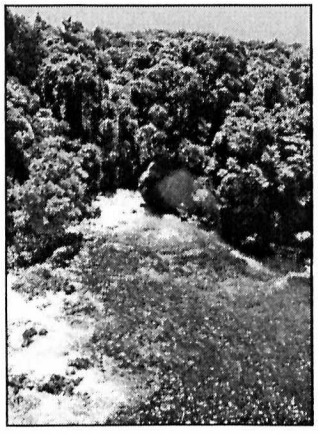
Smithsonian Institution

Spotlight on Science at the Smithsonian

Weekly Newsletter Vol. 1, No. 16 • June 2, 2003



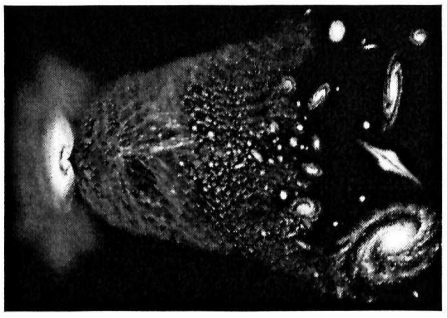
Coiba Island.

STRI Researchers Make Newsbreaking Discovery

Contrary to traditional thought that Coiba Island is home to only 160 hectares of coral reefs, the Smithsonian Tropical Research Institute's (STRI's) Héctor Guzmán recently discovered that Coiba actually encompasses more than ten times that area of reefs—about 1,700 hectares. Coiba is located in the Gulf of Chiriquí on Panama's Pacific coast. Its Ensenada María reef is the second largest coral reef in the tropical eastern Pacific and the largest in the Central American region.

The researcher based his findings on analysis of satellite images and observations in the field. His discovery was unveiled during a local television interview with Guzmán on May 26. Guzmán was also interviewed for an educational television program, and was joined by Todd Capson for an interview with Radio Nacional. Local television stations consulted the STRI researchers because the government of Panama is discussing legislation for managing Coiba Island.

Recently, STRI assisted Panama's lead environmental authority (ANAM) in submitting an application to add Coiba National Park to the list of the United Nations Educational, Scientific and Cultural Organization's World Heritage Sites. And last year, Conservation International awarded Capson a grant to coordinate a project with ANAM to help prevent illegal fishing in this 2,700-square-kilometer marine park. The biological assessment of Coiba was supported by the AVINA.



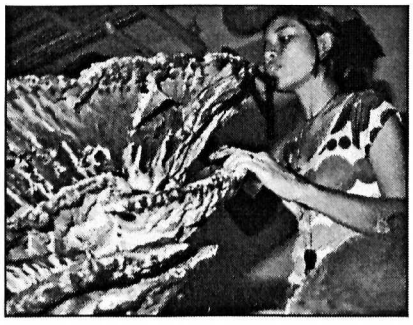
An artist's schematic concept of the history of the universe, showing (with cosmic time proceeding from left to right) its beginning in the Big Bang, and its current state, filled with galaxies.

Our Accelerating Universe

One of the most revolutionary discoveries of recent science has been the astronomical observation that our universe -- known from the motions of galaxies to be expanding in size -- is apparently accelerating its outward expansion. This motion is in stark contrast to the expectation that gravity, with its relentless attraction, should gradually be slowing down the speed of distant galaxies.

One line of evidence has come from studies of supernovae explosions in remote galaxies, because supernovae are so bright they can be seen over gigantic distances, and because they are all so similar that their brightness can be accurately calibrated and interpreted. Center for Astrophysics' (CfA) astronomers have played a pivotal role in this research.

This week, at the semiannual meeting of the American Astronomical Society, CfA astronomers Peter Challis, Bob Kirshner, Saurabh Jha (formerly of the CfA, as graduate student of Bob Kirshner's), and Tom Matheson, along with their colleagues, announced remarkable new results from their supernova studies. They report finding eight supernovae in distant galaxies so far away that their light has been traveling towards us, it is thought, for as much as about eight billion years. The astronomers discovered evidence that when these galaxies emitted the light we see now, the universe was indeed slowing down. The implication is that only relatively recently has the universe begun the acceleration we currently observe. The results lend additional, quantitative support to a current picture in which the universe is filled with invisible, so-called "dark energy" that drives its acceleration.



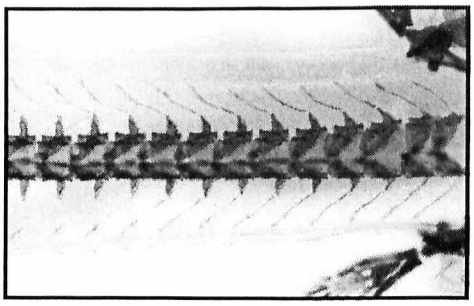
Mabelle Chong de Cabrera examines the mushroom.

Giant Mushroom Grows in Panama

Serendipity crossed Markela and Feliciano Ballesteros' path on their way to Soná, Veraguas. They found the largest mushroom ever collected in Panama.

Of the approximately 1.5 million fungi around the world, only about 100,000 have been scientifically described. And of the 667 fungi species registered in Panama, this new specimen is probably the largest—almost two feet at its widest point.

Markela and Feliciano Ballesteros have donated the mushroom to STRI's Herbarium. Microbiologist Mabelle Chong de Cabrera is assisting STRI scientist Noris Salazar-Allen in arranging to send a sample of the mushroom to a Costa Rican specialist for identification.



