the newly discovered and highly endangered "Kipunji" monkey from Tanzania.

Dr. Alexander Jih-Pai Lin is serving as a YIBS Environmental Postdoctoral Associate in the Department of Geology & Geophysics. Dr. Lin received his Ph.D. from Ohio State University in Geology and will be working with Professor Derek E.G. Briggs in the Department of Geology & Geophysics. Dr. Lin is a paleobiologist interested in the Cambrian explosion, particularly the remarkably preserved Middle Cambrian biotas of southern China and their relationship to Burgess Shale type (BST) faunas from elsewhere. While at Yale, Dr. Lin is investigating the spatial and temporal distribution of BST deposits in South China to determine how BST fossils from various localities are preserved, and to interpret the ecology of these faunas and their importance to our understanding of early Paleozoic marine life. His focus on the Cambrian and on exceptional preservation will complement activities in the Invertebrate Paleontology Division of the Yale Peabody Museum of Natural History, as well as those of graduate students and other postdocs in the lab of Professor Briggs.

Yale Undergraduates Conduct Summer Environmental Projects on Five Continents

Jonathan Russell (2)

A

By Debbie Broadwater, Program Manager for the Environmental Studies Program

B

During the summer of 2008, the Environmental Studies Program (EVST) supported 25 Yale College students investigating environmental questions at Yale, in the United States and abroad through its Environmental Fellowship Program. Student projects included training and real-world experience in independent research and study that was supervised by an adviser, worked with environmental nongovernmental organizations, and worked with governmental agencies. We also assisted several students in establishing working relations with mentors on site where they were interning. This year's recipients included sixteen juniors, six sophomores, and three freshmen, and represented majors in Anthropology, Biomedical Engineering, Chemistry, Ecology & Evolutionary Biology, Environmental Engineering, Environmental Studies, Molecular, Cellular & Developmental Biology, and Physics.

The EVST faculty committee that administered the fellowship program was chaired by Mary Helen Goldsmith, Professor Emerita in the Department of Molecular, Cellular & Developmental Biology and at the School of Forestry & Environmental Studies, and included professors John Wargo, Jeffrey Park, David Post, and Harvey Weiss. The Environmental Fellowship Program receives generous support from EVST through endowments from the William Bingham Foundation and the Montgomery Family Fund, as well as from the Department of Ecology & Evolutionary Biology.

These are this year's participants and their projects.

A. An avocado-like seed produced by the Calade tree. We grew these in nurseries and then transplanted them to neighboring farms.

B. A pod growing on the trunk of the tree. When ripe the pods can be as large as a football.

NORTH AMERICA

Berkley Adrio ('09) spent eight weeks interning with the Bureau of Land Management (BLM) "Seeds of Success" (SOS) program at their national office in Washington, D.C. The SOS program strives to increase the number of native plants available to buyers, particularly for use in restoration of BLM lands in the western United States, and this summer Berkley worked with Peggy Olwell, Plant Conservation Program Lead, to evaluate SOS, research other programs with similar goals, and finally, to consolidate, organize, and analyze annual seed buy data. This summer's work at the BLM provides the basis for her senior essay.

Katherine Boronow ('09) conducted research to determine whether native species evolved to have an increased tolerance following exposure to toxins by invasive species by investigating the invasive fire ants and native fence lizards system. Red imported fire ants, *Solenopsis invicta*, were introduced to North America in the early 1930s through Port Mobile, Alabama, and are an economic, ecological, and public health concern. Fire ant venom acts on the

Chad Vecitis was awarded a YIBS Environmental Postdoctoral Fellowship and will work in the Department of Environmental Engineering with Professor Menachem Elimelech when he receives his Ph.D. from the California Institute of Technology (Caltech) in December 2008. In his dissertation, Chad deals with several aspects of environmental chemistry, including heterogeneous marine aerosol chemistry, photo-driven electrochemical water splitting for hydrogen production, and remediation of aqueous fluorochemicals. His work has resulted in several important journal publications. While at Yale, Vecitis will work on the anti-microbial activity of single-walled carbon nanotubes, specifically investigating cell membrane-stress mediated toxicity.

profile

A

B

C

Katherine Boronow

A. A male fence lizard

B. a male fence lizard basking on a tree in Andalusia, Alabama.

C. Measuring the bite force of a male fence lizard.

profile

Kevin Currey

Prudhoe Bay, Alaska.

neuromuscular system and is used in mound defense and prey capture. One vertebrate that co-occurs with the fire ant across its invasive range is the eastern fence lizard, *Sceloporus undulatus*. Fire ants and fence lizards share similar habitats and often encounter each other during foraging. Katherine conducted field research in Marianna, Arkansas (not yet invaded), and Andalusia, Alabama (invaded 70 years ago), and analyzed her data at Pennsylvania State University. She examined whether fence lizards are evolving physiological mechanisms of tolerance by characterizing the whole-body and cellular consequences of fire ant venom in two populations of lizards with different invasion histories.

