Smithsonian Institution

Spotlight on Science at the Smithsonian

Weekly Newsletter

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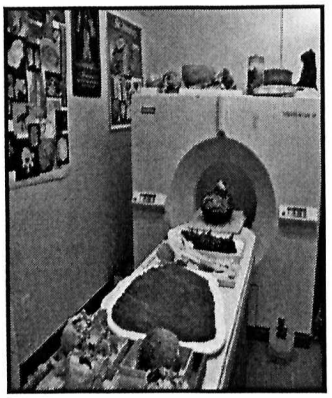


A Siemens Somatom CT scanner at the National Museum of Natural History's Department of Anthropology.

Mummies and CT Scanner Get New Digs

A new climate-controlled room for preserved tissue remains has been constructed in the National Museum of Natural History's (NMNH's) East Basement. Objects in this storage area include animal and human mummies from Egypt and North and South America, and remains that show the natural transformation of fatty tissues to a soap.

In the past, scientists had to unwrap the mummies to study their internal structures and pathology. Today, Smithsonian scientists are using less invasive techniques, thanks to Siemens Medical Solutions' donation of a computerized tomography (CT) scanner to NMNH in 1998.

Scientists have used the scanner to study bone density and disease in frozen whales and dolphins, and to help determine the function of the bony plates of Stegosaurus. Scanning fossilized dinosaur bones also shows conservators how the bones were repaired decades ago and how to stabilize them more efficiently. Physical anthropologists are scanning human skeletal material to better describe and diagnose diseases expressed in bone and to help solve forensic cases.

Other Smithsonian museums are also benefiting from this technology. Scientists are scanning Stradivarius violins from the National Museum of American History and the Library of Congress, Apollo space suits from the National Air and Space Museum, art from the Hirshhorn Museum, and rare books from the Smithsonian's Library collections to learn how these objects were made, what materials were used in the manufacturing process, and how to conserve them. In addition, the remains of National Zoo animals have been scanned to obtain information on disease.

NMNH has an excellent ongoing relationship with Siemens, who provides free spare parts, expertise, and maintenance for the CT scanner. Smithsonian scientists continue to explore new ways for this technology to contribute to Smithsonian research, conservation, and preservation.

Deforestation of *Dinizia excelsa* in the Amazon rainforest

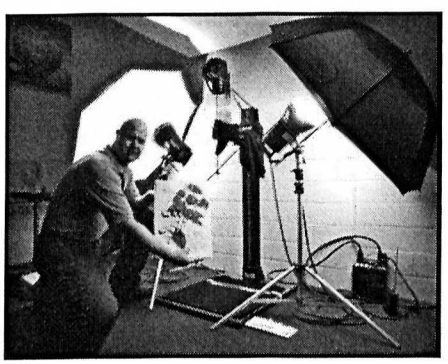
Testing the Resilience of Rainforests

The Amazon basin, which harbors half of the world's remaining lowland rainforests, is experiencing record high rates of deforestation, averaging 7–10 million acres a year. This may be the greatest challenge to the resilience ecological of rainforests since about 65 million years ago, when a meteor

decimated most tropical forests and disrupted important plant-insect interactions for several million years.

While the fragmentation of rainforests can drive locally rare plants to extinction, in some cases disturbing these habitats seems to enhance pollinator activity and may even promote plant productivity and gene flow. Until recently, few studies have attempted to pinpoint the ecological causes of high gene flow in disturbed habitats.

The staff of the Smithsonian Tropical Research Institute (STRI) recently published two articles in the Ecological Studies Series "How Landscapes Change," and a third article in this month's *Molecular Ecology.* In one of the studies, the authors used a "TWOGENER" analysis to estimate pollen dispersal in fragmented and unfragmented populations of the Amazonian tree *Dinizia excelsa.* This experimental system allowed the researchers to investigate the synergistic effects of habitat fragmentation and pollinator dynamics on pollen dispersal in these trees.



Rusty Russell, Botany's Collections Manager, displays a type specimen like those being imaged and placed on the Web.

