

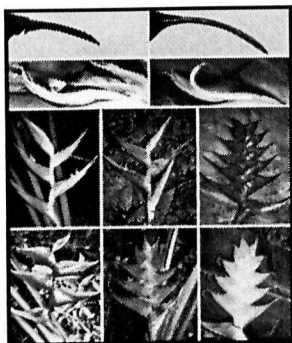


Smithsonian
Institution

Spotlight on Science at the Smithsonian

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Heliconia caribaea and *H. bihai* forms studied in Dominica and St. Lucia and the Hummingbird (*Eulampis jugularis*) male and female bills.

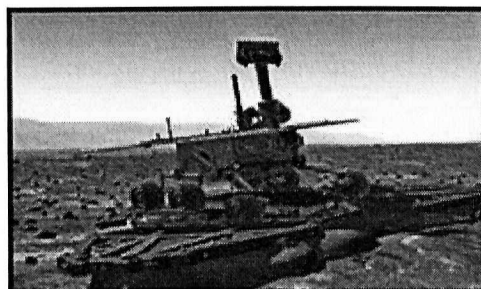
Color-Coordinated Floral Arrangements

The purple-throated Caribbean hummingbird is the sole pollinator of two *Heliconia* plant species: *H. caribaea* and *H. bihai*. In the April 28th issue of *Science*, W. John Kress, head of the Botany section in the Department of Systematic Biology, and co-author Ethan Temeles, assistant professor of biology at Amherst College, describe a natural experiment in co-adaptation between these two species on Dominica and St. Lucia islands.

The flowers of *H. caribaea* correspond to the short, straight bills of the male hummingbird, and the flowers of *H. bihai* correspond to the long, curved bills of the female. On St. Lucia, where *H. caribaea* is rare, *H. bihai* compensates by evolving a red-green bract that matches the bills of males. Females visit both the red-green and green-bracted flowers.

In contrast, on Dominica *H. bihai* has only one color morph—red with a yellow stripe; and *H. caribaea* has two color morphs—red or yellow—that correspond to the bills of females. In addition, the nectar rewards of all *Heliconia* morphs are consistent with each sex's choice for the morph corresponding to its bill shape and energy needs.

The complete reversal of the floral patterns between St. Lucia and Dominica, together with an increase in the length and curvature of flowers of the red *H. caribaea* morph to match the bills of females, support the hypothesis that feeding preferences have driven their co-adaptation.



Artist's conception of one of the Mars Exploration rovers on Mars.

Roving Eyes on Mars

Two Mars Exploration Rovers, scheduled for launch on June 5 and 25, will arrive on Mars on January 4 and 24, 2004, and begin a 90-day trek across the landscape.

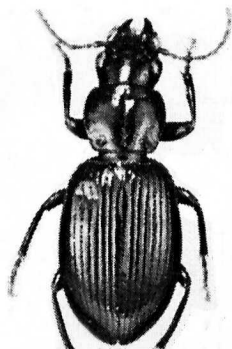
The rovers, which will act as two remotely operated field geologists, will have an instrument package that includes multiple cameras and remote-sensing instruments, some of which are mounted on an arm that can be extended to nearby rocks and soils for detailed close analysis of their properties.

During the mission, John Grant, a geologist at the National Air and Space Museum's Center for Earth and Planetary Studies, will be in residence at NASA's Jet Propulsion Laboratory and will be helping to direct the rovers' activities. Grant has co-chaired the group responsible for recommending landing sites and is a member of the mission's science team.

The two landing sites recently selected by NASA are on opposite sides of the planet in the Meridiani Planum region and Gusev Crater. Though they are very different, both are well suited to achieving mission science objectives, which include determining the history of two sites where evidence has been preserved for past and persistent water activity that may have supported biotic or pre-biotic processes.