Cleared and stained specimen of reedfish vertebrae and ribs.

Rewriting 100 Years of Vertebrate Anatomy

For more than 100 years, all major textbooks on vertebrate anatomy assumed the ribs of humans and fish were different. New evidence from National Museum of Natural History (NMNH) visiting scientist Ralf Britz and colleague Peter Bartsch is challenging this hypothesis.

Britz and Bartsch studied the development of two different primitive bony fishes, the bichirs and the reedfish, the only jawed vertebrates thought to have two distinct sets of ribs: dorsal ribs, which are considered the same as human ribs, and ventral ribs, considered the same as other fish ribs. They found that the different positioning of ribs within the connective tissue system varies between the different subgroups of fishes, creating the *impression* of two different kinds of ribs. The scientists concluded that humans and fish have only one type of rib, the ventral type, which is common to all jawed vertebrates.

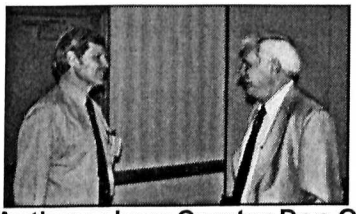
Britz's home institution is the University of Tuebingen in Germany, and his two-year residency at NMNH is but one result of a network of international collaborations. He originally made contact with Fishes Curator G. David Johnson because he disagreed with a hypotheses proposed by Johnson and the late Colin Patterson (Natural History Museum, London) in a paper on fish intermuscular bones and ribs. Ultimately, that paper provided an important piece of evidence used by Britz and Bartsch in their recent paper. Since their first interaction, Britz and Johnson have recognized many mutual research interests and developed a strong ongoing collaboration.

Aquatic Wings Inspire New Technologies

The U.S. Navy is tapping into NMNH's expertise and collections, and the science of biomimetics, to produce a robotic underwater vehicle with maneuvering capabilities superior to conventional naval technology. Biomimetics incorporates designs found in nature into manufacturing technologies.
Visiting researcher Dr. Frank Fish has been using NMNH's computed tomography (CT) scanner to examine the body parts marine animals use to control their movements. With the aid of Marine Mammals Collections Manager Charley Potter, Fish obtained a humpback whale flipper for his research. Humpback whale flippers have leading-edge tubercles, or bumps, that alter the flow of water over these "aquatic wings."

The CT scans indicate that the body parts have low drag, allowing water to flow smoothly over them. (Smooth flow reduces the tendency of creating stall patterns, as would happen when improper airflow over an airplane's wing causes the airplane to stall and fall. Fish's analysis showed that the leading-edge shape modifications, such as tubercles, can maintain lift production by delaying stall conditions.

Based on this work, Fish and a colleague have received a patent on the concept of applying leading-edge tubercles to wings. The research on humpback whale flippers continues as a cooperative project between West Chester University, Penn State University, Duke University, and the United States Naval Academy.



Physical Anthropology Curator Don Ortner (right) and Smithsonian Research Associate Bruce Ragsdale (left).

New Views of Old Bones

Physical Anthropology Curator Don Ortner and Smithsonian Research Associate Bruce Ragsdale, a pathologist with a speciality in skeletal disease, presented their 15th workshop on human skeletal paleopathology at the annual meetings of the Paleopathology Association and American Association of Physical Anthropologists in Tempe, Arizona. They titled this year's workshop "Oldies but Goodies: Challenging Pathology Cases from Past Workshops."

Ortner and Ragsdale each reviewed eight examples from both the museum's collection and modern pathology cases that provided a broad range of skeletal abnormalities encountered by biological anthropologists, and discussed the relevant pathology and diagnosis of each case. David Hunt, assistant collection manager in the Department of Anthropology, oversaw the care and transportation of the archeological skeletal remains used in the workshop. The review of the cases included relevant radiology in addition to the pathological bones.

Evidence of disease in archeological human skeletons provides an important link between past and present knowledge of human disease that may have implications for understanding modern disease. For example, archeological skeletal evidence suggests that rheumatoid arthritis is a relatively recent disease in human history. Today it is particularly prevalent in some Native American groups. Current thinking is that it is caused by the presence of a genetic potential for the disease which only occurs if it is triggered by some pathogenic agent probably a virus or bacteria. The recent history of the disease has implications for understanding the pathologic factors that cause this disease. The workshop conducted by Ortner and Ragsdale provides practical experience in skeletal pathology to improve the ability of paleopathologists to correctly diagnose evidence of pathology in past human groups.

Recent Publications

Dick, M.; Herrera-Cubilla, A.; Jackson, J. 2003. "Molecular phylogeny and phylogeography of free-living Bryozoa (Cululadriidae) from both sides of the Isthmus of Panama," *Academic Press.*

Rogers, L. 2003. "Odds-playing and the timing of the sex change in uncertain environments: you bet your wrasse," *Behavioral Econology,* 14(3):447-450

Sousa, W.; Kennedy, P.; Mitchell, B. 2003. "Propagule size and predispersal damage by insects affect establishment and early growth of mangrove seedlings," *Oecologia,* 135(4):564-575.

Web Links

Watch the dry forest of the Metropolitan Natural Park. Move the camera 360 degrees, and take an instant photograph from the crane with the possibility of close-ups. *www.stri.org* (under the PNM icon)

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.

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

www.si.edu/research/spotlight