YALE ENVIRONMENTAL NEWS

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

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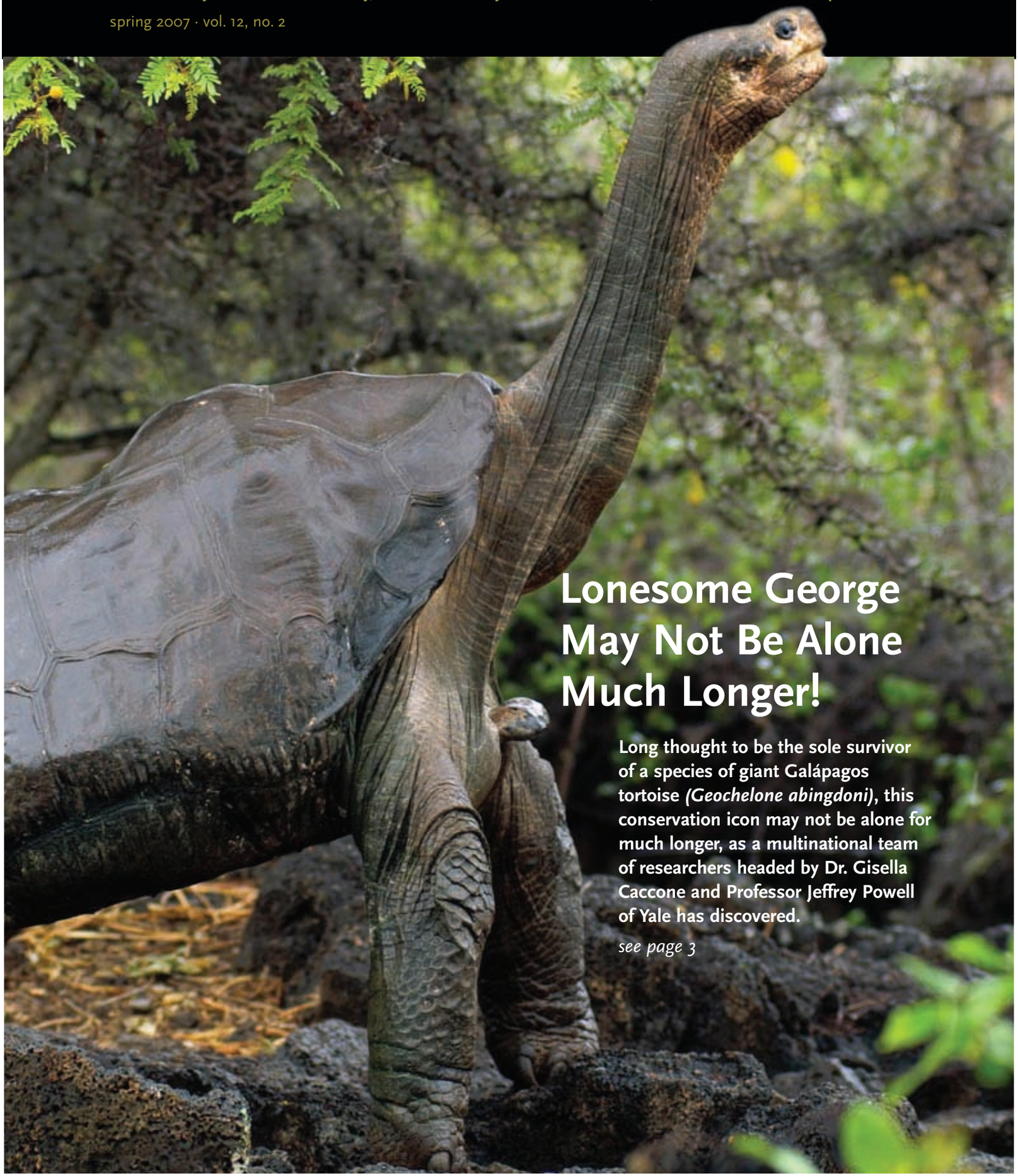

Lonesome George May Not Be Alone Much Longer!

Long thought to be the sole survivor of a species of giant Galápagos tortoise *(Geochelone abingdoni)*, this conservation icon may not be alone for much longer, as a multinational team of researchers headed by Dr. Gisella Caccone and Professor Jeffrey Powell of Yale has discovered.

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Donor's Faith in F&ES and Its Students Results in $4 Million Gift

By Stacey Stowe

When he was a young man, Gilman Ordway chose the land over law, buying a spread in Wyoming and opening a ranch rather than pursuing the Colorado bar exam after graduating from law school.

Ordway said one of the pleasures of contributing to scholarships at F&ES is receiving letters from the students who benefit from the contribution.

Yet while he maintains a lawyer's penchant for thoughtfulness and order, Ordway's passion is conservation. A steadfast and generous supporter of the Yale School of Forestry & Environmental Studies (F&ES), he pledged a total of $4 million for the study center and library that will bear his name on the first floor of the Kroon Building, the new F&ES home scheduled to be completed in late 2008. The gift is a manifestation of his love of the land and his belief in the importance of sound environmental stewardship.

The gift also represents his faith in the mission of the school. "I am especially impressed with the quality of the graduates that the school produces," said Ordway, Yale College Class of 1947. "And what Gus Speth has done as dean for the environment is just very admirable."

Ordway owns Fish Creek Ranch in Wilson, Wyoming, a 382-acre property that includes almost one mile of Fish Creek, with spawning areas for native cutthroat trout. Rustic cabins for vacationers are riverside. The pine-dotted, mountain-framed landscape is home to the bald eagle and great blue heron. Winter brings out the ungulates: moose and deer. A conservation easement held by the Jackson Hole Land Trust, on whose board Ordway sat, protects the ranch in perpetuity.

Ordway has also supported the Yale Institute for Biospheric Studies, whose focus is research and teaching in the environmental sciences, and he is a member of F&ES's Leadership Council. In addition to the Jackson Hole Land Trust, he has served on almost a dozen boards, including The Nature Conservancy, the American Farmland Trust, the World Wildlife Fund and the Wilderness Society.

He is so steeped in environmental causes that it is something of a surprise to learn that Ordway grew up in Manhattan and attended the Buckley School there and the Avon Old Farms Prep School in Avon, Connecticut, before coming to Yale. "We weren't particularly outdoorsy," he said, although the family did travel out West. His father was a lawyer for the International Telephone and Telegraph Company. Ordway was born in St. Paul, Minnesota, where his grandfather was a founder of 3M, and he still has many relatives there whom he visits frequently.

After graduating from Yale, he taught history and French at a private school in Montclair, New Jersey. In 1952, he enrolled at the University of Colorado Law School in Boulder. During the summers, Ordway would travel with friends, prompting what would become a lifelong affection for the Rocky Mountains and Jackson Hole, now a chic ski destination that he described as "a cow town in the '50s."

Ordway was so enamored of the unspoiled landscape that he abandoned his original intent to take the bar exam. His visits to the Western forests and mountains with law school classmates ignited an interest in environmental issues, and he soon found himself immersed in books such as Rachel Carson's *Silent Spring* and articles about global warming, the vanishing rainforests and other conservation-related matters.

He bought property in Wyoming, eight miles outside of Jackson, and created a vacation site that was "part cattle and part dude ranch" with close proximity to Grand Teton and Yellowstone National Park.

"It was just so beautiful and relatively underdeveloped," he said. "At that time, there were no condos. Skiing was much smaller."

Today, Fish Creek Ranch is no longer a dude ranch. The trails, where horses carried would-be cowboys, now lead to private homes. The ranch's cabins with kitchenettes are still rented by vacationers or leased by people working in the area.

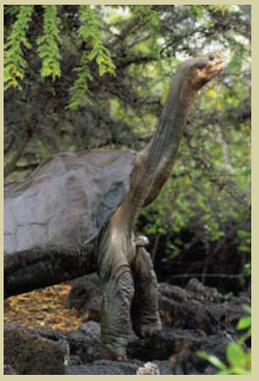
Ordway lives in Wyoming during the warmer weather with his wife, Margaret Doria, but since 1985 they have spent winters in California. Margaret is a watercolorist and the two also share philanthropic endeavors and a love of reading. Ordway's two daughters are full-time mothers, one living in Paris, the other in Montana. His son works for Boeing in Long Beach, California. Each summer, Fish Creek Ranch is a meeting ground for his five grandchildren.

During his Yale years, Ordway considered F&ES to be an "industry school," to train people for the U.S. Department of Agriculture or the U.S. Forest Service.

"It has completely changed its emphasis," he said. "The graduates have contributed so much to these nongovernmental organizations and nonprofits, and there are so many of the staff of these organizations who come from the school," he said. "Because of the effectiveness of the programs, I began to contribute. I also got to know the school through others in environmental organizations, and they were all enthusiastic about the school."

Ordway said one of the pleasures of contributing to scholarships at F&ES is receiving letters from the students who benefit from the contribution. "They tell me about their projects," he said, "and many say that they are only able to be at F&ES with help. It is there that they become very accomplished in solving environmental problems."

Among Flagship Species for Conservation, Lonesome George Is Perhaps the Most Renowned



Long thought to be the sole survivor of a species of giant Galápagos tortoise *(Geochelone abingdoni)*, this conservation icon may not be alone for much longer, as a multinational team of researchers headed by Dr. Gisella Caccone and Professor Jeffrey Powell of Yale has discovered.

Lonesome George originates from Pinta, an isolated, northerly island of Galápagos, visited only occasionally by scientists and fishermen. In the late 1960s, it was noted that the tortoise population on this island had dwindled close to extinction. Indeed, in 1972 only a single male, Lonesome George, was found. He was immediately brought into captivity at the Charles Darwin Research Station on the island of Santa Cruz, where he is housed with two female tortoises from a species found on the neighboring island of Isabela. After 35 years, Lonesome George remains uninterested in passing on his unique genes and has failed to produce offspring. His status as the "rarest living creature" (Guinness Records) and the continuing saga surrounding the search for a mate has positioned Lonesome George as a potent conservation icon, not just for Galápagos, but worldwide.

In the new work, the Yale team studied the evolutionary history of a species of Galápagos tortoise (*G. becki*) on Isabela Island that was previously known to be genetically mixed. The study analyzed the distribution of genetic variation within two *G. becki* populations across the nuclear genome relative to a large database including individuals from all extant species of Galápagos tortoises. The nearly extinct *G. abingdoni* on Pinta was added to the analysis for the first time by way of genetic data collection from six museum specimens, also including Lonesome George. Population genetic analyses revealed that one tortoise sampled on Isabela Island is clearly a first-generation hybrid between the native tortoises from the islands of Isabela and Pinta. That is, this tortoise has half his genes in common with Lonesome George; unfortunately it is a male. Given that there are well over 2,000 tortoises of *G. becki* on Isabela Island and a first-generation hybrid was detected in a very small subset of the population, there is hope that a more thorough sampling could reveal a genetically pure Pinta tortoise. In the event additional individuals of Pinta ancestry are discovered, a captive breeding and repatriation program may be enacted for species recovery. These findings offer the potential for transforming the legacy of Lonesome George from an enduring symbol of rarity to a conservation success story.

This work has been carried out in collaboration with the Charles Darwin Research Station and the Galápagos National Park. The Yale Institute for Biospheric Studies (YIBS)-ECOSAVE Center, The Bay and Paul Foundation, and the National Geographic Society have supported this research financially. The results have been published in the May 15, 2007 issue of *Current Biology*.

The Yale team is now in the process of looking for funds to organize a large sampling campaign on the slopes of Volcano Wolf on Isabela to genotype the majority of the tortoises from that population with the hope of finding additional individuals with Pinta genes. These individuals will eventually be brought to the Charles Darwin Research Station on the island of Santa Cruz, where a breeding program will be started.

To find out how to make a contribution to finding a mate for Lonesome George, please go to *http://www.yale.edu/yibs/lonesome_george.htm*.

Photo courtesy of Heidi Snell.

YIBS Center for Human and Primate Reproductive Ecology: Exploring Interplay between Ecology and Biology

The Center for Human and Primate Reproductive Ecology (CHaPRE) is a Yale Institute for Biospheric Studies (YIBS)-sponsored research center that supports research and training that address the influence of environmental and ecological factors on human and non-human primate reproductive biology. The significance of this research initiative encompasses questions and issues that touch upon conservation, evolutionary medicine, and the impact of global environmental conditions on the reproductive biology of humans and other primates. CHaPRE supports Yale graduate- and undergraduate-initiated research as well as collaborations with other universities.