Kevin Currey ('09) chose to investigate the social process surrounding the dispute over the 4.6 million acre northeast section of the National Petroleum Reserve-Alaska's (NPR-A) management, and the decision process used by the federal government to allow NPR-A oil and gas development. Kevin interviewed over 40 people involved with the NPR-A policy dispute, which included government officials from several agencies, representatives from oil companies, conservation organizations and native corporations, in order to achieve his goal of determining whether the NPR-A is being managed in the common interest.

Bente Grinde ('09) enrolled in the Sea Education Association's (SEA) summer semester, which incorporates a four-week shore training and orientation component in Woods Hole, Massachusetts, with a four-week research cruise from Hawaii and San Francisco. During the research cruise, Bente worked with the SEA science coordinators to study the role of plastic waste in the North Pacific Ocean as a basis for her senior essay.

Kevin Hickenbottom ('09) interned with the North Cascades National Park Service in central Washington to help gauge the amount of day use in the park and to assess the amount of damage being caused by hikers to the ecosystem. He helped design and conduct a survey of the backcountry permit system in the North Cascades National Park by interviewing rangers and trip leaders hiking through the park. This survey helped the rangers to understand the amount of permit compliance within the park, and the reasons for noncompliance.

Sarai Itagaki ('11) gained an understanding of research in a laboratory through working with Dr. Toby Sommer at the Center for Green Chemistry and Green Engineering at Yale, studying the aqueous Mitsunobu Reaction this summer. The Mitsunobu Reaction is a useful oxidation-reduction condensation reaction that links together a nucleophile and an electrophile with the loss of a water molecule. It is most commonly used to react an alcohol and a carboxylic acid to form an ester with stereochemical inversion of the alcohol. The Mitsunobu is widely used by the pharmaceutical industry in organic syntheses despite the fact that it is decidedly not environmentally friendly for a number of reasons: the use of harmful organic solvents (either halogenated or aromatic); the need for stoichiometric (versus catalytic) quantities of the reagents; the associated dangers of said reagents (an azo and a phosphine compound); and the need for multiple purification steps to separate the product from the side products. The project mainly addressed the first two of these concerns by carrying out the Mitsunobu in aqueous solution while using hydrogen peroxide in place of the azo compound as a greener oxidizing agent.

profile

A

B

Kevin Hickenbottom

A. Kevin Hickenbottom backpacking in the North Cascades.

B. Twisp Pass Trail in the North Cascades National Park.

profile

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D

Tse Yang Lim

A. The makeshift laboratory setup used to carry out stickleback crosses (artificial fertilizations).

B. Stickleback collected from Garden Bay Lake.

C. Garden Bay Lake in the Sechelt Peninsula, British Columbia, source of one of Tse Yang Lim's experimental stickleback populations.

D. Field site in the Sechelt Peninsula, British Columbia.

Kathleen Knighton ('09) traveled along the Blue Ridge Parkway in North Carolina and Virginia to conduct research for her senior essay, a historical analysis of the impact that aesthetic judgments have had on the appearance of the landscape along the parkway. Through a combination of interviews, site visits, and trips to the parkway's archives, Kathleen obtained rich information about the historical roots and current implementation of scenic management of the landscape along the parkway. A comparison between this data and the archival material she found from the original design of the parkway will hopefully allow Kathleen to draw conclusions about the progression of aesthetic taste and concepts of appropriate management techniques towards the ever changing landscape along the Blue Ridge Parkway.

