Smithsonian Institution

Spotlight on Science at the Smithsonian

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Slow-moving animals, such as the three-toed sloth-*Bradypus variegates*, suffer heavy mortality during surface fires.

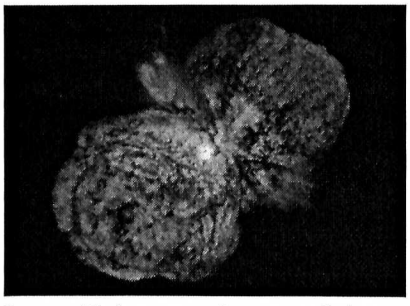
Creeping Fires Threaten Rainforests

Until recently, fires in rainforests like the Amazon occurred only once or twice every thousand years during very infrequent mega-droughts. Today, thousands of fires are lit in the humid tropics every year, to raze vast expanses of forest for ranching and slash-and-burn farming.

In the May issue of *Trends in Ecology and Evolution,* Smithsonian Tropical Research Institute staff scientist William F. Laurance reports that the ecological impacts of these highly destructive intentional fires are now being rivaled by a more subtle menace: accidental surface fires. Surface fires occur most frequently in fragmented landscapes, where intentionally lit fires spread into adjoining rainforests. They also occur occasionally in completely intact forests, when someone lights a fire during the dry season.

Surface fires are deceptively unimpressive, creeping along the forest floor in a thin ribbon of flames that is rarely higher than 8 inches from the ground. Unlike fast-burning intentional fires, surface fires consume only the leaf and woody litter, generate only modest heat, and cover as little as 160 yards a day. Nevertheless, surface fires are deadly to many rainforest plants, which typically have thin bark and thus are highly vulnerable to heat stress. They kill or injure numerous understory animals, and the smoke asphyxiates or drives away mid-story and canopy species. But even more alarming is the irreversible process of forest degradation that surface fires can set in motion.

Unfortunately, determining the true extent of surface fires in dense tropical forests is still very difficult, because current satellite-monitoring methods are generally ineffective at detecting scorched forest understories. However, new high-resolution satellites and specialized detection algorithms are becoming available, and could prove more useful for the key task of mapping the occurrence of surface fires. Equally vital is the need to better understand the ecological impacts of wildfires throughout the tropics, with their great diversity of forest types and land-use practices, and to predict the effects of regional and global climate change on fire incidence.



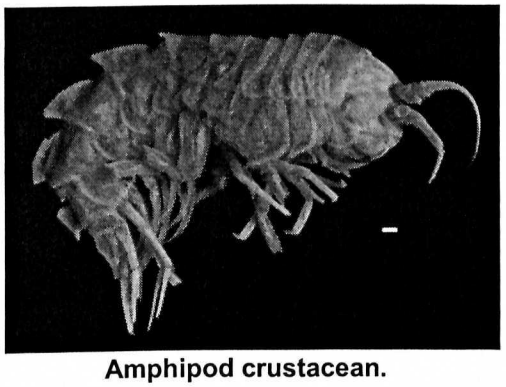
A Hubble Space Telescope Image of the massive star Eta Carinae and its dramatic, double-lobed nebula.

X-Rays from the Most Massive Star in Our Galaxy

The young star Eta Carinae shines prominently in the skies of the Southern Hemisphere. Although located quite far from Earth (about seven thousand

light-years away), it can nevertheless be seen easily by people in the Southern Hemisphere because it is so fantastically bright-- perhaps as much as five million times more luminous than our Sun.

Why is this star so bright? Astronomers, while not certain, think that at least one reason is that it is very massive -- about 120 times more massive than our Sun, making it one of the most massive stars known. The star is situated in a large molecular cloud (the Carina Nebula), and is surrounded by a double-lobed structure of gas and dust indicative of complex winds blowing intermittently from its surface. Now a team of seven Smithsonian astronomers led by Nancy Evans has published a new study of Eta Carinae and its environment using data obtained with the Chandra X-ray Observatory. Writing in this week's issue of *The Astrophysical Journal*, they report the first analysis ever done on all of the X-ray emitting stars in the Carina Nebula. They analyze 23 sources in the region that are strong X-ray emitters, illustrating that this molecular cloud has for some reason given birth to many massive stars (though none as massive as Eta Carinae). They also find that slightly less massive stars in the region do not radiate detectable X-rays at all. Their research will help astronomers figure out why some stars like Eta Carinae are born big and flamboyant, while others like our Sun are much more modest and sedate.



Amphipod crustacean.

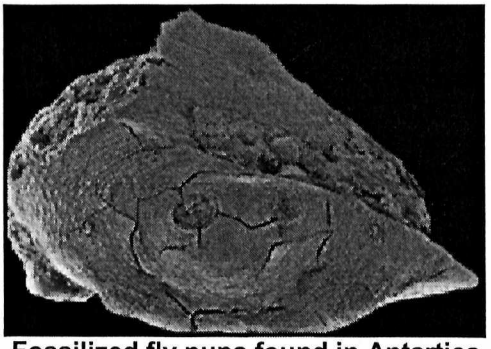
A Taxonomic Treasure Trove

Jorgen Berge, a scientist from Norway's Tromso Museum, visited the National Museum of Natural History (NMNH) for 10 days, to examine its extensive holdings of unidentified Antarctic amphipod crustaceans. Jorgen found eight new species in the three families he was working on, as well as material of three previously described but poorly known species. Berge's work demonstrates how much remains to be discovered in our collections, especially in the Antarctic fauna. NMNH will eventually incorporate his research results into its Antarctic database, which links all faunal elements with the ecological data for each sample station.

