Smithsonian Institution

Spotlight on Science at the Smithsonian

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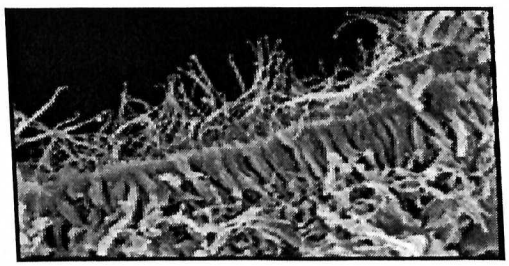


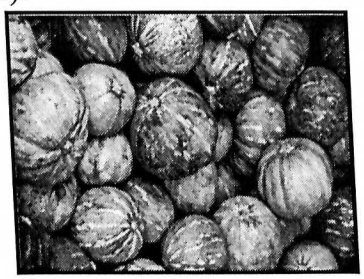
Electron micrograph of the freeze-factured wall of the giant larva of *Svenzea zeai*

New Genus in the Sea of Life

Klaus Ruetzler (Natural History Museum-Systematic Biology-Invertebrate Zoology) and colleagues from The Netherlands and New Zealand have discovered a new genus of tropical shallow-water sponges. Named *Svenzea* (volcano sponge), after a Colombian colleague who contributed data about one of the sponges, its type species is one of the most common sponges on the Belize barrier reef, home of the Smithsonian's Carrie Bow Cay Marine Field Station.

Ruetzler's field studies, followed by electron microscopy at the Natural History Museum, showed that this organism is a "bacteriosponge." Nearly 50 percent of its biomass consists of symbiotic bacteria that contain chlorophyll, participate in photosynthesis, and contribute significantly to the reef's productivity.

Another discovery during this research was the free-swimming larva of the volcano sponge. It is the biggest larva ever reported for the phylum, 6 mm long—three times larger than previously known sponge larvae. The fine structure and behavior of the larva provided essential clues for placing *Svenzea* correctly in the "tree of life" because the skeleton characteristics of the adult sponges that are generally used for identification placed them between two orders of the phylum. Results of these investigations are published or are in press in *Smithsonian Contributions to Zoology* (new species), *Contributions to Zoology* (Amsterdam; new genus and species), and *Invertebrate Biology* (larval ecology and fine structure).

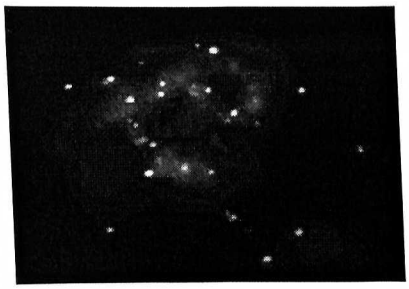


Squash

Hunter Gathers Tame Wild Squash

The fertile and diverse lowland tropics of coastal Ecuador seem a likely place for agriculture to develop 10,000--12,000 years ago. New archaeological evidence unveiled by Smithsonian Tropical Research Institute (STRI) staff scientist Dolores Piperno and Karen Stothert (University of Texas at Austin) reveals that hunter-gatherers in coastal Ecuador probably took advantage of resources from marine, mangrove, and forest ecosystems and began to domesticate wild squash varieties as they formed stable settlements at the end of the Pleistocene.

The February 14 issue of *Science* highlights the archaeologists' findings in "Phytolith Evidence for Early Holocene *Cucurbita* Domestication in Southwest Ecuador". Although few plant remains survive mold, high temperatures, and rainfall, plants protect themselves from herbivores and pathogens by forming hardened pieces of silica in their cells. In collaboration with a radiocarbon laboratory, Piperno and Stothert developed new methods for dating the carbon remaining inside plant cells. The sudden appearance of larger squash plants in the record may predate plant domestication sites in the Mesoamerican highlands.



Chandra X-ray Image showing the central regions of the Antennae

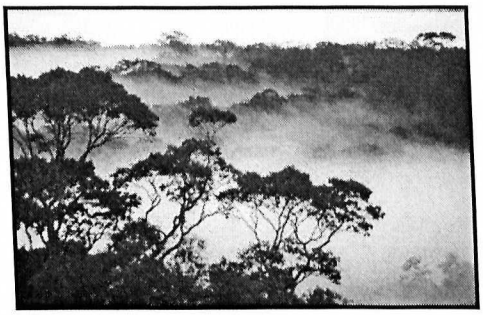
Collided Galaxies Produce Cosmic Light Show

The "Antennae Galaxies," a pair of nearby galaxies (only nineteen million light-years away), are in the midst of a cataclysmic collision. Optical images of the galaxies show intense radiation produced by dramatic bursts of star formation where the two galaxies have merged, and long streamers of stars and gas are sweeping out from the galaxies' bright centers and stretching over hundreds of thousands of light-years of space.

Collisions between galaxies are believed to be common. Our own Milky Way is bound by gravity to our nearest neighbor, the Andromeda Galaxy, toward which we are moving at a speed of about 50 kilometers per second. If we are on a collision course, we could come together in a few billion years.