Tse Yang Lim ('11) spent several weeks starting a six-month long experiment under the supervision of Professor Suzanne Alonzo in the Yale Department of Ecology & Evolutionary Biology to investigate whether male signaling in the three-spine stickleback, *Gasterosteus aculeatus*, is a reliable indicator of the direct (genetic) and indirect (parental care) benefits that a male will provide as a potential mate and parent. This question is highly relevant to the study of sexual selection. The key to this experiment is controlling the condition of males through diet manipulation, and observing the effects of condition on both signaling and parental care to determine whether any correlation exists. In order to carry out this experiment, an entire generation of fish has to be raised in the laboratory under controlled conditions, from eggs to sexual maturity. The main part of the summer's work was spent collecting fish from a field site in the Sechelt Peninsula, British Columbia, and artificially crossing them to produce eggs, which were then raised in the laboratory. He also attempted to take preliminary behavioral observations in the field.

Davis Lindsey ('09) worked with The Nature Conservancy in Minneapolis, Minnesota, to see whether there was a correlation of grassland landowner's interests in the Conservation Reserve Program (CRP) to their willingness to participate in bioenergy projects. Davis interviewed 50 CRP landowners throughout southeastern Minnesota and recognized that the majority of the people interested in harvesting their grassland for bioenergy were the people who had wildlife intent with their CRP land. The CRP landowners who mostly valued wildlife for hunting or aesthetic purposes also tended to have larger tracks of grassland, less concern for economics, were more educated, and had a greater knowledge for future bioenergy initiatives. The people less interested in harvesting grasslands for bioenergy were usually enrolled in CRP for economic reasons and tended to be the average farmer in the area.

Liz Mandeville ('09) hypothesized that morphological variation in different populations of landlocked alewives (*Alosa pseudoharengus*, fish) corresponds to ecological variation in lakes, and that there will also be considerable variation in the strength of the link between ecology and evolution of these fish. There is ample evidence that alewives operate as a keystone species in lakes, radically restructuring the zooplankton prey community upon introduction (seasonal or permanent) into a system. The alewives' disproportionate ecological impact as keystone predators changes their surroundings and resource availability to

profile

Davis Lindsey

Grasslands in southeastern Minnesota.

profile

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B

Liz Mandeville

A. Liz taking a water sample with the DIWS (depth-integrated water sampler) for her mesocosm experiments.

B. Adding nutrients to a mesocosm experiment.

the point where the alewives' own ecological effect influences subsequent alewife evolution. Different zooplankton communities introduce differing selection pressures on alewives in different populations. These altered selection pressures in turn affect alewife evolution, creating an eco-evolutionary feedback. Since morphological traits related to feeding are both easily measurable and likely to be sensitive to changes in the size of zooplankton prey available to the alewives, comparison of these traits form the backbone of this study. To investigate alewife-zooplankton interactions within a coevolutionary framework, Liz continued her senior thesis research by gathering data in three major categories: 1) alewife feeding morphology; 2) zooplankton composition; and 3) alewife diets. This summer she completed the alewife morphology work on all lakes and the zooplankton work on five lakes.

Julia Meisel ('10) participated in the Yale International Bulldogs Program as a technology transfer intern with the Secretariat U.N. Convention on Biological Diversity (CBD) in Montreal, Canada. The objectives of the Convention are "the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources." In order to achieve these objectives, countries must be able to access and transfer environmentally friendly technologies that can help protect and conserve biodiversity. During her internship, Julia worked on two main projects: 1) adding specific, adoptable technologies that protect and conserve biodiversity to the CBD's database; 2) compiling possible portfolios of activities that would show the varying scopes of a potential Biotechnology Transfer Initiative that could be established among countries to more easily share and adopt the types of technologies included in the CBD database.

Ariel Patashnik ('09) interned with The Nature Conservancy in Klamath Falls, Oregon, to work on a sampling project aimed at measuring the habitat use of two species of endangered fish, the Lost River sucker and the shortnose sucker. The Nature Conservancy has worked with state and federal agencies as well as private companies to purchase and restore the Williamson River Delta Preserve, an area that historically had been wetland (which is crucial nursery habitat for suckers), but was drained and dyked for farming in the 1940s. In October 2007, habitat restoration began with levee breaches to reinundate part of the delta. Ariel's work this summer was to help monitor the larval fish using this new habitat. She sampled fish four days a week to help answer whether endangered suckers are successfully rearing in the restored delta, and what types of habitat within the delta they prefer.