Global Questions, Novel Approaches

Since its inception, CHaPRE has supported numerous research projects extending from indigenous populations in northern Argentina, farmers in rural Poland, fathers in Jamaica, breastfeeding women in Brazil, Puerto Rican preschoolers, as well as wild chimpanzees in the jungles of western Uganda. Support has included logistical and monetary support as well as laboratory services and consultation. CHaPRE not only has been fortunate to have received support from YIBS over the past two years, but has also garnered extramural support for a postdoctoral research associate, Dr. Stephanie Anestis (Yale Ph.D., 2005), who has been involved in training new researchers, developing laboratory courses, aiding the daily operations of CHaPRE, as well as conducting her own research with captive and wild chimpanzees.

Professor David Watts collecting urine samples from wild chimpanzees at Ngogo, Kibale National Park, Uganda.

Chimpanzees of Ngogo

Along with being our closest evolutionary relatives, chimpanzees are among the most endangered animals on the planet. Considering their importance to evolutionary biologists, it is imperative to understand the influence of environmental stresses on reproduction. Among the most intriguing projects is the ongoing collaboration of Professor David Watts and his graduate students, examining the influence of food availability on reproductive hormones in male and female wild chimpanzees. Professor Watts and his co-director, Professor John Mitani of the University of Michigan, established the site of Ngogo in the Kibale National Forest of western Uganda. Ngogo is unique in that it is composed of the largest population of wild chimpanzees in the world, well over 100. Moreover, due to the efforts of professors Watts and Mitani, the Ngogo chimpanzees are all but totally habituated, therefore allowing researchers to collect urine samples for hormonal analysis.

CHaPRE is collaborating with the Ngogo research team, including Yale anthropology Ph.D. candidates Sholly Gunter and Melanie Beuerlein, on a number of questions related to the impact of food availability on female and male reproductive function, aging and senescence, as well as hormonal interactions with social stress. For a comparative perspective, Dr. Anestis is exploring similar questions with captive chimpanzee populations as a form of control to determine what is environmentally mediated and what is relatively insensitive to environmental influence. The results of these studies will not only aid in understanding the evolutionary biology of chimpanzees, but also provide a useful assessment of wild population fertility, a central question in developing conservation strategies. A recent development has been the exploration of another site near Ngogo called Mainaro. Dr. Gary Aronsen, a research associate within the Yale anthropology department, and Dr. Simone Teelen, a recent graduate of the the Yale anthropology Ph.D. program, are currently undertaking exploratory transects and studies to determine the feasibility of establishing a new chimpanzee site and perhaps expanding CHaPRE research.

Argentina to Poland to Puerto Rico

At first glance, there might not seem to be much commonality between an Amerindian community living in northern Argentina and farmers in the remote hills of southern Poland. However, CHaPRE is currently sup-

porting collaborative research in both areas. Meredith Reiches, a Ph.D. student at Harvard University under the mentorship of CHaPRE distinguished fellow Professor Peter Ellison, has been assessing growth and developmental hormones among the Toba of northern Argentina. Her aim is to determine how environmental cues such as food availability and activity affect the age of reproductive maturation. Though the assessment of urinary C-peptide, a metabolite of insulin, Reiches, Ellison, and CHaPRE affiliate Professor Claudia Valeggia of the University of Pennsylvania hope to determine the physiological causes of variation in reproductive maturation in association with ecological stresses such as diet and activity.

Similarly, Dr. Kate Clancy, a recent Yale anthropology Ph.D. recipient, and Professor Grazyna Jasienska of Jagiellonian University, Krakow, Poland, are continuing to examine the impact of seasonal food availability and work activity on female reproductive function. It has been well established that ecological stress related to energy balance, such as food availability and activity, has a significant impact on human female reproductive function and is an important source of fertility variation between populations. Using non-invasive hormone assessments, mainly salivary estrogen measurements, biological anthropologists have shown that such patterns exist among rural agricultural women in Poland. However, the site of action for hormone variation is largely unknown. Clancy and Jasienska, with CHaPRE support, have shown through cutting edge research methods, primarily transvaginal ultrasounds, that variation in ovarian hormones may lead to differences in the physiology of the uterus, specifically the endometrial lining. In basic terms, lower hormone levels may result in thinner endometria and may contribute to a compromised ability to have a successful implantation.

Finally, Yale Ph.D. candidate Angélica Torres is investigating the impact of threat ecology on child development. In many organisms, development and reproductive maturation can be accelerated in response to cues that reflect some chronic external threat, such as a predator. However, this question has been largely ignored in humans. Torres suggests that preschool children living in high- and low-homicide communities in Puerto Rico may exhibit differences in development as reflected by stress, growth, and reproductive hormones, all assessed using salivary measurements. The significance of this research is that it views urban environments as simply a differing ecology that presents challenges that are not unlike many found in the wild.

For further information, please contact the director of CHaPRE, Professor Richard G. Bribiescas, or visit the CHaPRE website *at www.yale.edu/chapre.*

TOP Harvard Ph.D. candidate Meredith Reiches (second from right) with Toba children and field assistant in Argentina.

BOTTOM Yale Anthropology Ph.D. candidate Angélica Torres conducting research among Head Start children in Puerto Rico.

CONFERENCES, SEMINARS, SYMPOSIA

YIBS/ESC FRIDAY NOON SEMINARS

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

Richard Bribiescas, Associate Professor, Department of Anthropology; Director, YIBS Center for Human and Primate Reproductive Ecology, *Is There an 'Andropause'? An Evolutionary Perspective on Human Male Reproductive Senescence* ▪ **Robert Berner**, Professor, Department of Geology & Geophysics, *The Paleozoic Rise of Trees and Their Effects on CO2, O2, Climate and Evolution* ▪ **Jerome Ringo**, President, Apollo Alliance; Chair, National Wildlife Federation Board of Directors, *Climate Change: A Changing World —Let's ALL Get Involved* ▪ **Lisa Curran**, Professor, Yale School of Forestry & Environmental Studies, *Effects of Land Use Change on Bornean Ecosystems: Implications for Carbon Emissions* ▪ **Yongtao Guan**, Assistant Professor, Epidemiology & Public Health, Yale School of Medicine, *Using Spatial Point Pattern Analysis Techniques to Model Ecological Data* ▪ **Steve Sparks**, Edward P. Bass Distinguished Visiting Environmental Scholar; Director, Research Center for Environmental and Geophysical Flows, University of Bristol, *Volcanic Ash: Effects on Human Health and the Biosphere* ▪ **Barry Alto**, Gaylord Donnelley Postdoctoral Environmental Fellow, Department of Ecology & Evolutionary Biology, *Larval Competition and Adult Susceptibility to Arbovirus Infection in Container Mosquitoes* ▪ **David Zinniker**, Gaylord Donnelley Postdoctoral Environmental Fellow, Department of Geology & Geophysics, *Pack Rats, Peat Bogs, and Prymnesiophytes: What Can We Learn from the Stable Isotopic Composition of Taxa-Specific Compounds in the Fossil Record?* ▪ **Daniel Esty**, Hillhouse Professor of Environmental Law and Policy, School of Forestry & Environmental Studies, Law School; Director, Yale World Fellows Program; Director, Yale Center for Environmental Law & Policy, *Green to Gold: How Smart Companies Use Environmental Strategy to Innovate, Create Value, and Build Competitive Advantage* ▪ **Peter Rabinowitz**, Associate Professor, Occupational and Environmental Medicine, Department of Internal Medicine, Yale School of Medicine, *From 'Us vs. Them' to 'Shared Risk'—Can Animal Sentinels Link Ecosystem and Human Health?* ▪ **Christian Koerner**, Edward P. Bass Distinguished Visiting Environmental Scholar; Professor Dr., Institute of Botany at the University of Basel, Switzerland, *Beyond Counting: The Functional Significance of Biological Diversity* ▪ **Piotr Naskrecki**, Director, Invertebrate Diversity Initiative, Museum of Comparative Zoology, Harvard University, *Biting the Hand that Feeds Us, or the Reality of Invertebrate Animal Conservation* ▪ **Per Ahlberg**, Professor of Evolutionary Organismal Biology, Uppsala University, Sweden, *Vertebrates Move Onto Land*

EDWARD P. BASS DISTINGUISHED LECTURE

Science, Environment and the Media

On May 2 the Yale Institute for Biospheric Studies (YIBS) presented a program—Science, Environment and the Media. This event was supported by the Edward P. Bass Distinguished Visiting Environmental Scholars Program, and explored how the various forms of media represent and disseminate news of a scientific nature.

A prominent panel representing radio, television, film and newspapers offered a two-hour discussion followed by a question-and-answer period, reporting on the ways in which they communicate critical environmental issues that impact our health and the state of the planet.

Dr. Tom Lovejoy, President, H. John Heinz III Center for Science, Economics and the Environment and chair of the YIBS External Advisory Board, served as moderator for the afternoon. The panelists were Steve Curwood, journalist, author and Public Radio International host of *Living on Earth*; Dennis Dimick, Executive Editor of *National Geographic*; Bob Kaiser, Associate Editor at the *Washington Post*; Mark Shelley, Executive Producer and Director of Photography at Sea Studios; and James "Gus" Speth, Dean at the Yale School of Forestry & Environmental Studies and author of *Red Sky in the Morning*.

The program is being made available for viewing on the YIBS website at *www.yale.edu/yibs* and for podcast at *http://www.yale.edu/opa/podcast/*.

YIBS SYMPOSIUM ON GEOBIOLOGY

On April 17, 2007, the Yale Institute for Biospheric Studies (YIBS) presented a seminar and discussion on geobiology in order to inform the Yale community about exciting developments in this field. The event included the following presentations:

Microbial oceanography: From genomes to biomes.

Sonya Dyhrman, *Woods Hole Oceanographic Institution Department of Biology*
Microbes in the ocean catalyze key biogeochemical transformations of nutrients and trace elements, produce and consume greenhouse gases, support roughly one-half of global primary production, and are a critical component of the food web linking dissolved organic matter to higher trophic levels. Microbial activities and their resultant biogeochemical impacts are hard to constrain, and one of the ongoing challenges in microbial oceanography is to understand the links between community structure, function, and biogeochemical processes well enough to model how the system will function in the future. The intersection between microbial metabolism and the biogeochemistry of elements such as phosphorus in the sea was highlighted.

Earth's early microbial biosphere

David Des Marais, *NASA Ames*
Earth's geologic record reveals that our biosphere arose more than 3.7 billion years ago and consisted solely of single-celled organisms for the first four-fifths of its existence. About 2.7 to 2.4 billion years ago the fossil record of stromatolites, microfossils and other biosignatures became much more abundant and diverse. The elaboration of microbial physiologies and ecosystems transformed sedimentary environments, helped to oxidize the oceans and atmosphere, and set the stage for the rise of plants and animals.

Bacterial niches and greenhouse gases: Tradeoffs between power and efficiency

Thomas Schmidt, *Michigan State University*
The heterogeneous matrix of soil includes a broad range of niches inhabited by bacteria which can be characterized on a spectrum between slow and efficient growth to rapid growth rates. Efforts to link the ecological strategies of bacteria, land management practices that modify niche space, and the production and consumption of the greenhouse gases methane and nitrous oxide were described.

Shewanella oneidensis **biofilms**

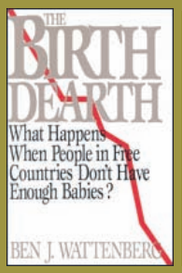
Alfred Spormann, *Stanford University*
Microbe-mineral interactions have been at the center of the co-evolution of the biosphere and geosphere. In metabolic interactions, microbes mediate electron transfer to mineral surfaces enabling microbial growth but also mineral dissolution. In physiological interactions, microbial cells adapt to the mode of life on surfaces.