At the near-equatorial Meridiani site, the rover will investigate a deposit of gray hematite, an iron oxide whose formation may have been related to past hydrothermal activity or deposition in a standing body of water. In contrast, Gusev Crater (-15° latitude) is at the terminus of a large, dry channel that once flowed into the crater and probably created a large lake. The goal at Gusev is to locate and characterize sediments that may have been deposited in the lake in order to evaluate past conditions on Mars.

Images and data from the mission will be readily available on the Internet and on display in the National Air and Space Museum's *Exploring the Planets* gallery.



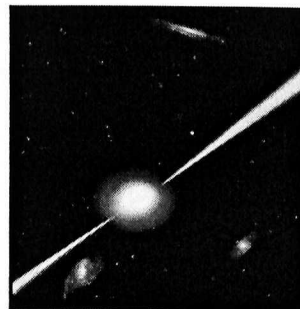
Hawaiian carabid beetle.

Hawaiian Beetle Comes Out of Hiding

Dan Polhemus of the Department of Systematic Biology and his colleagues have rediscovered a native Hawaiian carabid beetle species not observed in nature since the late 1800s. They found *Blackburnia anomala* (Blackburn) in the shrubland formation near Paliku Cabin, and in Kaupo Gap's Acacia koa forest. Prior records of *B. anomala* are limited to the leeward edges of historical koa forest near Olinda, on the northwestern slope of Haleakala.

The rediscovery of the species on the far southeastern side of Haleakala Crater in similar, though con-

served, habitats suggests that other long-missing koa flora and fauna may persist in similar situations on Haleakala. The authors have concluded that while the dry and mesic forests may be greatly reduced in Hawaii, their distinctive and diverse animal and plant life still lingers. Their findings were recently published in *Pacific Science* and *Environment Hawaii*.



Artist's conception of the violent gamma ray bursts.

Astronomers Link Gamma Ray Bursts to Supernovae

Gamma ray bursts (GRBs) are flashes of high-energy light that are thought to occur about once a day, randomly, from around the sky. While underway, each burst is the brightest event in the known universe, many millions of times brighter than an entire galaxy. Although GRBs are the most violent events in the universe, they are poorly understood.

A team of twenty-two scientists led by seven CfA astronomers, including Kris Stanek and Tom Mathe-son, has just announced convincing evidence that GRBs are associated with certain kinds of supernova explosions. The team used the 6.5m MMT and 1.5m telescopes at the Fred L. Whipple Observatory in Arizona, along with the Magellan 6.5m telescope in Chile, to study the dying embers of a very nearby GRB (only two billion light-years from Earth) that flared on March 29. They discovered that its spectrum was very similar to that of one type of supernova, implying that at least some GRBs are produced in the death throes of massive stars.

Understanding the life cycle of stars, from birth to death, helps scientists better understand how our Sun was formed and how it will age. According to Stanek, "For the first time, we were measuring an event

no other human being had seen before. The MMT was our magic time machine that we used to capture this catastrophic cosmic event."



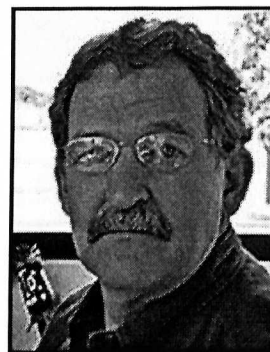
Cross-Section of humerus of a loggerhead seaturtle, showing bony growth layers.

Solving the Olive Ridley Riddle

George Zug, Curator in the Department of Systematic Biology's Division of Amphibians and Reptiles, recently received a contract from the Honolulu Laboratory of the National Marine Fisheries Service to estimate the ages of a sample of olive ridley seaturtle (*Lepidochelys olivacea*) killed by commercial fishing activities.

Zug and National Museum of Natural History undergraduate research interns have refined the skeleto-chronological technique for estimating seaturtles' ages. The technique is similar to counting tree growth-layers, but unlike tree rings, sea turtle bone is constantly remodeled so earlier growth layers necessary for estimating a turtle's age are lost. Accurate age assessments are important for understanding population dynamics, especially when many individuals within specific age groups are lost to predation and such human activities such as commercial fisheries or pollution that reduces survivorship.