Irene Scher ('09) continued to research "despite international and domestic pressure on Canadian policymakers and firms to increase resource extraction from the Canadian Boreal Forest; why has the number of strictly protected and certified areas in the Boreal increased dramatically over the last decade?" She spent her summer working in the International Boreal Conservation Campaign's Seattle office and traveled to Ontario and Vancouver in order to meet with leaders in the ENGO (Environmental Non-Government Organizations) community, consultants to the ENGO community, government officials in Canada, and an industry official, to try to

profile

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Ariel Patashnik

A. Mt. McLoughlin, seen from The Nature Conservancy's Williamson River Delta Preserve in Oregon.

B–D. Ariel Patashnik sampling for endangered suckers in The Nature Conservancy's Williamson River Delta Preserve.

profile

A

B

Brandon Berger

A. The skull and jaw of a juvenile Andean bear found in the Intag Vally, Ecuador.

B. A mountaintop view into the Alto Chocó Reserve, Intag Valley, Ecuador.

obtain a wide and balanced range of data with which to analyze her central question through these extended personal interviews.

CENTRAL AND SOUTH AMERICA

Brandon Berger ('10) spent the summer in the Intag Valley, in the northwest of Ecuador, working with Fundación Zoobreviven, a small nonprofit that manages several private nature reserves throughout the country. While in South America, Brandon designed a project that presents a theory on the effect that land use and vegetational succession are having on the habitat use of Andean bears in the area. He proposes that development and disruption on the lower slopes of mountains (where it is easiest and most common) is leading to a nearly monocultural successionary generation of native bamboo in those areas, which has been shown to be a major source of the bears' diet in the local area. Additionally, clearing the forests may in this way be drawing the bears towards human inhabited areas by changing the composition of the forest in these areas to provide very easy food for them.

Isabel Chen ('10) took a tropical biology field course in Costa Rica offered by Duke University's Organization for Tropical Studies. This course allowed Isabel to study biodiversity and conservation biology at four separate biological stations that introduced students to a wide variety of plant, animal, and insect taxa in different ecosystems. The program also explored themes in conservation biology and their effects on diversity in Central America.

Elyse LeeVan ('09) engaged in a Chagas disease related research project in Buenos Aires, Argentina. Chagas disease, a tropical parasitic disease commonly transmitted to humans and other mammals by an insect vector of the subfamily Triatominae, affects more than 40% of the rural population in the Chaco province in the northeastern region of the country. A laboratory team from the eco-epidemiology lab at the University of Buenos Aires had been monitoring re-infestation activities of triatomine vectors following an application of deltamethrine, a common pesticide, and Elyse accompanied this research team to perform surveillance activities and gather information from the local inhabitants about insect populations and their interaction with the community. Over the course of the next five months, she designed and carried out an experiment to provide further insight into the relationship between the commonly used pesticide and the target triatomine population.

Jonathan Russell ('11) volunteered on a conservation project in the coastal Esmeraldas province of Ecuador sponsored by Ecociencia. Jonathan lived and worked in the Monte Saino Reserve, a small section of remaining coastal rainforest on the Pacific coast of Ecuador. The people involved in the Monte Saino project are trying to regenerate forest cover by reintroducing native fruit species to partially or heavily intervened areas and introduce new methods of cultivation to the local community that are both environmentally sustainable and economically profitable.

Matthew Smith ('10) volunteered with the condor liberation efforts of a local Argentine organization, Fundación Bioandina Argentina (FBA), to reintroduce the Andean condor (*Vultur gryphus*) to the Patagonian coast during the first half of the summer. With FBA,

profile

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C

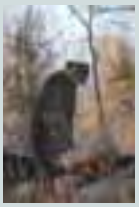
Jonathan Russell

A. A pole saw is used to harvest cacao pods from trees. This harvesting process is the first step towards the production of chocolate.

B. Cacao pods of the Forastero variety. The pods are split open and the beans dried, fermented, and roasted to begin making chocolate.

C. Tia's farm on a hill. One of the local farms near the Monte Saino Reserve. The farmer had cleared 4 hectares for active farming and still had 200 more that consisted of untouched coastal rainforest.

profile



Jacob Berv

Karongwe Game Reserve, South Africa.

Matthew gained a truly local perspective on the conservation effort, and much of this involved interacting with the neighboring estancias. Then Matthew worked with Global Vision International, helping local scientists collect data to help Argentine condor expert Sergio Lambertucci anticipate the plight of the main South American condor population.

