Smithsonian Institution

# Spotlight on Science at the Smithsonian

Weekly Newsletter

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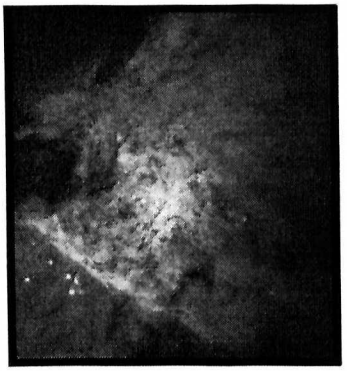


**A Hubble image of the giant molecular cloud in the Orion Nebula. It contains many of the organic molecules discovered in space.**

## Life's Backbone Discovered in Space

Organic (carbon-bearing) molecules form the backbone of the chemistry of life as we know it. Astronomers have identified about 136 different molecules in interstellar space, predominantly in giant clouds of gas and dust.

Molecular hydrogen is by far the most abundant molecule, comprising about one percent of all the known mass of the Milky Way. But carbon-bearing molecules dominate in number: 103 different organic molecules are known, ranging from simple ones like carbon monoxide, CO, to complex species like HC(11)N with 13 atoms.

Two Smithsonian Astrophysical Observatory (SAO) astronomers, Pat Thaddeus and Michael McCarthy, have pioneered innovative laboratory efforts to measure precisely (to about one part in ten million) the molecular line frequencies of suspected interstellar cloud chemicals. In fact about one-quarter of those 136 molecules were discovered thanks to this SAO group. The SAO capability allows astronomers at SAO and elsewhere to search molecular clouds for these chemicals and use the resultant information to better understand organic chemical reactions Underway in the clouds.

## Reproductive Mysteries of Giant Pandas

The reproductive cycles of giant pandas last a mere 24-48 hours a year. If that narrow window of time is missed, the opportunity for conception is delayed for another year.

When rare animals like the giant panda fail to breed or thrive, clues can often be found by examining their hormones. In the past, this entailed blood sampling after physical restraint or anesthesia, which can be especially impractical, stressful, or dangerous for giant pandas.

National Zoo endocrinologists have developed new hormone assays for quantifying reproductive and stress hormone by-products in feces without disturbing animals. These noninvasive approaches offer extraordinary new opportunities for biologists to understand the fundamental mechanisms associated with endocrine control of general health and reproductive success of giant pandas. The new information also is valuable for scheduling breedings or, if necessary, artificial insemination.

This research involves a partnership with the San Diego Zoo and many collaborators in China who are responsible for managing more than 100 giant pandas in zoos and breeding centers. National Zoo scientists also plan to train Chinese colleagues later this year to conduct noninvasive endocrine methods in

China, including using fecal steroid measures to study free-living giant pandas. Noninvasive hormone monitoring will be key to unlocking the secrets to increasing reproductive success in giant pandas.

## The Rise of the Isthmus of Panama

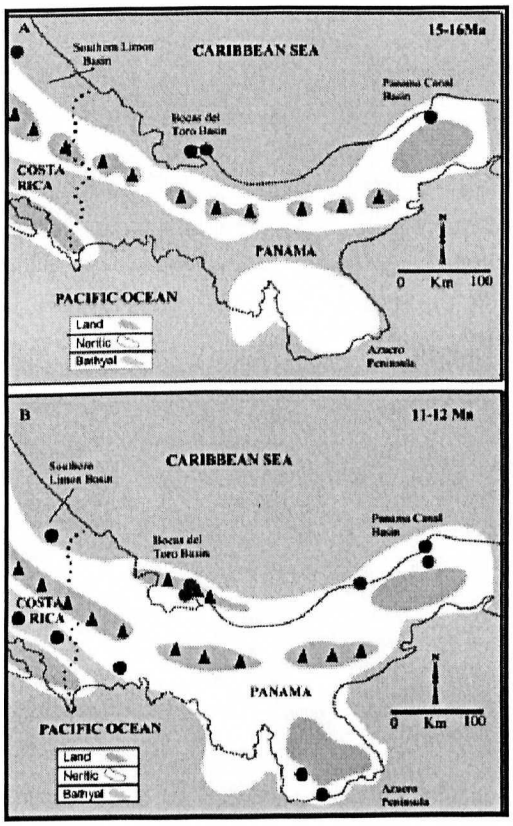
A newly discovered sequence of lower to middle Miocene rocks from the eastern Bocas del Toro archipelago in western Panama reveals the timing and environment of the earliest stages in the rise of the Isthmus of Panama in this region. Staff scientist Anthony G. Coates and collaborators recently published this finding in the *Geological Society of America Bulletin.*