A team of six astronomers led by two from the Smithsonian Astrophysical Observatory has just published a paper in the *Astrophysical Journal Letters* on their Chandra X-ray Observatory observations of ultra-luminous X-ray sources (UXRs) in the Antennae. UXRs have an X-ray energy output equal to about one million times the energy output of our Sun in all its emitted wavelengths. No one is quite sure what UXRs are. They are seen in other galaxies, but the Antennae contain nine of them--more than any other known source--and all of them are situated far from the nuclei of the two galaxies in regions where hot young stars are also seen.

The team discovered that seven of the nine UXRs vary in brightness. Based on this behavior (and some other observed properties), they conclude that each UXR is made up of a black hole with an orbiting companion star. Material from the companion is gradually, and somewhat erratically, being attracted into the environment of the black hole, where the high temperatures and peculiar conditions generate beams of extremely bright X-rays.



Canopy mist in the Amazon forest

Global Warming Debate Heats Up

A recent study Frédéric Achard and colleagues argued that earlier estimates of worldwide tropical deforestation and atmospheric carbon emissions are too high. Published in *Science* (vol. 297), their conclusions received extensive press coverage. They asserted that the razing and felling of tropical forests only produced about 0.6–1.0 billion tons of greenhouse gases a year. This estimate is considerably lower than those of earlier studies, which range up to 2.4 billion tons annually.

Smithsonian Tropical Research Institute's staff scientist William F. Laurance and Phillip M. Fearnside from Brazil's National Institute for Amazonian Research (INPA) challenge those results in the February 14 issue of *Science*. They contend that the Achard study contains serious flaws that render its conclusions unreliable and significantly underestimate greenhouse gas emissions. For example, the study does not account for the effects of selective logging, habitat fragmentation, and other types of forest degradation on global warming.

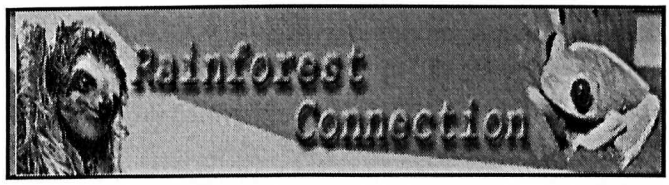
Preparing for the Next Big Virus

We understand very little about West Nile virus--how it moves, how its prevalence varies across space and time and among potential host species, and how it affects wildlife populations. But we do know that

West Nile virus isn't the first pathogen to invade our borders and won't be the last.

On February 5–6 Smithsonian Environmental Research Center (SERC) hosted 100 scientists at a multidisciplinary workshop to discuss the impacts of West Nile virus (WVN) on wildlife health. Chaired by SERC Avian Ecologist Peter Marra and Robert McLean of the U.S. Department of Agriculture's Wildlife Health Center, the workshop included arbovirologists, entomologists, ecologists, ornithologists, immunologists, epidemiologists, modelers, and statisticians from the major U.S. and Canadian animal health and wildlife agencies and from several nonprofit organizations and universities. Dr. James Tate, Science Advisor to the Secretary of the Interior, and Dr. Duane Gubler, Chief of the Infectious Disease Unit of the Centers for Disease Control, presented keynote talks.

The participants advised that the U.S. should be prepared for assessing the impact of the next virus before it emerges. Some key recommendations of the meeting include establishing an informal multidisciplinary team of specialists that form a West Nile virus research network across the continent; drawing up a prioritized list of objectives for West Nile virus research for the next decade; writing a white paper summarizing and synthesizing our present knowledge (in language understandable to policymakers); and publishing several issue and review papers in a variety of scientific journals.



The Rainforest Connection, Live!

Panama's rainforest came into U.S. classrooms in New Jersey and Texas this month, with live videoconferencing from Barro Colorado Island, a tropical forest research facility operated by the STRI in Panama. For one month a year for the past 20 years, Dr. Jacalyn Willis, director of PRISM (Professional Resources in Science and Mathematics) at Montclair State University's College of Science and Mathematics, and Gregory Willis have been carrying out a long-term census to study annual changes in different species of mammals on Barro Colorado.

During the week of February 10, students talked directly with the researches about their experiences, research projects, and ecological principles. The research team in Panama has posted regular journal entries on the Rainforest Connection Web site (http://rainforest.montclair.edu), describing what they see and experience as they carry out their projects in the rainforest. The broadcasts will be converted to streaming video for Web site viewing and archiving.

Recent Publications

"Phytolith Evidence for Early Holocene *Cucurbita* Domestication in Southwest Ecuador," *Science* 2003 February 14.

"Researchers Scramble to Track Virus's Impact on Wildlife," *Science 2003* February 21.

"The Time-variable Ultraluminous X-Ray Sources of The Antennae," *Astrophysical Journal Letters* 2002 January 17.

Wilf, Peter; Johnson, Kirt; Huber, Brian. 2003. "Correlated terrestrial and marine evidence for global climate changes before mass extinction at the Cretaceous-Paleogene boundary, *Proceedings of the National Academy of Sciences*, 100:599-604.

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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