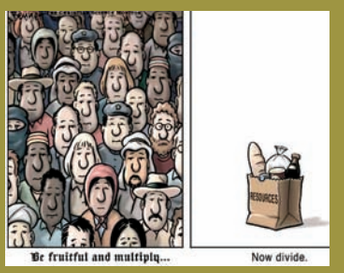
Letting the microbes do the weaving: Understanding the braid of microbiology, mineralogy, and geochemistry

David Emerson, *George Mason University, American Type Culture Collection*
A unique group of oxygen-dependent iron-oxidizing bacteria live at neutral pH. These organisms have developed a number of unique adaptations that allow them to thrive under challenging metabolic conditions. Their biology influences both the deposition of, and mineralogy of, iron oxides in the environment.

Archaea in deep marine sediments: Diversity and function

Andreas Teske, *University of North Carolina*
Deep marine subsurface sediments are permeated with microbial life; total cell counts, biogeochemical processes, and biomarkers of actively metabolizing cells are all indicative of a diversified, thriving subsurface biosphere. Most of these bacterial, archaeal and eukaryotic cells are still uncultured and are therefore not accessible for direct metabolic studies. However, functional genes, stable C-isotopic signatures and metabolically informative biomarkers begin to reveal structure and function of the deep subsurface biosphere.





DEMOGRAPHY & POPULATION

A Seminar Series

As part of his interactions with Yale faculty and students while serving as an Edward P. Bass Distinguished Visiting Environmental Scholar, Dr. Michael Teitelbaum, noted demographer and vice president of the Alfred P. Sloan Foundation in New York, continued the seminar series on Demography & Population that he organized during the Fall 2006 semester. Co-sponsored by the Interdisciplinary Bioethics Center at Yale, and the Yale Institute for Biospheric Studies (YIBS), the Spring 2007 seminar featured the following speakers:

Peter Schuck, Simeon E. Baldwin Professor of Law, Yale Law School, presented *Demography, Human Rights, and Diversity Management, American-Style*

Liza Grandia, Program in Agrarian Studies, Yale, presented *Spectres of Chayanov: Land, Conservation, and Family Planning in Northern Guatemala*

Mark Rosenzweig, Frank Altschul Professor of Economics, and Director, Economic Growth Center, Yale, presented *Using the New Immigrant Survey to Study Skilled Migration to the United States*

Gus Speth, Dean, School of Forestry & Environmental Studies, and Sara Shallenberger Brown Professor in the Practice of Environmental Policy, Yale, presented *Demography as a Driver of Environmental Trends*

Nicoli Nattrass, Professor, School of Economics, and Director, AIDS and Society Research Unit, University of Cape Town, presented *Will Anti-retroviral Treatment Result*

F&ES Conference Analyzes Dams

By Alan Bisbort

Proponents of dams have cited their many benefits over the past two centuries, including flood control, irrigation, transportation and hydropower, but one they may be reluctant to claim is that dams helped foster the conservation movement in America. Indeed, heated opposition to dams has inspired grassroots movements worldwide, many of whose adherents—as well as some dam proponents—participated in a three-day conference last November at the School of Forestry & Environmental Studies (F&ES), "Global Perspectives on Large Dams," organized largely by F&ES students.

Dams large and small were examined from every conceivable angle—technical, political, ecological, economic, even spiritual.

Former U.S. Secretary of the Interior Bruce Babbitt set the conference tone with his provocative keynote address, "Do We Need More Dams? Or Fewer?" After being introduced by Dean Gus Speth as "one of [his] heroes," Babbitt called F&ES a "sweet spot" for environmental studies. Then he turned to the subject at hand, noting that two things are now happening in the world simultaneously—one hopeful, one not so: "We are learning to take dams down in the United States even as elsewhere in the world we are going in the wrong direction, building more and bigger dams."

The subject of "dam busting"—the removal of outmoded dams—seemed to energize Babbitt, chair of the board of directors of the World Wildlife Fund. "I'm astonished at how far we've come since 1994 at Yosemite, when I told an audience that I intended to tear down a couple of dams," he said. "That almost ended my career. President Clinton later took me aside and said, 'What's all this stuff about tearing down dams?' I kept my mouth shut until he was reelected in 1996."

At that point, Babbitt helped negotiate the removal of a small (6-foot-high) dam in North Carolina (Quaker Neck) that blocked shad runs on the Neuse River. Removing that dam opened upstream spawning waters, and shad returned in large numbers. This successful effort spawned something else—an inventory of U.S. dams that revealed 75,000 still standing. "Nobody will miss one or two or even half a dozen," said Babbitt, laughing. "[Dam busting] is a wonderfully blossoming field." He suggested that the biggest obstacles to dam removal—and habitat restoration—may be psychological.

"From a cultural perspective, dams are seen as eternal," he said. "But along the East Coast, most dams are obsolete, having been built for grist mills and now decommissioned. Local people fight taking them down out of nostalgia, and see dam removal as government encroachment."

Babbitt said he was disturbed that no consensus has been reached on criteria by which we can plan and "understand" large

in More or Fewer New HIV Infections in South Africa?: Contradictory Results from Different Demographic Models

Louise Druke, Leibniz University, Hannover, and Harvard University (formerly Representative of the United Nations High Commissioner for Refugees in Europe, Southeast Asia, Latin America, Africa) presented *Refugees and Migration Governance in EURASIA since the Collapse of the Soviet Union–Impact and Prospects of External Support*

Paul Kennedy, J. Richardson Dilworth Professor of History, and Director, International Security Studies, Yale, presented *Youth and War: Revisiting W. H. McNeill's Theses*

The Interdisciplinary Bioethics Center at Yale is planning to continue the seminar series for the next academic year.

For information please visit their website at *http://www.yale.edu/bioethics/events/index.shtml*.

dams. He cited the "melancholy" examples of the Columbia, Colorado and Missouri rivers. "The upper Missouri River is a template of failure from which other countries must learn. The destruction wreaked by Hurricane Katrina began in the 1930s, when the first dam was built at Fort Peck."

After the dam at Fort Peck was built, the U.S. Army Corps of Engineers built 20 more dams. In the process, native peoples were dispossessed, cultures destroyed, farmland lost and habitats ruined. "This was done in the name of flood control. ... Sixty million acre-feet of water were created, 80 percent of the sediment collected behind dams; the river no longer exists and the delta is disappearing. Let's not create another Missouri River elsewhere," Babbitt warned.

Land Cover Effects on Water Fluxes and Atmospheric Deposition: Across a Mexican Tropical Montane Landscape

By Alexandra Ponette '08, School of Forestry & Environmental Studies

In recent years, human modification of the land surface—for agriculture, grazing, forestry, urban development, and industrial purposes—has been recognized as the most important process driving changes in the Earth system. Concern over the effects of land use and land cover change, including the rapid loss of plant and animal species, alterations of water and biogeochemical cycles, and global climate change, has led to a major shift in how scientists and the public see, study and understand the world. Growing awareness of the importance of land use legacies, synergies and feedbacks between human-mediated and natural processes, and of the cumulative effects of anthropogenic activities on global-scale phenomena has led to increased focus on landscape dynamics in and around highly complex human-modified environments. What are the consequences of land cover and land use change for human societies and the sustainability of ecosystems?

With current funding from National Science Foundation's (NSF's) Division of Environmental Biology and National Aeronautics and Space Administration (NASA's) Graduate Student Research Program, and in-country support from the Instituto de Ecología, A.C., in Xalapa, Mexico, Dr. Lisa Curran (Yale School of Forestry & Environmental Studies), Dr. Kathleen Weathers (Institute of Ecosystem Studies) and I are examining the effects of land cover change on water and nutrient/pollutant inputs to a heterogeneous tropical montane landscape in Central Veracruz, Mexico. The study is being conducted in cloud forest fragments, shade coffee plantations, and cleared areas, the three most prevalent land cover types in Mexico's tropical montane regions. The volume and chemistry (nitrate, sulfate and chloride) of bulk and throughfall precipitation have been sampled at 12 sites since April 2005. These measurements will be used to: (i) estimate the relative importance of fog and rain as a water source and as a vector of nutrients and pollutants to the three land cover types; (ii) examine the effects of forest conversion on the volume, spatial distribution and chemistry of water inputs; and (iii) quantify the exposure of cloud forest fragments and watersheds to upwind pollution sources.

Increased understanding of the complex relationship between vegetation cover and water resources is a topic of major global environmental concern and of immediate interest to land managers, policy makers and environmental scientists at regional, national and international levels. My research program will increase awareness about the linkages between land cover change and air and water quality and will provide an indication of the conservation value of different forested land cover types in fragmented landscapes, a topic of current importance to the Mexican governmental Payment for Environmental and Hydrological Services Program, supported by the Global Environment Facility. Further, my research will provide data to assess the potential impacts of upwind pollution sources on the region's remaining forests, food production systems and watersheds.

YALE PEABODY MUSEUM OF NATURAL HISTORY

EVENTS

DINOSAURS, MAMMOTHS & FORESTS PRIMEVAL: CELEBRATING THE GREAT ZALLINGER MURALS AT YALE

Opens April 25, 2007

Join us in 2007 as the Yale Peabody Museum celebrates Rudolph Zallinger and his masterworks on the occasion of the 60th anniversary of *The Age of Reptiles* mural, and the 40th anniversary of *The Age of Mammals* mural.

PEABODY SUMMER YOUTH PROGRAMS

July and August 2007

Another summer of 12 fun, week-long programs for students entering 3rd to 9th grades, on topics as diverse as biodiversity, astronomy, natural science illustration, ancient survival skills, ancient cultures and archaeology. See the Yale Peabody Museum website for details.

For information and updates visit *www.peabody.yale.edu.*

"Swimming for Life" by Willem Kolvoort, The Netherlands

WILDLIFE PHOTOGRAPHER OF THE YEAR

June 2–September 3, 2007

This exhibition of the breathtaking winning photographs from the international Wildlife Photographer of the Year competition, developed by the Natural History Museum in London, celebrates the beauty, wonder and value of the natural world. The pictures, of any "natural" subject, include animals, plants and landscapes presented as stunning backlit images: the sun rising in Antarctica, a tiny baby gorilla clinging to a branch, rockhopper penguins hurrying across a beach to safety, a damselfly emerging from its final molt, swirling shoals of fishes, jewel-like dew drops sticking to a windowpane, and a snowy owl gliding over an eerie white landscape. The Wildlife Photographer of the Year competition is owned by the Natural History Museum and BBC Wildlife Magazine.

Peabody to Restore Historical Paleobotany Wall Charts

By Linda Klise, Senior Collections Manager, Division of Paleobotany, and Catherine Sease, Senior Conservator

One of Karl Zittel's colored lithographs, of a Carboniferous landscape.

The Yale Peabody Museum of Natural History's Division of Paleobotany and its Conservation Lab were recently awarded a grant from the Peck Stacpoole Foundation to undertake a comprehensive project to clean, repair and reframe five historically important paleobotanical wall charts (*Wandtafeln*) produced in the late 19th century as teaching aides in geology.

Early in the spring of 2004 the Division of Paleobotany learned that three paleobotanical wall charts housed nearby in Yale's Osborne Memorial Laboratory were to be discarded. On seeing them, the curatorial staff realized that the charts were from the same series as two charts already in the Division's possession. The three charts were rescued and research revealed that they are part of a series of instructional wall charts, entitled *Ideale Landschaft*, published by the German paleontologist Karl Alfred von Zittel in 1883 and 1884.

Each chart measures approximately 42 by 56 inches. These beautiful lithographs depict paleobotanical landscapes in different geological periods: the Ice Age *(Ideale Landschaft der Eiszeit)*; the Carboniferous *(Ideale Landschaft der Steinkohlenformation* and *Ideale Landschaft der Steinkohlenformation II)*; the Jurassic *(Ideale Landschaft aus der Jurzeit)*; and the Cretaceous *(Ideale Landscaft der Kreidezeit)*.

Unfortunately, the charts have seriously deteriorated with the passage of time and their fragile condition precludes their use for teaching or display today. They suffer from overall discoloration, water damage, wrinkling, tears and mold growth. The goal of the conservation project, to be carried out by independent paper conservator Mary Wood Lee, is to restore the charts to a stable enough condition that they can be used for teaching and exhibition. Treatment will involve removing the current acidic framing materials, dry cleaning the prints to remove mold and dirt, removing their linen linings and washing the charts to remove harmful acids from the paper. Once cleaned, tears will be mended and losses in the paper filled. The charts will also be digitally photographed and then reframed using appropriate archival materials. The final goal of this project is to make the charts accessible, both on the Peabody Museum's website and in an exhibit. Although today many such historic educational visual aids are left to deteriorate or are discarded, this restoration project will ensure that Karl Zittel's wall charts remain a source of information in the study of paleobotany.