EUROPE

Katherine French ('09) is interested in being able to predict future climate responses to the current carbon dioxide input by studying ancient hyperthermal events. These events are characterized by a rapid carbon dioxide spike that induces a period of global warming. During the summer, Katherine began developing a paleotemperature record for her senior research project on a specific poorly resolved hyperthermal event called the Middle Eocene Climatic Optimum (MECO, about 41-42 Ma). The MECO has been observed at high latitude sites in the southern hemisphere, and Katherine wanted to be able to demonstrate the global nature of this hyperthermal event by using two low latitude sites in the northern hemisphere. Previous work conducted on the MECO used carbon and oxygen isotopes to characterize the hyperthermal event. Her project looked to generate a low latitude sea surface temperature record using the Tetraether Index of 86 Carbon Atoms (TEX86) proxy and a terrestrial temperature record using the Methylation Index of Branched Tetraethers (MBT) proxy. For this purpose, she targeted two sites in Italy to collect samples for this work: the Contessa Highway section, an outcrop along a highway in the Umbria region of central Italy, and the Alano section, an outcrop in a riverbed in the Venetian Alps in northeastern Italy; both were easily accessible and remarkably had a complete geologic record of the MECO.

Laura Zatz ('09) spent the summer in Paris, France, gathering data for her senior essay project to examine the regulation of food marketing in France and to compare it to regulations in the United States. Laura wanted to determine the factors that facilitated the enactment of stricter regulations in France and compare these factors to the barriers which exist in the United States, especially as it relates to obesity. During her research, Laura collected qualitative data, primarily through interviews with French students, university professors, other adults, researchers from INSERM (Institut national de la santé et de la recherché médicale) (French National Institute of Health and Medical Research), and program managers from the EPODE obesity prevention program (Ensemble prévenons l'obésité des enfants) (Preventing Child Obesity Together).

AFRICA

Jacob Berv ('10) volunteered as a research assistant for Global Vision International's Wildlife Research and Conservation Project in South Africa on the Karongwe Game Reserve. Jacob was able to participate on several ongoing projects aimed at investigating the behavioral ecology and impact of large predators within a small, multi-predator system. These projects include careful monitoring of the predator and prey populations with specific regard to lion, cheetah, hyaena, leopard and their territorial interactions with prey species. The long-term goal of this research is the establishment of sustainable and effective management policies for the future conservation of game reserves in Africa.

profile

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Christine Ellman

A. Christine in front of Humayan's tomb in New Delhi, India.

B. Christine in Jaipur, India.

Todd Anderson ('09), Alison Hoyt ('09), and **Elizabeth Marshman ('10)** submitted proposals for the Yale Chapter of the Engineers Without Borders Phase II of a water distribution project to make clean water available to the village of Kikoo, Cameroon. The students were originally planning to travel to Africa in August 2008 but have postponed their trip until January 2009.

ASIA

Christine Ellman ('09) interned with The Energy and Resource Institute (TERI) in New Delhi, India, working on several projects related to climate change and water resources in South Asia. Christine helped write a background paper for a TERI-Stimson Center conference entitled "Climate Change and Water: Examining the Interlinkages." For this, she completed a comprehensive literature review of recent international and relevant national water reports and conducted several open interviews with key stakeholders. Christine focused on the following areas: 1) the current state of water in India and South Asia; 2) how water and climate change are transnational phenomena; 3) the nature and scope of climate change on water bodies in South Asia; 4) climatic and non-climatic parameters that lead to gaps in water supply and water demand; 5) the social and economic effects on vulnerable sectors and communities; 6) the linkages between water and development; 7) how this all affects the Millennium Development Goals; and 8) how the politics of climate change needs to change.

Yale Report Cites Emerging Carbon Finance Market

Climate change is an unprecedented global problem and an emerging carbon finance market will play a critical role in addressing it, asserts a newly published Yale report.

"This publication represents a major advance in our understanding of the interrelationships of government policy, private markets and technology in the climate arena," says Brad Gentry, director of the Center for Business and the Environment at Yale, in the report's foreword.

According to a 2007 United Nations report, 85% of the multibillion dollar investment to address climate change now comes from the private sector, not government. The global carbon market logged $64 billion in trades in 2007 and is on track to top $100 billion this year. One recent forecast predicted that the trade would reach $1 trillion annually by 2020, assuming that the United States joins the market with the passage of a cap-and-trade system now being discussed in Congress.