Milestone Reached in Plant Imaging

During the first week of March, the Plant Type Digitization Project produced the 30,000th high-quality digital image of the important specimens of dried plants in the U.S. National Herbarium. With this milestone, the Botany Section's staff has completed about one-third of the project. Scholars and students around the world can view all of the images by visiting http://rathbun.si.edu/botany/types. In addition to improving access to the collection, the project is helping to preserve the specimens by reducing their handling and, thus, the potential for damage.

The Mysterious Missing Mass

Although stars are bright and dominate our view of the night sky, they actually comprise only about one-half of one percent of all the material in the universe. Other forms of matter that astronomers can readily detect, such as cold clouds of gas and dust, seem to add only another four percent to the total. The composition of the rest of the universe has become known as the mysterious "missing mass."

Last week Smithsonian Astrophysical Observatory astronomers Fabrizio Nicastro, Andreas Zezas, Martin Elvis, Cesare Cecchi-Pestellini, Douglas Burke, Jeremy Drake, and Piergiorgio Casella, and two of their colleagues published an article in *Nature* partly resolving this mystery. They discovered a "fog" of about 50 giant clouds of fiercely hot, ionized atomic gas in intergalactic space near our Milky Way that may account for about two-thirds of the missing mass.

USDA scientist Dr. Alma Solis, based at the Natural History Museum, searches the collections for specimens of pest fruit fly species from Mexico.

Making a Case for Fruit Flies

In late February, Mexican officials demanded that U.S. regulatory personnel prevent certain species of insects from entering Mexico via U.S. exports of stone fruits (peaches, nectarines, plums). Using the National Collection of Insects and data from research carried out across the U.S., Agriculture Research Service scientists and the NMNH supplied information to the Animal and Plant Health Inspection Service/Plant Protection and Quarantine that

proved that several of these species were already present in Mexico and would not pose a threat if occasionally found on exported fruits. This type of information is critical to the rapid and safe movement of fruit and other commodities between the U.S. and our trading partners.

Botany volunteer Mary Ellen Wiser skillfully mounted one of the many yellow roses left at NASM after the Columbia tragedy.

Preserving Roses and Memorials

In the week following the Space Shuttle Columbia accident, visitors to the National Air and Space Museum (NASM) left many floral bouquets near the space shuttle exhibit in tribute to the seven astronauts. Several bouquets featured yellow roses, symbolic of the astronauts' home base in Texas. To preserve one of these roses, the space history curator, Dr. Valerie Neal found the needed expertise elsewhere in NMNH's Botany Section. The rose was carefully pressed by Deborah Bell and mounted by volunteer Mary Ellen Wiser. The specimen is now part of the permanent collection of artifacts, joining a white rose that was preserved after the 1986 Space Shuttle Challenger accident.

Recent Publications

Fabrizio, Nicastro; Zezas, Andreas; Elvis, Martin; Mathur, Smita; Flore, Fabrizio; Cecchi-Pestellini, Cesare; Burke, Douglas; Drake, Jeremy; Casella Piergiorgio. 2003. "The far-ultraviolet signature of the "missing 'baryons in the Local Group of galaxies," *Nature,* 13 February, 419: 719-721.

Gascon, Claude; Laurance, William F.; Lovejoy, Thomas. 2003. "Forest Framentation and biodiversity in Central Amazonia.: In A., Bradshaw, Gary and Marquet, Pablo A. (Eds.), *How landscapes change: Human disturbance and ecosystem fragmentation in the Americas, Ecological Studies series,* 162:33-48.

Laurance, Susan G.; Laurance, William F.; Lovejoy, Thomas E. 2003. "Bandages for wounded landscapes: Faunal corridors and their role in wildlife conservation in the Americas.: In A., Bradshaw, Gary; Marquet, Pablo A. (eds.); *How landscapes change: Human disturbance and ecosystem fragmentation in the Americas, Ecological Studies series,* 162:313-325.

Marra, Peter. 2003. West Nile Virus Found in the Caribbean. *Science* NOW, 20 March.

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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.

David L. Evans.....Under Secretary for Science
Theresa L. Mellendick.....Editor