Zug is collaborating on this study with Dr. George Balazs of the Honolulu Lab and Dr. Milani Chaloupka of the University of Queensland. This will be the first attempt to provide data-based age estimates and growth curves for the olive ridley. Zug and his colleagues previously have provided age estimates on two populations of the green seaturtle, two of the loggerhead, the Kemp's ridley, and the leatherback seaturtle.



Bruce D. Smith

Smith Elected to National Academy of Sciences

The Smithsonian's Bruce D. Smith was recently elected to the National Academy of Sciences. Dr. Smith is Director of the National Museum of Natural History's (NMNH's) Archaeobiology Program, Curator of North American Archaeology, and Senior Research Scientist in the Department of Anthropology. Before joining the curatorial staff at NMNH in 1978, he received his undergraduate and graduate degrees in Anthropology at the University of Michigan, and held faculty positions at Loyola University of Chicago and the University of Georgia.

Dr. Smith's area of general research interest is interdisciplinary, focusing on the interaction between past human societies and their environment, particularly the spatial distribution of human settlements and subsistence activities on ancient landscapes, human patterns of reliance on plant and animal species, and human impacts on plants and animals.

Dr. Smith is a Fellow of the American Association for the Advancement of Science, has served as Secretary and President of the Society for American Archaeology, has co-edited a Smithsonian Institution Press series, and serves in an editorial board capacity for a number of journals. He is also a member of the National Geographic Society's Committee for Research and Exploration. His books have won the American Historical Association's James Henry Breasted award and the Society for American Archaeology's Book Award.

Recent Publications

Coates, A. 2003. Paseo Pantera, *Smithsonian Books*.

Kress, J.; Temeles, E. 2003. "Adaptation in a Plant-Hummingbird Association," *Science* April 25; 300:630-633.

James, H.; Ericson, P.; Slikas, B.; Lei, F.; Gill, F.; Olson, S. 2003. "Pseudopodoces humilis, a misclassified terrestrial tit (paridae) of the Tibetan Plateau: evolutionary consequences of shifting adaptive zones," *Ibis*, 145: 185-202.

Polhemus, D.A.; Ewing C.P.; Kaholoaa, R.; Liebherr, J.K. 2003. "Rediscovery of *Blackburnia anomala* (Coleoptera: Carabidae), in East Maui, Hawaii, after a 107 year hiatus," *Pacific Science*, 57: 161-166.

Reichhardt, T. 2003. "NASA homes in on Sites for Mars exploration," *Science News* April 17; 422:653.

Schultz, T. 2003. "Hyperdiversity Up Close," *Science* April 4; 300:57-58.

Sweeney, A.; Jiggins, C.; Johnsen, S. 2003. "Polarized light as a butterfly matting signal," *Nature*, May 1.

Windsor, D. 2003. "Uptake and metabolism of [14C] rinderine and [14C] retonecine in leaf-beetles of the genus *Platyphora* and alkaloid accumulation in the exocrine defensive secretions," *Chemoecology*, 13: 55-62.

Wachowiak, M. 2003. "Routine and High -volume Preparation of Embedded Coatings Cross-sections," *The Microscope*, 50:4 147-153.

Web Links

The National Anthropological Archives' online exhibit, *Drawing the Western Frontier: The James E. Taylor Album*, was selected as one of the Exploratorium, the Museum of Science Art and Human Perceptions' Ten Cool Sites for April/May 2003.

Spotlight on Science at the Smithsonian

Spotlight on Science at the Smithsonian is a weekly electronic newsletter about Science at the Smithsonian. It is produced for the Smithsonian community by the Office of the Under Secretary for Science. To contact the editor, e-mail mellendickt@si.edu.

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