Courtesy of M. Dove (2)

Peabody Welcomes Social Ecologist Michael Dove

Michael R. Dove, the Margaret K. Musser Professor of Social Ecology in Yale's School of Forestry & Environmental Studies, has been named a curator in anthropology at the Yale Peabody Museum of Natural History.

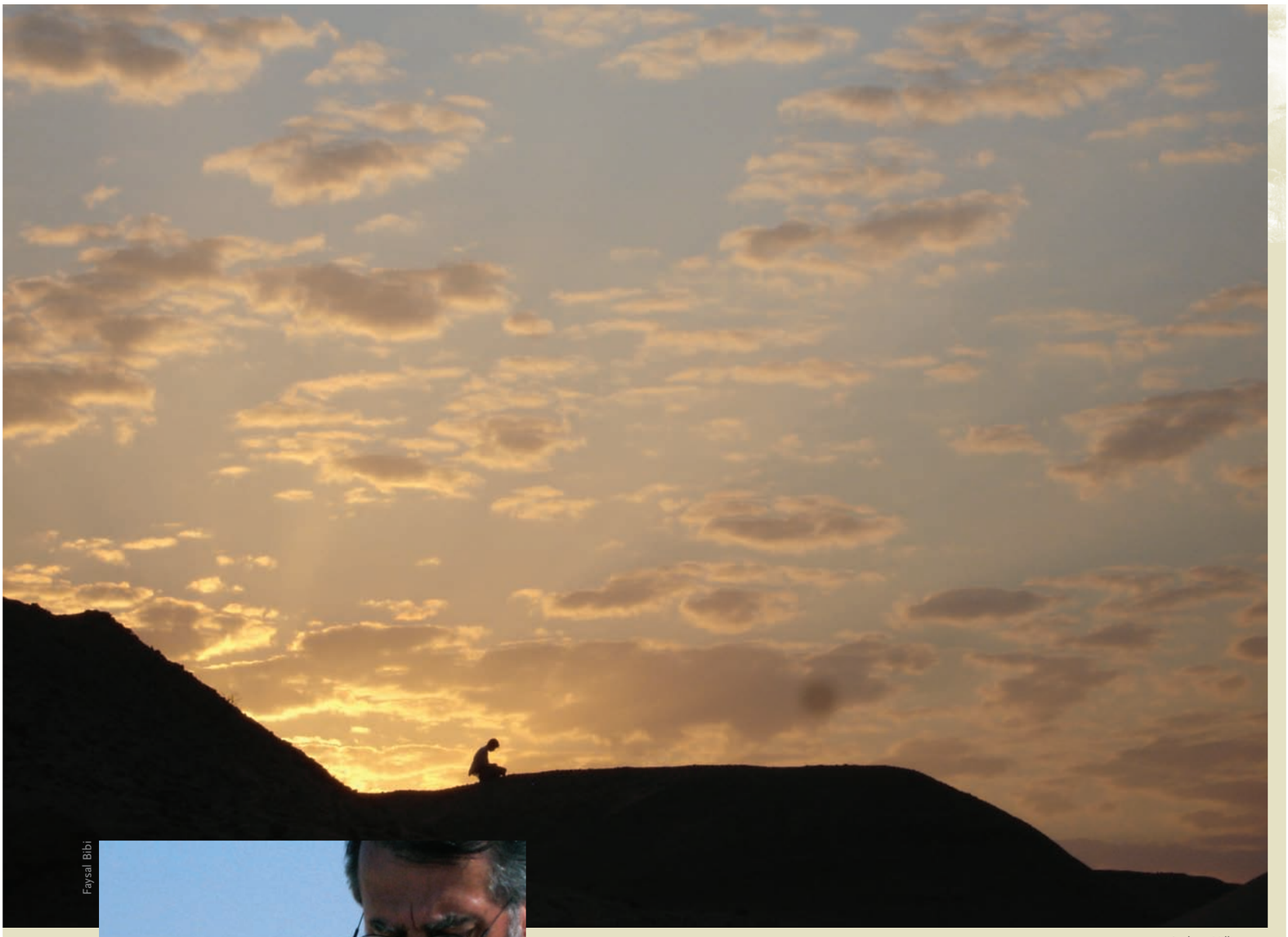
Professor Dove's research focuses on the environmental relations of local communities in less-developed countries, especially in South and Southeast Asia. He spent two years in a tribal longhouse in Borneo studying swidden agriculture, six years as a research adviser in Java studying the formation of government resource policy, and four years in Pakistan advising its forest service on social forestry policies. His most recent book is *Conserving Nature in Culture: Case Studies from Southeast Asia*, co-edited with Percy E. Sajise and Amity Doolittle (2005, Yale Southeast Asia Monograph Series). Professor Dove's forthcoming books are on the anthropogenic grasslands of Southeast Asia (New York Botanical Garden) and the history of environmental anthropology, with Carol Carpenter (Blackwell). He is currently completing books on vernacular dimensions of conservation in Southeast Asia (with P. Sajise and A. Doolittle) and on the historic participation of remote Bornean tribes in global commodity production.

One of Professor Dove's current research projects, in collaboration with colleagues in Indonesia, focuses on the cultural and political aspects of natural hazards and disasters in central Java. Another ongoing research activity, with members of the Dove–Carpenter doctoral lab, consists of a theoretical critique of key academic and policy concepts in current conservation and development discourse. Other research and teaching interests include the global circulation of environmental concepts; political dimensions of resource degradation; indigenous environmental knowledge; contemporary and historical environmental relations in South and Southeast Asia; the study of developmental and environmental institutions, discourses and movements; and the sociology of resource-related sciences.

Professor Dove's interests in material culture and museology include such topics as swidden tools and technology, the ancient, global trade in tropical forest products, the worldviews of 19th century collectors and natural historians like Alfred Russel Wallace, and the social science of 20th-century anthropology and archaeology.

LEFT Michael Dove and colleague Jamil Qureshi meeting with farmers in an arid region of the Punjab, Pakistan.

RIGHT Michael Dove and assistants interviewing a tribal leader in Baluchistan Province, Pakistan.



Andrew Hill

Faysal Bibi

A Return to the Desert

By Andrew Hill, Clayton Stephenson Professor of Anthropology, Yale Department of Anthropology, and Curator, Division of Anthropology

Peabody Welcomes Anthropology Curator Roderick McIntosh

Roderick James McIntosh, professor of anthropology at Yale and visiting professor (permanent) of archaeology in the Department of Anthropology and Archaeology at the University of Pretoria in South Africa, has been named a curator in anthropology at the Yale Peabody Museum of Natural History.

Professor McIntosh's major interests are in African and Old World comparative prehistory, the intellectual history of prehistoric archaeology, ethnicity and specialization and the origin of authority in complex society, urbanism, geomorphology and palaeoclimate, the international art market, and prehistoric symbols and ideology. He was involved in the birthing of the first bilateral accord banning the import of antiquities into a "market" nation (U.S.A.) from a "source" nation (Mali). For the past 30 years he has compared the urban landscapes of the great Niger and Senegal floodplains, and has been the co-director of investigations at Jenne-jeno, sub-Saharan Africa's oldest city. His recent and forthcoming books and site reports are on the antiquities traffick (*Plundering Africa's Past*, edited with Peter Schmidt), syntheses of Middle Niger and West African prehistory (*Peoples of the Middle Niger: Island of Gold*; *Prehistoric Investigations at Jenne, Mali*; *Ancient Middle Niger: Urbanism and the Self-Organizing Landscape*), archaeological investigations along the middle reaches of the Senegal River (*Archaeological Excavations and Reconnaissance Along the Middle Senegal*), and

Arabia lies at the junction of three classic biogeographic zones: the Palearctic, the Ethiopian and the Oriental. It has clearly played a significant role in the establishment of the characteristic terrestrial faunas of those regions. However, there are very few appropriate fossil sites known on the subcontinent that might provide information on the nature of the Arabian fauna and its environments through time.

So it was particularly exciting for me to be invited in 1984 to Abu Dhabi, one of the United Arab Emirates on the Arabian Peninsula, to help evaluate some fossils found by an archaeological survey team in the west of the Emirate. These fossils proved fascinating, and included hippopotamuses and pigs with clear affinities with 6- to 8-million-year-old species I already knew from my work in eastern Africa. So began a 10-year research program, conducted jointly with the late Peter Whybrow of the Natural History Museum, London, and our Abu Dhabi counterparts. This program culminated in the First International Conference on the Fossil Vertebrates of Arabia, which Whybrow and I organized in Abu Dhabi, and led to the publication of our monograph, *Fossil Vertebrates of Arabia: With Emphasis on the Late Miocene Faunas, Geology, and Palaeoenvironments of the Emirate of Abu Dhabi, United Arab Emirates* (1999, Yale University Press). Then, a few years ago, Faysal Bibi, at that time an undergraduate at the University of California at Berkeley, led his own project to Abu Dhabi and resumed work on some of the sites.

Although now in a desert, the Abu Dhabi sites were formed in the context of a large river, perhaps a proto-Tigris. The lush conditions along this river six million years ago or so supported a varied fauna that included elephants, hippopotamuses, rhinoceroses, bovids, horses, giraffes and pigs, as well as birds, and a range of small mammals and invertebrates. Some are new species; some show affinities with already known fossil taxa in Africa and Asia. This is the only fossil terrestrial vertebrate fauna known from the whole of Arabia between 17 million years ago and the Pleistocene.

Last December Faysal, by now a graduate student in the Department of Geology & Geophysics at Yale, and I were invited by the Abu Dhabi Authority on Culture and Heritage to report on the status of vertebrate paleontology in the Emirate. We spent two weeks in the western desert with Abu Dhabi Authority scientists Mark Beech and Walid Yasin, revisiting my old sites and seeing new ones. The former localities, along the Arabian Gulf coast, remain productive, and new ones include extensive well-preserved trackways of elephants and other beasts, and a new series of fossiliferous exposures some way inland.

We hope soon to enter into an agreement with the Abu Dhabi Authority to lead a team, including other Yale Peabody Museum scientists and staff, to begin a new research program with annual visits for the next five years. Independent of these developments, Yale University has been fostering a collaboration with the Abu Dhabi emirate, so far mainly focusing on the arts. Possibly this proposed relationship could be expanded to the Peabody Museum, extending collaborative work beyond vertebrate paleontology to additional areas of natural history and ethnography.

Mark Beech

Andrew Hill

Faysal Bibi

ABOVE Faysal Bibi (left) and Andrew Hill excavating a hippopotamus radius at the site of Kihal, Abu Dhabi.

LEFT Faysal Bibi shows his find of a fossil ulna of a small carnivore.

RIGHT Andrew Hill excavates a hippopotamus humerus at Hamra, Abu Dhabi.

OPPOSITE PAGE

TOP The setting sun at Hamra is the backdrop for end-of-day excavating by Bibi.

BOTTOM Andrew Hill in the western desert of Abu Dhabi.

the human response to global climate change (*The Way the Wind Blows: Climate, History and Human Action*; *Climates of the Mande*; *Geomorphology and Human Palaeoecology of the Méma, Mail)*. He is currently co-authoring the update of Nehemia Levtzion's classic *Ancient Ghana and Mali,* entitled *Emerging Polities of the Western Sudan: Ancient Ghana and Mali.*

Future field work will concern the paleoclimate, floodplain dynamics, and rise and fall of cities in the now "dead" delta of the Niger, the Méma of Mali, and plotting a paleoclimate project along the Dornoch Firth of the Scottish highlands.

Professor McIntosh earned a doctorate from the University of Cambridge, has been a Guggenheim Fellow, was twice a Fulbright Senior Fellow (Senegal and Mali) and has held a fellowship at the Center for Advanced Study in the Behavioral Sciences (Stanford University). For four years he was involved in the reconstitution of archaeology at the University of Pretoria as a visiting professor (permanent).