Breathing Life into Faces of the Past

Anthropology curator Doug Owsley has been working with forensic artist and sculptor Sharon Long to reconstruct the faces of eight Civil War soldiers who died in the sinking of the *Hunley.* The *Hunley* was lost in 1864, after being the first submarine to successfully sink a warship, the heavily armored *Housatonic.*

Owsley and Long are fine-tuning the men's individual features by closely comparing their skull morphology and the clay reproductions. Different pathological conditions have come to light, along with other details as well. A pipe will be placed with one of the men who loved to smoke, as revealed by a notch worn into his teeth by the pipe stem. And a sewing needle will be placed with another man with a notch in a tooth characteristic of biting thread while sewing.

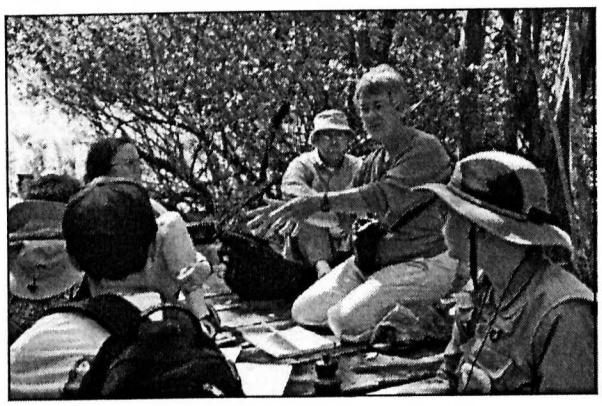


Fossilized fly pupa found in Antartica.

Flying High Over Antarctica

Christian Thompson, resident U.S. Department of Agriculture Entomologist, and North Dakota State University colleague Allan C. Ashworth published findings in last week's *Nature* contradicting long-held beliefs that the *Cyclorrhapha* group of flies never inhabited Antarctica. The scientists contend

that this family of "higher flies," which includes the common housefly, existed in Antarctica during the Neogene epoch, 3–17 million years ago. They based their findings upon their identification of a fossilized fly pupa (the transitional stage between the larva and adult) that Ashworth collected in Antarctica. Possible explanations for the flies' presence in Antarctica include they arrived on the continent via colonization from South America during an especially warm period in the Neogene, or from a relict Gondwana population that survived after that early continent broke up millions of years ago.



SERC Ecologist Candy Feller leads a group of students in discussion.

Reach Out and Touch - a Belizean Turtle!!

On May 13 and 15 the Smithsonian conducted two 90-minute educational field trips from Calabash Cay in Belize broadcast live via satellite into classrooms across the United States. On site, experiencing mangrove environments and learning about sea turtles, were a dozen U.S. and Belizean students who have shown promise in scientific studies.

Fifteen million students in the U.S. participated in "Where Land and Sea Intertwine," with scientist Candy Feller and distance learning coordinator Dottie Klugel from the Smithsonian Environmental Research Center (SERC). During the field trips, aimed at attracting students to careers in science, students interacted live with Feller and Klugel via satellite. Back in Washington at the Smithsonian's National Museum of Natural History (NMNH), Dr. George Zug, curator of amphibians and reptiles, answered student questions on sea turtles.

At the same time on the Belize mainland, NMNH's Marsha Sitnik and Tuck Hines, Assistant Director of SERC, conducted press briefings to the Belizean printed media, national radio, and the two national television stations in an effort to bring the technology to the Belizean people.

The electronic field trips were produced in cooperation with the Institute of Marine Studies of the University of Belize, where courses in mangrove ecology conducted by Feller and Sitnik beginning in 1992 build on the work of the NMNH's Caribbean Coral Reef Ecosystems Program which has been operating a research station in Belize since 1972.

Recent Publications

Coates, A. 2003. *Paseo Pantera.* Smithsonian Books. This richly illustrated book is the first popular yet thorough investigation of both the natural and the human history of Central America in Spanish.

Ernst, C.; Ernst, E. 2003. *Snakes of the United States and Canada.* Smithsonian Books. This ultimate reference presents detailed information and color photos for all snake species found in the U.S. and Canada.

Meyer, H. 2003. *The Fossils of Florissant.* Smithsonian Books. The most diverse fossil bed in the United States provides a unique picture of what life was like 34 million years ago.

Evans, N.; Seward, F.; Krauss, M.; Isobe, T.; Nichols, J.; Schlegel, E.; Wolk, S. 2003. "Chandra Observations of Associates of Eta Carinae," *The Astrophysical Journal*, 589:509.

Greenfield, M.; Snedden, W. 2003. "Selective Attention and the Spacio-temporal Structure of Orthopteranchoruses," *Behavior*, 140:1-26.

Laurence, W. 2003. "Slow Burn: The Insidious Effects of Surface Fires on Tropical Forests," *Trends in Ecology and Evolution*, 18:209-212.

Laurence, W.; Rankin-de Merona, J.; Andrade, A.; Laurence, S.; D'Angelo, S.; Lovejoy, T.; Vasconcelo, H. 2003. "Rain-Forest Fragmentation and the phenology of Amazonian Tree Communities," *Journal of Tropical Ecology,* 19:343-349.

Thompson, C. 2003. "A Fly in the Biogeographic Oitment," *Nature,* 423:135-136.

Web Links

What's going on at the Zoo? Find out in their newsletter, *Spotlight on Zoo Science*.

Biodiversity Centre for Antarctic Amphipod Crustaceans is a website devoted to those who work with Antarctic amphipod fauna.

IZ's catalog database is a website that showcases the many diverse collections that NMNH has within its walls.

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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