The report *Carbon Finance: Environmental Market Solutions to Climate Change* grew out of a carbon finance speaker series sponsored by the Emily Hall Tremaine Foundation and organized by the Center for Business and the Environment at Yale, in which corporate leaders and investors from around the world discussed how financial markets are playing a major, positive role in providing solutions to environmental problems.

Co-edited by program director Bryan Garcia and researcher Eric Roberts, both with the Center for Business and the Environment at Yale, and published by the Yale School of Forestry & Environmental Studies, the report is a compilation of lectures on, among other themes, the problem-solving role of finance in confronting climate change; the need for investors to factor climate change into their investment strategies; the value of carbon and renewable energy; the role of regulation in a functioning environmental market; climate change funding and investment by foundations; hedge funds and climate change; venture capital and the challenge of funding new technologies; the link between the insurance industry and climate change; and the complexities and opportunities facing the forest products business.

"This publication is a timely resource, especially as the northeastern United States embarks on a major carbon market program through the Regional Greenhouse Gas Initiative," said Gus Speth, dean of the environment school. "Since carbon now has a price, RGGI can be effective in reducing greenhouse gas emissions."

To download the report for free or purchase your own copy, visit *www.yale.edu/cbey/carbonfinance2008*, where downloadable netcasts and presentations of the speakers' remarks are also available.

BULLETIN OF THE PEABODY MUSEUM OF NATURAL HISTORY

The Yale Peabody Museum Publications Office is pleased to announce the publication of the *Bulletin of the Peabody Museum of Natural History*, Volume 49, Issue 2, 31 October 2008.

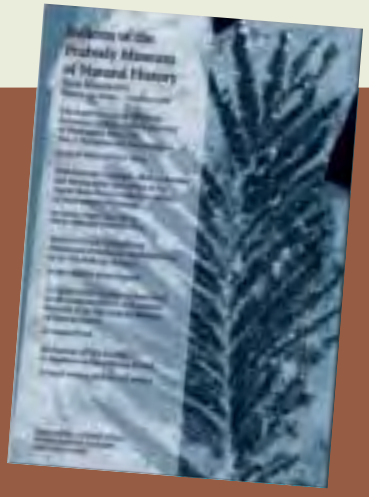
Abstracts and full text of papers published in the Yale Peabody Museum's *Bulletin* (Volume 47 and later) are available online to institutional subscribers of BioOne (*www.bioone.org/*), an electronic database of high-impact bioscience research journals.

Included in this issue are:

The Fossil Flora of the Winthrop Formation (Albian-Early Cretaceous) of Washington State, USA. Part I: Bryophyta and Pteridophytina by Ian M. Miller and Leo J. Hickey

A Morphotype Catalogue, Floristic Analysis and Stratigraphic Description of the Aspen Shale Flora (Cretaceous-Albian) of Southwestern Wyoming by Daniel J. Peppe, Leo J. Hickey, Ian M. Miller and Walton A. Green

Review of Some Terebelliform Polychaetes (Polychaeta: Terebelliformia) at the Yale Peabody Museum by João Miguel de Matos Nogueira



La Quina Lithic Collections Assembled by the American School of Prehistoric Research at the Yale Peabody Museum of Natural History by Douglas P. Park

An Instance of Tick Feeding to Repletion Inside a Human Nostril by Gary P. Aronsen and Richard G. Robbins

The *Bulletin of the Peabody Museum of Natural History* is published twice a year, in April and October. Information on subscriptions, standing orders, library exchanges, and back issues of both *Postilla* and *Bulletin*, are available at *www.peabody.yale.edu/scipubs/*, or contact the Publications Office at (203) 432-3786 or *peabody.publications@yale.edu*.

Yale Journal Finds Nanomaterials May Have Large Environmental Footprint

Environmental gains derived from the use of nanomaterials may be offset in part by the process used to manufacture them, according to research published in a special issue of the *Journal of Industrial Ecology*.

Hatice Şengül and colleagues at the University of Illinois at Chicago assert that strict material purity requirements, lower tolerances for defects and lower yields of manufacturing processes may lead to greater environmental burdens than those associated with conventional manufacturing. In a separate study of carbon nanofiber production, Vikas Khanna and colleagues at Ohio State University found, for example, that the life-cycle environmental impacts may be as much as 100 times greater per unit of weight than those of traditional materials, potentially offsetting some of the environmental benefits of the small size of nanomaterials.