Aerial photo of Jenne, Mali, descendant of the oldest city in sub-Saharan Africa (Jenne-jeno) and site of the world's largest adobe structure, the mosque. The annual floods of the Niger River, here lapping at the edges of the town, provide a fantastic harvest of rice and fish.

Peabody Invertebrate Zoology Division Receives Major NSF Grant

By Eric Lazo-Wasem, Senior Collections Manager, Division of Invertebrate Zoology

Eric Lazo-Wasem (5)

TOP Museum Assistant Daniel Drew cataloguing specimens in the Peabody Museum's KE EMu® collections management database system. Records are routinely uploaded to the Museum's searchable website automatically.

MIDDLE Specimens ready for processing. Decades-old preservative has in some cases darkened to a deep red-orange, making it difficult to browse the contents of the jars.

BOTTOM The precise shelf location of every specimen lot (in this case large peneid shrimp) is electronically recorded for instant retrievability.

RIGHT Images of specimens, such as these of crustaceans, will be made available over the web. left: ***Hyperiid amphipod Parathemisto*** (15 mm). right: Clam shrimp ***Eulimnadia*** (6 mm).

The National Science Foundation's Division of Biological Infrastructure, Biological Research Collections Program, has awarded the Yale Peabody Museum of Natural History's Division of Invertebrate Zoology a major grant to fund an ongoing curatorial initiative to move, reorganize and re-curate its fluid-preserved specimens. Once this project has been completed, more than 20,000 lots of primarily marine invertebrates will have been transferred from existing cramped storage in the basement of the Peabody Museum to a new climate-controlled, state-of-the-art storage facility in the Class of 1954 Environmental Science Center. The funding has allowed the Division of Invertebrate Zoology to hire a full-time museum assistant for the duration of the project (3.5 years), and to purchase supplies, such as glassware and alcohol, and a new microscope outfitted with a digital camera.

These specimens are recognized internationally for their historical and scientific importance. Most of the included groups (crustaceans, echinoderms, mollusks, tunicates) were collected as part of broad government surveys (such as the United States Fish Commission's faunal survey of the Western Atlantic) or major Yale University expeditions such as the Yale Seychelles Expedition (1957–1958). The development of each of these taxonomic group collections was guided by a noted specialist, and many of the specimens were referred to in countless scientific papers dating back to the 1860s. To this day scientists continue to use the data from these specimens to account for ever-changing trends in faunal composition, distribution and morphological variation. As techniques develop, even the oldest specimens may eventually be assessed for molecular studies that can answer questions about systematics and population genetics.

As specimens are brought from the Peabody Museum to the ESC, many will be transferred to new glassware—in many cases the current containers date to the late 19th century—and all fluid preservative (primarily ethyl alcohol) completely replaced. Specimen data will be recorded in the Museum's database, including the new location of each specimen. For the first time in divisional history the precise location of each catalogued specimen in the fluid-preserved collection will be known. Searchable data for all specimen records will be freely available to the scientific community, students, educators and the interested public on the Yale Peabody Museum's website.

In addition to basic specimen data, the Division of Invertebrate Zoology will be providing other "products" of value to the scientific community. As part of an ongoing project to create a database of localities from which Yale Peabody Museum specimens may have been collected, we will develop a web-based gazetteer to make accessible the locality, date and depth data of every station (more than 2,200) sampled by the United States Fish Commission in the Atlantic Ocean from 1871 to 1887 under the direction of Addison E. Verrill, Yale's first professor of zoology. This will be available for distribution to mapping programs

such as Google Earth. This gazetteer will document the geographical coverage of one of the most comprehensive surveys of the Atlantic Coast fauna ever conducted by the U.S. government. The Division's newly acquired photographic equipment will be used to capture digital images for distribution through the Peabody's website and other public-access digital repositories.

In addition to recognizing the outstanding historical significance of this material and the need to make it more accessible both physically and electronically, NSF reviewers were also clearly impressed by the extent of Yale University's commitment to the Peabody Museum, through its enhancement of the Museum's infrastructure and the strengthening of curatorial ranks with new faculty appointments.

Yale Ornithologists in Suriname

By Kristof Zyskowski, Collections Manager, Division of Vertebrate Zoology

In recent decades the attention of ornithologists working in South America has been focused mostly on the lowlands of Amazonia and the Andes. Among the least-studied areas has been the Guiana Shield, the region encompassing Guyana, Suriname, French Guiana and adjacent territories of Venezuela and Brazil. When planning their most recent field foray, ornithologists from the Yale Peabody Museum of Natural History sought to explore this relatively neglected corner of the continent. The search was narrowed to Suriname as the country with the greatest need for additional ornithological surveys and the most promising with respect to the research interests of Yale ornithologists and the holdings of the Peabody Museum.

In late 2005 the Peabody's Division of Vertebrate Zoology signed a three-year collaboration agreement with the representatives of Suriname's Nature Conservation Division (STINASU) and the National Zoological Collection of the University of Suriname. With this agreement and funds generously provided by Lynn Fusco of the Fusco Corporation and matched by Yale University, we were able to run two highly successful ornithological expeditions to remote corners of the country. A third trip is planned for June 2007.

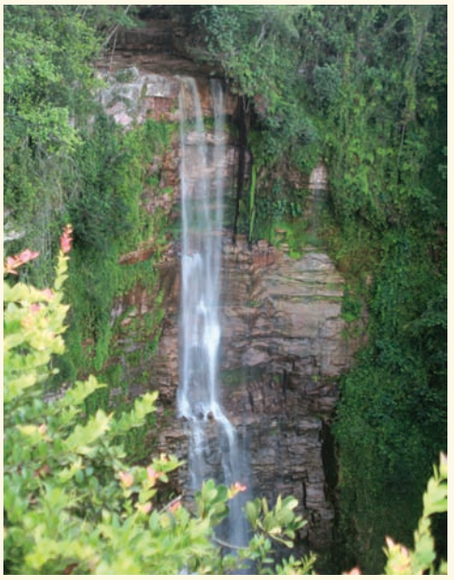
The first expedition in November and December of 2005 was devoted to surveying Tafelberg, an isolated, 1,026-meter peak within the recently established (and enormous!) Central Suriname Nature Reserve. Tafelberg is of special biogeographic importance as the easternmost in the chain of Guiana Shield tepuis (characteristic landforms of the Guiana highlands) and the only Roraima-sandstone mountain in Suriname. This flat-topped mountain is covered with pristine mesophytic forest and surrounded with thousands of hectares of unbroken lowland rainforest, with no human inhabitants except for the few people maintaining the Kappel airstrip some 30 kilometers to the south.

Our four-person team was joined by Surinamese ornithologist Otte Ottema and STINASU game warden Vincent Esajas. From

Kristof Zyskowski

Tafelberg, Suriname's only tepui, as seen from the Kappel airstrip.

Kristof Zyskowski



Augustus Creek Waterfall on the north face of Tafelberg. A daily spectacle at our Augustus camp was watching flocks of White-throated Swifts arriving at dusk and departing at dawn, flying through the spray of falling water to their nests in the wall behind the waterfall.

the capital of Paramaribo we were flown to Kappel airstrip and from there shuttled by helicopter to a recently cleared landing area on the north rim of the Tafelberg plateau. To access all the major habitat types across the 15- by 10-kilometer plateau, we established three base camps along an altitudinal gradient. Recent satellite images courtesy of Larry Bonneau of the Yale Institute for Biospheric Studies Center for Earth Observation were of great help in selecting the study areas. Our field work included daily visual surveys, mist-netting and hunting, and specimen preparation. The presence of each species was documented with voucher specimens, photographs, recordings of vocalizations and, for some species, video recordings of courtship behaviors.

Until our expedition, knowledge of Tafelberg's avifauna was based entirely on accounts of two Dutch biologists who visited the mountain briefly, Dirk C. Geijskes in April 1958 and Otte Ottema in March 2005. It is no surprise then that our findings included numerous first-site records and even new country records. Our inventory clearly shows that this easternmost of the tepuis is sufficiently large and elevated above the floor of the surrounding lowland forest to support isolated populations of montane bird species. These include the Tepui Greenlet (*Hylophilus sclateri*), Rufous-brown Solitaire (*Cichlopsis leucogenys*), Black-hooded Thrush (*Turdus olivater*), Speckled Tanager (*Tangara guttata*) and the distinct Guianan subspecies of the Chestnut-tipped Toucanet (*Aulacorhynchus derbianus*), which lacks chestnut tips to the tail feathers. More unexpected and biogeographically puzzling were our discoveries in Suriname of Pelzeln's Tody-Tyrant (*Hemitriccus inornatus*) and White-streaked Antvireo (*Dysithamnus leucostictus*). The former was previously known only from a handful of isolated localities near Manaus, Brazil, and the latter from the northern Andes and the Venezuelan coastal cordillera.

The focus of the second expedition, in July and August of 2006, was the Sipaliwini savanna and adjacent lowland forest in extreme southern Suriname. Here too we had the privilege of working in extremely remote and pristine areas where little prior ornithological research has been done. Access to these Amerindian tribal lands was possible only through the diplomatic channels developed by Conservation International and with their

Kristof Zyskowski

Our base camp on Cayman Creek, Tafelberg's highest point with a reliable water supply.

Susan Hochgraf

The tight helicopter landing area at the north edge of Tafelberg's flat-topped summit.

logistical support. We also benefited greatly from the excellent knowledge of the area and the impressive hunting skills of CI-contracted Amerindian assistants. In addition to these skilled helpers and a STINASU game warden, Sjoerd Prika, the team included three Yale students: Edward Stowe, Gideon Bradburd and student team leader John Mittermeier, all funded by summer internships from the Yale Peabody Museum and Yale's Environmental Studies Program (see Mittermeier's article on page 23 of this issue and "Yale Students Disperse to Four Continents on Summer Environmental Internships," *Yale Environmental News*, Fall 2006, 12(1):25–30). The student team members were accompanied by a Peabody ornithologist for the first three weeks and then continued with surveys and collecting on their own for another three weeks.

The avifauna of the Sipaliwini savanna is unique within the Guianan region because it is composed mostly of species typical of the cerrado and chaco regions south of the Amazon. We succeeded in collecting the first modern specimens and first tissue samples for all of these cerrado species. We also were surprised to discover pairs of White-banded Tanager (*Neothraupis fasciata*) as part of the mixed flocks of other cerrado specialists. This finding represents a new country record and extends the known range of this species by more than 1,000 kilometers. Furthermore, the student team was fortunate to discover a nest new to science at a forest site farther up along the Sipaliwini River. The nest belonged to the enigmatic Band-tailed Antshrike (*Thamnophilus melanothorax*), a Guiana Shield endemic species.

Overall, the two expeditions generated lots of valuable research material, including hours of sound and video recordings, hundreds of digital photos, and 628 specimens representing 212 species. The specimens complement beautifully the Yale Peabody Museum's existing holdings of some 2,000 specimens from the Guianan region. Among others, the collection includes a series of over 1,000 skins from French Guiana collected in 1917 and 1918 by Samuel Klages, and a small set of alcohol-preserved birds from Suriname collected in 1961 by Rudolph and Susan Freund. Our new specimens add 41 new taxa to the existing collection, including 5 genera, 16 species, and 20 subspecies; an additional 46 genera and 65 species are new to our anatomical (skeleton and fluid-preserved) collection. In more general terms, the specimens and data generated by the Peabody's Suriname program add significantly to our understanding of Guianan biodiversity and to the identification of high-priority areas for conservation. This is especially true when our results are combined with those being produced by the Smithsonian's Biological Diversity of the Guiana Shield Program, which focuses on the neighboring country of Guyana.

Kristof Zyskowski

A male Blue-backed Manakin.

Patricia Brennan

Participants of the 2005 Tafelberg expedition sharing their most showy specimens with the Peabody's ornithology curator Rick Prum (second from left). From right to left: Kristof Zyskowski, Jonas Lai and Sue Hochgraf; far left: Jorge de León.

Kristof Zyskowski

A female Guianan Cock-of-the-rock on her nest attached to a wall of a cave on Tafelberg.

Tracy Langkilde

Susan Bolden, David Skelly and Manja Holland (left to right) using the VisualSonics high-resolution ultrasound system to diagnose infection in a preserved frog.

Ultrasonic Frogs: New Technology Used to Track Animal Disease through History

Yale Peabody Museum of Natural History curator and professor of ecology David Skelly has teamed up with doctoral student Manja Holland and research technician Susan Bolden to investigate the use of ultrasound in studying disease.

The group learned in November 2006 that they had been awarded a $250,000 National Science Foundation grant to purchase a recently developed ultrasound system. Unlike typical systems, the new ultrasound machine from Canadian manufacturer VisualSonics is capable of discerning objects as small as 0.03 millimeter. This extremely high resolution opens up new possibilities for ultrasound analysis. The researchers plan to use it to uncover patterns of infection hidden inside frogs.

History of Illness

This work will be part of a larger effort to uncover the history of disease. Reports of disease among both people and wildlife seem to be increasing. This sense has led scientists to ask whether there is a historical trend for the increasing incidence of disease and whether such a pattern may be related to changes to the environment caused by humans. While seemingly straightforward, such questions are difficult to answer. New diseases are discovered each year and our ability to diagnose infection tends to improve over time. The best information about trends will come from systems where the same disease can be examined within a sample of "patients" that are distributed over time, but still available for diagnosis.

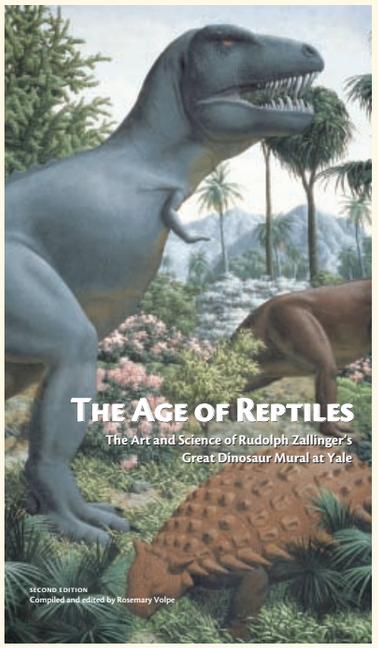
This study will focus on a group of parasites called echinostomes. Echinostomes form cysts in the kidneys and can number in the hundreds in highly infected animals. Recent research by Professor Skelly's laboratory at Yale has shown that infections can become severe, particularly in ponds in landscapes altered by human activity. In some cases, animals harboring the parasites undergo kidney failure and can die from infection and its aftermath. Holland's dissertation research examines why this happens and how severe the effects can be.

Treasure Trove

Thus far, research on echinostome infection has concentrated on modern patterns. Frogs preserved in museum collections provide a potential treasure trove of information, but there are challenges. Older specimens are irreplaceable; destroying them to remove and dissect the kidneys is typically not an option. Even if done with a few specimens, researchers are unlikely to get a picture of an overall pattern. Dissecting is also extremely time consuming. A single specimen may take an entire day.

Ultrasound investigation avoids these issues. Scanning is rapid and does not harm the specimen. The trick is figuring out how to apply the technology effectively. At a physician's office, the casual observer marvels at the ability of the technician to make out objects in an ultrasound image of a developing fetus that seem thoroughly abstract. This ability is the result of intense training. Ultrasound analysis used for research is no different. The research team began working with its new machine at the end of December and after one training session there is much more work ahead. Once proficient at scanning specimens and turning images into estimates of infection, they will move on to the Yale Peabody Museum's herpetology collection in the Division of Vertebrate Zoology, where Skelly serves as curator. The Peabody's rich historical holdings will be a critical proving ground for the use of specimens that may have been collected more than a century ago.

New Guide Marks the Peabody's Celebration of the Zallinger "Centenary"



In 2007 the Yale Peabody Museum is celebrating the 60th anniversary of the completion of *The Age of Reptiles*, and the 40th anniversary of *The Age of Mammals,* both painted by Rudolph F. Zallinger. Events throughout the year will celebrate this "centenary" of Zallinger's work. As part of this celebration, the Peabody Museum has published *The Age of Reptiles: The Art and Science of Rudolph Zallinger's Great Dinosaur Mural at Yale,* a revised, full-color edition of its guide to *The Age of Reptiles* mural.

An overview of prehistoric life told through the principal features and concepts of *The Age of Reptiles*, this new edition of the Peabody's guide to Zallinger's masterwork is a compilation of earlier material and new information contributed by the staff and scientists of the Peabody Museum. The descriptions of the life and landscapes depicted in the mural have been updated to reflect current knowledge in botany, zoology, paleontology and geology—information unknown and undiscovered in Zallinger's time—keyed to an included foldout, full-color poster, and enhanced with highlights from the Museum's distinguished history and rich collections.

Told here as well is Rudy Zallinger's story and, in his own words, the making of the remarkable achievement that is *The Age of Reptiles*, along with Yale Sterling Professor Emeritus of the History of Art Vincent Scully's classic essay on the mural's place in the history of art.

Zallinger's murals have figured prominently in the life of the Yale Peabody Museum, and are still being used to teach and inform not only schoolchildren and other visitors to the Museum, but, through countless reproductions and publications of all kinds, audiences worldwide. *The Age of Reptiles* mural in particular has for generations defined our view of the prehistoric world. Recruited when he was a senior at Yale's School of the Fine Arts to "decorate" the east wall of the Great Hall, Zallinger completed the 110-foot (33.5-meter) *fresco secco* painting, one of the largest natural history murals in the world, in less than five years. *The Age of Reptiles* earned Zallinger recognition from the Pulitzer Foundation in 1949, but the mural remained only a local attraction until New Haven's former mayor Richard C. Lee, at that time head of the Yale News Bureau, brought it to the attention of the editors of *Life* magazine. Once it was published in *Life* in the 1950s, the mural caught the imagination of the rest of the country.

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 visiting *www.peabodystore.com*.

The New Peabody Museum *Bulletin*

An important part of the mission of the Yale Peabody Museum is publication of the original research of staff and associates, and their colleagues, in the natural science disciplines based on specimens, artifacts and related materials represented by the collections of the Peabody Museum's curatorial divisions. To this end the Peabody's Publications Office produces and distributes the scholarly books and journals that report this research.

Last fall, the Peabody's two scholarly publications, *Postilla* and the *Bulletin of the Peabody Museum of Natural History*, were merged into a single journal to be published twice a year, in April and October. The new journal retains the *Bulletin* name, which has been in use since the opening of the Yale Peabody Museum building in 1925. Papers in the first two issues of the newly designed *Bulletin* covered topics as diverse as the taxonomy and biology of decapod crustaceans, primitive fossil insects, deep-sea lobsters, Connecticut's amphibians and reptiles, a systematic revision of fossil turtles, the paleoecology of *Deinonychus*, taxonomy of fossil eurypterids, notes on epibionts of sea turtles, and faunal analysis of large mammals from the La Quina archeological site in France.

Curatorial Editor Professor of Geology & Geophysics Jacques Gauthier and Executive Editor Larry Gall are actively soliciting contributions from scholars working on Peabody material. Interested authors should contact Executive Editor Gall at lawrence.gall@yale.edu for information. For author guidelines go to *www.peabody.yale.edu/scipubs/*.

Primitive Primates Discovered in Paleocene Limestones

Michael Marsland

ABOVE Eric Sargis holds the skull of *Ptilocercus lowii*, the pen-tailed tree shrew. *Ptilocercus*, a very primitive tree shrew that was important for the current study, is similar to *Dryomomys szalayi* in many ways.

RIGHT

1. A reconstruction of the primitive aboreal primate *Ignacius clarkforkensis*.

2. Illustrations of the primitive primates *Ignacius clarkforkensis* (top) and *Dryomomys szalayi* (bottom).

3. Illustrations of the newly described primates were featured on the cover of the journal *Proceedings of the National Academy of Sciences*. Shown are the skeletons of the primitive primates *Dryomomys szalayi* (left) and *Ignacius clarkforkensis* (right).

A team of paleontologists that includes Eric Sargis, associate professor of anthropology at Yale and associate curator of mammalogy at the Yale Peabody Museum of Natural History, has discovered two new primitive primates in freshwater limestone blocks from the Clarks Fork Basin in Wyoming. The two fossils are approximately 56 million years old, placing them in the Paleocene epoch (65 to 55 million years ago), the period between the extinction of dinosaurs and the first appearance of undisputed members of modern mammalian orders. The team, led by Jonathan Bloch, curator of vertebrate paleontology at the Florida Museum of Natural History, described the two new skeletons, which were featured on the cover of the January 23, 2007, print edition of the *Proceedings of the National Academy of Sciences*. The specimens were prepared from the limestones by Bloch and co-author Doug Boyer, a graduate student in anatomical sciences at Stony Brook University.

Both of the fossils are plesiadapiforms, archaic mammals mostly known from the Paleocene. Plesiadapiforms were traditionally classified in the order Primates, but in the early 1990s were proposed to be more closely related to flying lemurs (order Dermoptera), based on a study of incomplete fossils and a small data set. To test this hypothesis, the team analyzed 173 features from every region of the skeleton in more than 85 species of modern primates, flying lemurs, tree shrews and plesiadapiforms. As part of this analysis Bloch and co-author Mary Silcox, professor of anthropology at the University of Winnipeg, made high-resolution computed tomography (CT) scans of plesiadapiform skulls, which allowed them to examine inaccessible characteristics, particularly of the ear region. The team's extensive analysis yielded a well-supported phylogenetic tree showing that plesiadapiforms are primitive ("archaic") primates.

The new skeletons were also critical for reconstructing the locomotor behavior of plesiadapiforms. For example, *Ignacius*, a paromomyid plesiadapiform previously known only from skulls and unassociated skeletal elements, had been proposed to be a gliding mammal similar to flying lemurs. However, the more complete (and associated) skeleton of the newly described species, *Ignacius clarkforkensis*, unequivocally shows that this animal was an arboreal primate, not a glider.

The new genus that the team described, *Dryomomys szalayi*, has the most primitive primate skeleton ever described, similar in several aspects to that of the arboreal *Ptilocercus lowii*, the pen-tailed tree shrew. *Ptilocercus,* the most primitive living tree shrew, has been the focus of much of Sargis's previous research. It is also extremely rare in museum collections; there are only seven skeletons in museums throughout the world, including the one housed at the Yale Peabody Museum. *Dryomomys szalayi*, a micromomyid plesiadapiform, is named for Dr. Frederick Szalay, Sargis's former graduate adviser, who described the first micromomyids in 1973 and 1974, and who has a large body of work on the paleobiology of other plesiadapiforms. Stephen Chester, a Yale graduate student working with Sargis, will continue the study of *Dryomomys* and other micromomyids for his dissertation research.

The inclusion of plesiadapiforms in Primates is significant because it extends the primate fossil record back by 10 million years. Modern primates are characterized by a suite of traits, including grasping hands and feet with nails instead of claws on the digits (or at least the big toes), enhanced vision and forward-facing eyes, relatively large brains, dental specializations for eating fruit, and skeletal specializations for leaping locomotion. The team's analysis shows that plesiadapiforms are early (stem) primates that have some, but not all, of these traits, indicating that the suite of

Doug Boyer, Stony Brook University

modern primate traits accrued incrementally through the first 10 million years of primate evolution. They also concluded that plesiadapiforms were very small, arboreal primates that likely ate a significant amount of fruit, and that the transition from eating more insects to eating more fruit coincided with the radiation of angiosperms (flowering plants). These early primates are critical for understanding our own origins because they document the initial divergence of primates from other mammals, as well as the earliest evolutionary history of our order.

The team will continue investigating the relationships of primates as part of the Mammal Tree of Life project (*http://mammaltree.informatics.sunysb.edu/*), a much broader collaboration that brings together 28 investigators at 17 institutions. This collaboration, funded by the National Science Foundation Assembling the Tree of Life project (*http://atol.sdsc.edu/*), will include many more species and features, allowing the team to further test their newly proposed phylogenetic hypothesis.

The team's research was supported by grants from the National Science Foundation, the Field Museum of Natural History, Yale University, the Sigma Xi Scientific Research Society, the Natural Sciences and Engineering Research Council (Canada), the University of Winnipeg, the Paleobiological Fund, and the Wenner-Gren Foundation for Anthropological Research.