Materials engineered at dimensions of 1 to 100 nanometers (1 to 100 billionths of a meter) exhibit novel physical, chemical and biological characteristics, opening possibilities for stunning innovations in medicine, manufacturing and a host of other sectors of the economy. Because small quantities of nanomaterials can accomplish the tasks of much larger amounts of conventional materials, the expectation has been that nanomaterials will lower energy and resource use and the pollution that accompanies them. The possibility of constructing miniature devices atom-by-atom has also given rise to expectations that precision in nanomanufacturing will lead to less waste and cleaner processes.

"Research in this issue reveals the potential of environmental impacts from nanomanufacturing to offset the benefits of using lighter nanomaterials," says Gus Speth, dean of the Yale School of Forestry & Environmental Studies. "To date, most attention has focused on the possible toxic effects of exposure to nanoparticles and appropriately so. But considerations of pollution and energy use arising from the production technologies used to make nanomaterials need attention as well."

Other topics explored in the special issue include:

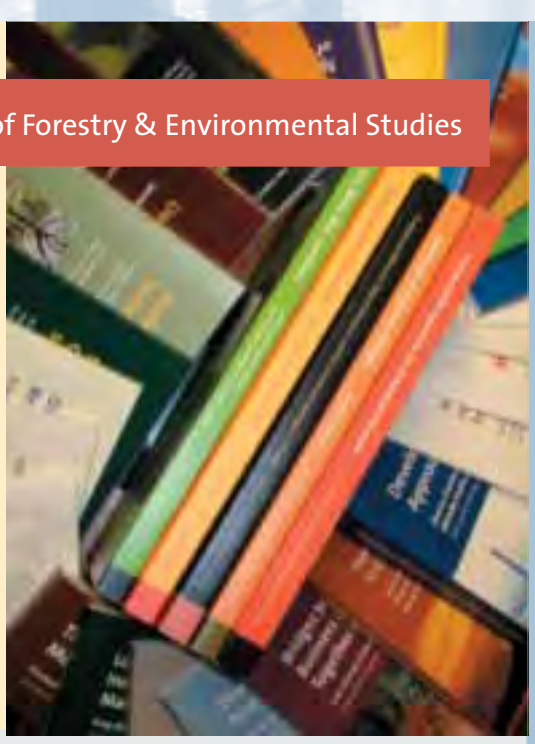
- Approaches for identifying and reducing the life cycle hazards of nanomaterials
- Quantified life cycle energy requirements and environmental impacts from nanomaterials
- Tradeoffs between nanomanufacturing costs and occupational exposure to nanoparticles
- Efficiency of techniques for nanomaterials synthesis
- Improvement of the sustainability of bio-based products through nanotechnology
- Industrial frameworks for responsible nanotechnology
- Industrial and public perception about the risks and benefits of nanomaterials
- Governance and regulation of nanotechnology

Industrial ecology is a field that examines the opportunities for sustainable production and consumption, emphasizing the importance of a systems view of environmental threats and remedies. "Through the use of tools such as life cycle assessment, green chemistry and pollution prevention, industrial ecology takes a broad and deliberate view of environmental challenges," states Reid Lifset, editor-in-chief of the *Journal of Industrial Ecology*. "This special issue shows the power of this approach."

Roland Clift, Professor of Environmental Technology in the Centre for Environmental Strategy at the University of Surrey, and Shannon Lloyd, principal research engineer in the Sustainability & Process Engineering Directorate at Concurrent Technologies Corporation, served as guest editors. Support for this special issue was provided by the Educational Foundation of America in Westport, Connecticut, and the Project on Emerging Nanotechnologies of the Woodrow Wilson International Center for Scholars in Washington, D.C.

To obtain a PDF of the issue, contact journalnews@bos.blackwellpublishing.net. The articles in this issue are also available online at *www.interscience.wiley.com/journal/jie-nano*. To request a print copy of the special issue, contact indecol@yale.edu. The *Journal of Industrial Ecology* is the official journal of the International Society for Industrial Ecology. It is published for Yale University on behalf of the Yale School of Forestry & Environmental Studies. For more information, visit *www.interscience.wiley.com/journal/jie*.

PUBLICATION SERIES Yale School of Forestry & Environmental Studies



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