3

THE EDWARD P. BASS VISITING ENVIRONMENTAL SCHOLARS PROGRAM

WILLIAM CRONON RETURNS TO YALE AS EDWARD P. BASS DISTINGUISHED LECTURER

Professor William Cronon, Frederick Jackson Turner & Vilas Research Professor of History, Geography, and Environmental Studies at the University of Wisconsin, and former member of the Yale faculty, returned to Yale as an Edward P. Bass Distinguished Lecturer on February 12, 13 and 14. Professor Cronon's visit was sponsored by the Edward P. Bass Distinguished Visiting Environmental Scholars Program.

Professor Cronon is the author of *Nature's Metropolis: Chicago and the Great West* (W.W. Norton, 1991), awarded the Bancroft Prize and Chicago Tribune Heartland Prize, and *Changes in the Land: Indians, Colonists, and the Ecology of New England* (20th anniversary edition, Hill & Wang, 2003), awarded the Francis Parkman Prize. He is the editor of *Uncommon Ground: Rethinking the Human Place in Nature* (W.W. Norton & Co., 1996), an original collection of essays to which he contributed an introduction and first chapter—"The Trouble with Wilderness, or, Getting Back to the Wrong Nature"; and *Under an Open Sky: Rethinking America's Western Past* (W.W. Norton & Co., 1992), with George Miles and Jay Gitlin.

While at Yale, Professor Cronon presented two lectures, the first *Prophetic Nature: Where Environmental Past and Future Meet* in the Department of Sociology, and the second, *And the Moral of the Story Is...: Fables of Climate Change* at the School of Forestry & Environmental Studies. He also met with faculty and students in the Departments of History and Sociology, and at the School of Forestry & Environmental Studies.

EDWARD P. BASS DISTINGUISHED VISITING ENVIRONMENTAL SCHOLAR CHRISTIAN KÖRNER

Christian Körner, Professor of Plant Ecology at the University of Basel, Switzerland, served as Edward P. Bass Distinguished Visiting Environmental Scholar in the Department of Ecology & Evolutionary Biology during April and May 2007.

Professor Körner is particularly interested in the impact of elevated CO_2 on the growth of forests, and in plant diversity at high altitudes. He is the author of *Alpine Plant Life* (2nd edition, Springer Verlag, 2003), and *Carbon Dioxide, Populations and Communities* (with F. Bazzaz, Academic Press, 1996). His edited books include *Land Use Change and Mountain Biodiversity* (with E. Spehn and M. Liberman, CRC Press, 2005), and *Mountain Biodiversity, a Global Assessment* (with E. Spehn, Parthenon, 2002).

During his visit to Yale Professor Körner presented three lectures—*Beyond Counting: The Functional Significance of Biological Diversity*; *Trees at the Limit: The Global Cold Climate Treeline Phenomenon*; and *The Globe's Green Roof in a CO_2-Rich Future*—and he addressed members of the Yale Institute for Biospheric Studies External Advisory Board on *Biosphere Responses to Enhanced Carbon Supply.* He met with faculty and students in the departments of Ecology & Evolutionary Biology and Geology & Geophysics, and at the School of Forestry & Environmental Studies.

STUDENT NEWS

John Mittermeier (3)

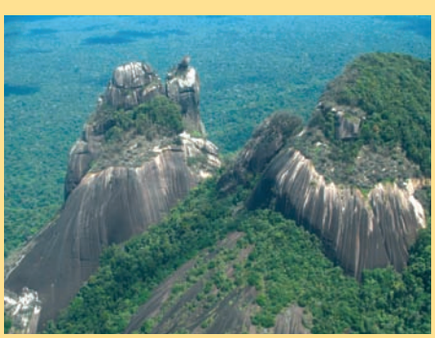
A Yale Student Expedition Discovers a New Bird for Suriname

By John Mittermeier, Yale '08

That bird is not in the book! It was late afternoon in the Sipaliwini savanna of southern Suriname and I had just focused my binoculars on a bird unlike anything I'd studied in field guides. Roughly sparrow-sized with a stout, pointed beak, pearl gray upperparts and a conspicuous black mask, the bird—as we would later identify it—was a White-banded Tanager (*Neothraupis fasciata*). Native to the grasslands of southern Brazil, Bolivia and Paraguay, the individual I had spotted was more than a thousand kilometers beyond its known range. It was the first time the species had ever been recorded in Suriname, or in South America north of the Amazon.

After this initial sighting, our expedition team—Yale Peabody Museum Division of Vertebrate Zoology Collections Manager Kristof Zyskowski, Edward Stowe (Saybrook, Class of 2007), Gideon Bradburd (Berkeley, Class of 2008) and myself—regularly recorded small groups of White-banded Tanagers in the Sipaliwini area of southern Suriname. Apparently a fairly common species in this isolated patch of natural savanna, the White-banded Tanager exemplifies how much remains to be discovered about the avifauna of Suriname.

Sandwiched between Guyana and French Guiana on the northern coast of South America in an area known as the Guiana Shield, Suriname—roughly the size of the state of Georgia—is known to be home to 715 species of birds, nearly as many as are found on the entire European continent. Despite this rich diversity, comparatively few museum specimens have been collected in Suriname. Specimens serve as a permanent, physical record of a region's avifauna; they document the presence of species in space and time. Without them there is no foundation on which to construct an understanding of a region's birds and no way for researchers to compare the morphological variation, anatomy or DNA of species. In the case of Suriname, the lack of specimens has undermined attempts to gain a basic understanding of the country's avifauna and crippled phylogeographic studies of Guiana Shield birds.



Edward Stowe and Iwan Derveld show specimens to Tareno schoolchildren visiting the Werehpai forest.

LEFT The first nest of a Band-tailed Antshrike (***Thamnophilus melanothorax***) to be described to science.

RIGHT The Devil's Egg, a striking granite mountain rising above the forests of central Suriname.

Kristof Zyskowski (2)

Specimens of White-banded Tanager from Sipaliwini. This distinctive species has been previously known only from the cerrado region in the interior of South America.

Edward Stowe and the author listening for birds in a coastal swamp near Galibi.

John Mittermeier

Members of the ornithological expedition team with their gear on the Kwamalasamutu airstrip. From left, Koita Koeramihte, Sjoerd Prika, Gideon Bradburd, Iwan Derveld, Edward Stowe, Kupias Tawadi, Semmie Andre and Kamanje Panashekung.

In July and August of 2006, our team traveled to Suriname to explore areas along its north coast and in the extreme southern part of the country. We had the good fortune of being able to collaborate with local environmentalists from the Nature Conservation Division of the Suriname government, Conservation International–Suriname, and Amerindians from the village of Kwamalasamutu. In the field we were joined by as many as seven local people at a time, including foresters, Tareno hunters and a game warden.

Our expedition focused on four major ecological zones: mangroves, coastal white-sand forests, lowland terra firme rainforests, and the natural savannas of the Sipaliwini. At each of these locations we collected birds with mist nets and by hunting, conducted visual surveys, photographed specimens and recorded vocalizations.

Over the course of four weeks we collected 276 ornithological specimens representing 136 different species. Of these, 26 bird taxa were new for the Peabody collections. Additionally, we collected 45 herpetological specimens of 22 different species, 11 of which represented species new to the Museum's collections. We also found and collected three bird nests, one of which—that of the Band-tailed Antshrike (*Thamnophilus melanothorax*)—was the first ever documented for the species.

In exchange for help in finding local birds, we taught basic methods for ornithological survey work, mist netting and museum specimen preparation to some of the local conservationists working with us. Beyond the direct field work, we prepared a display of our collection for the village *granman,* or headman,

F&ES Students Develop Management Plans for Protected Areas

By Alan Bisbort

Last December at the School of Forestry & Environmental Studies (F&ES), 12 members of the Class of 2007 stopped being students for an afternoon and assumed the role of, in the words of Professor Mark Ashton, "apprentice professionals." That is, these second-year students presented their first land management plans to some noteworthy clients, including a private school whose Yale connections span more than a century, and the City of New Haven.

The plans were the culmination of the six-credit capstone course called Management Plans for Protected Areas, taught by Ashton '85, Ph.D. '90, Professor of Silviculture and Forest Ecology, and Thomas Siccama, Professor in the Practice of Forest Ecology, and assisted by David Ellum, a doctoral student; Amity Doolittle '94, Ph.D. '99, a lecturer in social science and research scientist; Timothy Gregoire '82, Ph.D. '85, J.P. Weyerhaeuser Jr. Professor of Forest Management; Ann Camp '90, a senior lecturer and research scientist in stand dynamics and forest health; John McKenna '00, GIS specialist and coordinator of certification and extension for the School Forests; and David Hobson '04, Manager of School Forests.

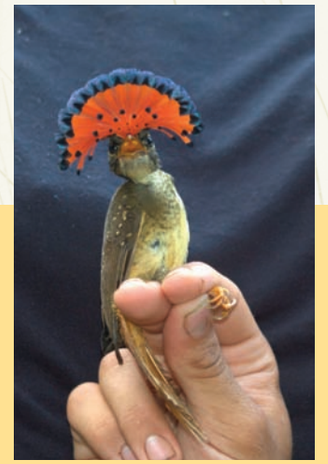
"It's called *capstone* because it is a six-credit terminal course that brings together disciplines in the social and natural sciences that a student should have learned," said Ashton. "With the skills they've acquired, they focus on an assessment of a property with its user conflicts and ecological problems and suggest solutions based on gathering and analyzing primary information—*primary* meaning that students obtained as much information as possible from field and social surveys."

In short, they did work that F&ES grads-turned-professionals do on a regular basis for nongovernmental organizations, private landowners, land trusts, governments and others. The students formed three four-member consulting teams, and each team was responsible for one plan. The three properties under review were Fairfield/Blum Farm at the Hotchkiss School in Lakeville, Conn.; the Dudley Woods Preserve in Guilford, Conn.; and Beaver Ponds Park in New Haven.

To create their plans, students compiled land use and zoning histories of their site; mapped it; documented the types of rock, soil,

Kristof Zyskowski

John Mittermeier (3)



A few of the birds found in southern Suriname (left to right): White-rumped Tanager (*Cypsnagra hirundinacea*), a savanna specialist from the Sipaliwini; White-plumed Antbird (*Pithys albifrons*); Mottled Owl (*Ciccaba virgata*); and Amazonian Royal Flycatcher (*Onychorhynchus coronatus*), species from the lowland rainforests of Werehpai.

of Kwamalasamutu, and gave two demonstrations to local schoolchildren in the village. We are continuing to collaborate with Conservation International to put together a preliminary bird checklist for the Werehpai area, an important first step in attracting ecotourism.

Perhaps as significant as these concrete accomplishments was the experience of the expedition. Ed, Gideon and I traveled hundreds of miles into one of the most pristine wildernesses on earth, hunted with shotguns, waded through swamps, swam with piranhas, ran rapids by canoe and starred in a national television report documenting our project. At Galibi we watched a giant leatherback turtle nest on the beach. In Sipaliwini a sudden dust storm nearly destroyed our specimens and blew away Ed's tent. In the dense forests of Werehpai a jaguar ran across the path in front of us and I accidentally stepped on the head of a six-foot-long bushmaster, the deadliest snake in the Americas.

For many birders, discovering a new country record like the White-banded Tanager or finding an undescribed nest is an unlikely dream. For me, these were just two of many highlights in an unforgettable summer.

I would like to thank the Yale Peabody Museum Summer Internship Program, the Environmental Studies Summer Internship Program, Kristof Zyskowski, Annette Tjon Sie Fat, Russell Mittermeier, Richard Prum, Bryan Drakenstein and Conservation International–Suriname. It was only through their help and support that this experience became possible. Iwan Derveld, Kamanje Panashekung, Koita Koeramihte, Semmie Andre, Sjoerd Prika, Edward Stowe and Gideon Bradburd also deserve recognition for their fantastic efforts in the field.

forest, wetland and species (including invasive species) found there; and gave clients recommendations for its future stewardship. Judging by the reactions of those assembled in Marsh Hall, the three plans were successes.

For example, after vowing to implement many of the recommendations, Hotchkiss School representative Rosina Rand said, "We are thankful for the exceptional students who worked for and with us." Cristin Rich '88, the school's environmental consultant, said, "We were so gratified to have these students, because they offered terrific information that we don't have the manpower to get."

Hotchkiss has had a close relationship with Yale since the school's founding in 1891. The school's goal from the start was "to prepare young men for Yale" (and, after 1974, young women too). Many Hotchkiss students go on to Yale, and many Yale alumnae sit on the Hotchkiss board of directors. In 1996, the school made a commitment to environmental stewardship, and it now uses 500 acres of woods, wetlands and fields, including Fairfield/Blum Farm, as part of the learning experience.

The management plan was created specifically for the 260-acre farm, which abuts the Hotchkiss campus and was purchased from the Blum family in 2004. The land is located within the Housatonic River watershed and bordered by Nature Conservancy property (Beeslick Brook Wetland). Christopher Craig, Avery Anderson, Tamara Muruetagoiena and Ariane Lotti created the plan, under the banner CATA Consulting. They surveyed the land and worked with the farm's stakeholders, including faculty, students, the dining hall manager, The Nature Conservancy, the Audubon Society chapter in Sharon and the Fairfield/Blum Farm Committee, which is composed of faculty, staff and consultants and makes decisions about how the farm will be utilized by the school.

CATA Consulting noted that 70 years after the land was cleared for farming, forest has returned to 80 acres of the farm and is broken into two parcels at the north and south ends. A diversity of trees, including the dominant species white pine, maple, ash and cedar, was found, as was "a veritable study in invasive species." Such introduced species as autumn olive, honeysuckle and multiflora rose have expanded exponentially, overwhelming native species and making the forest at the south end impenetrable; other invasive species (*Phragmites*, purple loosestrife) are also choking the wetlands.

Among CATA's recommendations were to adopt the invasive-species management plan used by The Nature Conservancy on the adjoining land; set up a 50-foot buffer zone to keep cows from a neighboring farm from eating native plants and soiling the water; clean up a dump that includes old cars; and create a trail through the forests and a boardwalk over the wetlands for students and birdwatchers. To address the Audubon chapter's concerns about preserving habitat, the team recommended installing bird houses to increase species diversity and implementing a new mowing regimen in which only one-third of the hayfield would be mowed annually in order to avoid the destruction of habitat that results when the entire hayfield is cut. To curtail the danger of Lyme disease, the deer population would be thinned by hunting.

Because 150 of the 260 acres are still potentially farmable, CATA recommended that Hotchkiss consider a poultry and vegetable farm with a community-supported agriculture component—that is, an arrangement in which members of the community pay a local farmer an annual membership fee to cover the production costs of the farm and, in turn, members receive a weekly share of the harvest during the local growing season. The immediate goals, as presented by CATA, are to get basic information about the farm to all Hotchkiss students, faculty and staff; hire a full-time farm manager who also teaches at the school; and include a farm component in the science curriculum. The farm, CATA concluded, "is important for experiential learning ... teaching students where their food comes from, how to work and manage resources and deal with complex issues of the natural world."

Since Thomas Siccama informally started the Management Plans for Protected Areas course in the 1960s, over 110 management plans have been produced for properties throughout New England, 70 since the course was formalized in 1993. Ashton says that the clients cheerfully pay for all expenses that the students incur, because in the end they avoid the fees charged by environmental consulting firms. And the students get invaluable practical experience by putting their education to work in creating the plans and in learning the art of political compromise.

"This is the second time we've availed ourselves of help from F&ES students," said Rich, of the Hotchkiss School. "Three years ago, students from Professor Ashton's class created a plan for Beeslick Brook that codified a base of knowledge that has proven instrumental in generating interest in the woods along the brook. We've since reprinted additional copies of that report. Partly based on that positive experience, we contacted the school again when we purchased the Blum Farm."

Ashton says there is a long queue of clients waiting to take advantage of the expertise of F&ES students, ensuring that the students will be leaving their imprint on the New England landscape for decades to come.

RESEARCH AND PROGRAM HIGHLIGHTS

Tackling Forestry's Challenges Through Dialogue

By Jackie Fitzpatrick

It starts with a packet of seedlings, a patch of land and unyielding terrain, where it is difficult to farm traditional crops. With the seedlings and an interest-free loan, subsistence farmers from the KwaZulu-Natal Province of South Africa begin to grow trees. The process takes time; the first crop will not be ready for about five to seven years, but the tree growers can rely on experts from Sappi, a global pulp and paper company based in Johannesburg, to help them nurture the trees. Sappi also guarantees a market for the timber. The workers are part of Project Grow, a program that unites private business, nongovernmental organizations (NGOs) and people from local communities who are in need of work. Project Grow had three participants at its inception in 1983. Today, more than 9,800 small farmers provide the company with 124,000 tons of timber each year.

Challenges in the region are many. A second phase of the program, creating entrepreneurial opportunities for local people to harvest and transport the timber, has been problematic because of the high cost of equipment and the lack of local access roads. The region is also riddled with high rates of HIV/AIDS and other health problems.

Still, life has improved for the impoverished growers, 80 percent of whom are women. Families have seen their incomes increase, and many have been able to put their children through college. More than 80 families have used the tree income to start other small businesses in the area, and one man built a church for his community with the money that came from his timber sales.

Last year, 27 representatives of major paper corporations, government, family tree farms, organized labor, forestry concerns, investment firms and NGOs, including conservation groups like The Nature Conservancy, gathered in Richards Bay, South Africa, for a "scoping" dialogue convened by The Forests Dialogue (TFD) to discuss poverty and how it could be ameliorated by the sustainable use of forests. TFD is an ad hoc group of individuals from diverse interests and regions that is committed to the conservation and sustainable use of forests. The Global Institute of Sustainable Forestry at the Yale School of Forestry & Environmental Studies (F&ES) hosts the Secretariat of TFD, according to Executive Director Gary Dunning '96. The participants of the scoping dialogue heard from a representative from Project Grow, and they visited the small tree farms to see firsthand how the project has helped people in the region.

Reducing poverty through commercial forestry is the most ambitious goal of TFD to date. TFD's steering committee had addressed other issues in the past, including forest certification, illegal logging and the biodiversity of forests, but it kept returning again and again to the questions: Could poverty be reduced through commercial forestry? If so, how?

"It's certainly an ambitious goal and an important one," said Cassie Phillips, who along with Justin Ward, vice president of business practices at Conservation International, is the co-leader of TFD. Phillips, vice president of sustainable forests and products for Weyerhaeuser, added, "It is the biggest topic we have tried to tackle, and it has gotten a lot of support from many different stakeholders."

Phillips said having so many divergent points of view in the room "catalyzes people to do things. You get good people in a room and they start to see each other's points of view, and they start to see solutions."

For example, during a dialogue in Hong Kong on illegal logging in 2005, the Environmental Investigation Agency screened a video that it had created about how illegal logs from Papua, Indonesia, were ending up in Chinese mills that shipped flooring to the United States and Europe. Dunning said representatives of the Chinese government attending the dialogue saw the film, and a month later the Chinese government shut down every

mill in the towns where those logs were being used. "They felt compelled to clean up the supply chain, to keep illegal logs out of the mills," Dunning said.

Until the TFD was formed, a radical environmental group that works undercover and the Chinese government would never have attended that kind of forum together. The dialogue gave them the chance to communicate with each other in private, without the press recording their every move.

"Yale is an academic institution with an international presence and a strong program on forests and the environment," said Dunning. "So it was uniquely equipped to host the neutral Secretariat."

Dean Gus Speth said that TFD is also a unique teaching tool for graduate students who research the dialogue topics, write background papers that lead to summary reports and work with the many different constituencies represented at the dialogues. "Yale has a lot of expertise and knowledge to bring to the table in these discussions, but perhaps one of the most compelling reasons that we are involved is for the perfect training ground it provides our students."

commercial forestry are the keys to relieving poverty there.

The summary report said the group found that "demand for a wide range of sustainable forest products and ecosystem services, including fiber and wood, conventional non-timber forest products, biomass and green energy, and recreation and biodiversity, present opportunities for many levels of society, especially the rural poor, to earn sustainable incomes." At a full dialogue scheduled for June, the invited parties will work to take advantage of these opportunities.

William Ginn, managing director of the Global Forest Partnership of The Nature Conservancy, said, "For us to see the change we want to see in the world, we have to engage with others, especially in the economic sector," adding that his organization has many important partnerships with industry, including one with Weyerhaeuser that grew out of the dialogues. In 2006, Weyerhaeuser and the Weyerhaeuser Company Foundation pledged a million dollars to The Nature Conservancy, teaming up to develop forest conservation and biodiversity projects in the Northwest and Southeast United States, where the company owns and leases 6.4 million acres of managed forest.

Reducing poverty through commercial forestry is the most ambitious goal of TFD to date.

The TFD went to South Africa, as Phillips and other steering committee members pointed out, to highlight how, in many impoverished communities, forests are "the one resource that they've got." They visited Project Grow and the forestry company Mondi's programs. They listened to speakers, including Inviolata Chinyangarara, who represents the Building and Wood Workers' International union, and Rosane Monteiro Borges of Aracruz Brazil, who addressed the company's efforts to use local farmers to grow eucalyptus trees. They heard from Chris Mkhize of the Uthungulu Community Foundation in South Africa, who said in a report to the committee that when poverty is extreme, such as in some rural South African communities, "the poor do not have the ability—by themselves—to get out of the mess." Education and training in

Gerhard Dieterle, the forests adviser of agriculture and rural development for the World Bank, who attended the scoping dialogue, said the World Bank will work to put programs into place after seeing the "visionary approach" of disparate groups working to solve the problems of poverty. The World Bank plans to support more dialogue on poverty and to firm up the role the private sector can play in alleviating it. Current plans include holding a forum in 2008, where heads of corporations and representatives from NGOs will work together to launch a charter and bring their ideas for change to the public.

Bringing a diverse group of stakeholders together has been the hallmark of TFD since its inception in 1999. TFD was created after the International Institute for Environment and Development wrote a report encouraging people from industry, environmental agencies and elsewhere to set "globally acceptable guiding principles for sustainable forest management." At the same time, the World Business Council for Sustainable Development, the World Bank, the World Wildlife Fund and the World Resources Institute were seriously considering this vision. "So many people were talking about the same thing that it was obvious they needed to talk," said R. Scott Wallinger '61, an adviser in forest sustainability and one of the co-founders and first co-leaders of TFD. What they needed, as it turns out, was time together around a conference table to hear each other's points of view.

"A decade of open warfare had existed between the forest industry and NGOs," Wallinger said. "What caused the change was that TFD for the first time provided a format and a forum in which some of the leading figures in these communities could meet face-to-face in a private setting and begin to talk to each other in facilitated sessions that were off-the-record and unstructured. Equally important was the opportunity for participants to eat meals together, to socialize with one another over drinks in the evening, to take a walk together. Previously, the only contact had been in public forums, where each party or person was sort of duty bound to assert the organizational position, and organizational pressures didn't allow debate or the ability to concede any points. Communication was characterized as 'throwing bombs from a distance into each other's castles,' with the objective to destroy the other party, not build consensus."

Today, Dieterle, Phillips, Ginn and others describe the dialogues as "thoughtful," "energizing" and "positive."

At each dialogue, there is always a visit to a forest, such as a eucalyptus plantation in Brazil or the Project Grow site in KwaZulu-Natal Province, South Africa. "Everyone carries in their head a different vision of a forest," Phillips said. "It's important to see it."

Typically, they walk and observe until they find a clearing. They gather there and talk some more.

Yale School of Forestry & Environmental Studies

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Directors of the Environmental Partnership
Derek E. G. Briggs
Director, Yale Institute for Biospheric Studies, Frederick William Beinecke Professor of Geology & Geophysics, and Curator, Yale Peabody Museum of Natural History
www.yale.edu/yibs
www.geology.yale.edu

Michael Donoghue
Director, Yale Peabody Museum of Natural History and G. Evelyn Hutchinson Professor of Ecology & Evolutionary Biology
www.peabody.yale.edu

James Gustave Speth
Dean, Yale School of Forestry & Environmental Studies and Sara Shallenberger Brown Professor of Environmental Policy
www.yale.edu/environment

We welcome submissions from faculty, staff and students.

To submit an item, please contact:
Rose Rita Riccitelli, Editor
Tel: 203.432.9856
Fax: 203.432.9927
E-mail: roserita.riccitelli@yale.edu

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Maura Gianakos

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