Two new formations appear in the schematics below: the Punta Alegre Formation and the Valiente Formation. The circles represent reliably dated sections that have yielded rich deep-sea rock assembled blages, and the triangles represent volcanoes.

During the Punta Alegre Formation, the Central Cordilleran volcanic arc appears as a line of islands. Land areas to the south of the arc are interpreted as exotic rock formations. The Panamanian Isthmus at this stage was a volcanic island arc with a narrow shallow-water zone. The sedimentary rocks of the Southern Limón and Bocas del Toro Basins indicate deep-sea depths in contrast to the Panama Canal Basin, where shallow-water to emergent conditions persisted through most of the Cenozoic.

By the time of the Valiente Formation (middle Miocene), the shallow-water zone had expanded significantly, and an emergent active volcanic back arc had developed in the Bocas del Toro Basin. The authors assume that the Central Cordilleran volcanic arc had become more emergent.

**Punta Alegre Formation**




**Valiente Formation**

**Kudzu (*Pueraria lobata*), brought from Japan in 1876 for the Centennial Exposition in Philadelphia, grows at a rate of a foot per day and now covers 7 million acres in the southeastern United States.**

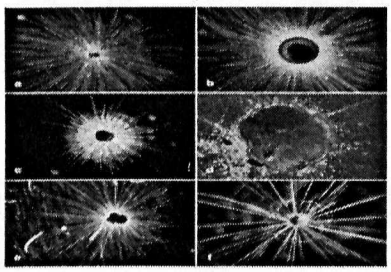
## Fighting Alien Invaders

Invasive weeds are a global problem, affecting human health, agricultural productivity, and biodiversity and carry an enormous price tag if not controlled. The National Museum of Natural History's (NMNH's) 83 million biological collections are especially rich in plants and are key to identifying invasives and their spread. Original research by NMNH and affiliated Federal agencies provide the tools for developing strategies for controlling these alien weeds

To raise awareness of its biodiversity research, education and conservation programs, NMNH's Depart-

ment of Systematic Biology co-sponsored the National Invasive Weeds Awareness Week in February. This event was organized by the Invasive Weeds Awareness Coalition, whose members include The Nature Conservancy; Smithsonian Institution and the Global Invasive Species Program (whose Washington office is now at NMNH); the Ecological Society of America; the National Wildlife Refuge Association; the Departments of Defense, Agriculture, Interior, and Commerce; and other federal, State, and private organizations. Over 150 representatives from those organizations attended the opening reception and award ceremony at the Smithsonian Institution Commons.

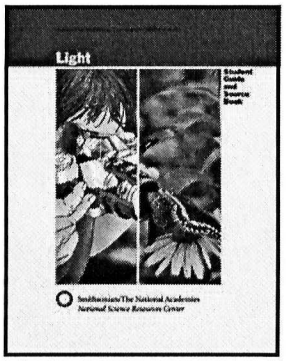
At NMNH, Smithsonian Environmental Research Center, and Smithsonian Tropical Research Institute, research and collections are contributing to a national as well as international efforts to control alien invaders on both marine and terrestrial fronts. These efforts are raising awareness of the important contribution our programs in biodiversity research can make to applied questions.

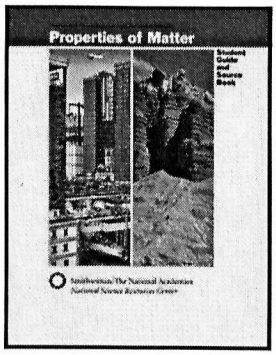


**Living Foraminifera.**

## National Museum of Natural History Honored with Helms Award

Marty Buzas, Senior Scientist at Smithsonian's National Museum of Natural History (NMNH) and Research Associate Steve Culver have won the prestigious 2003 Helms Research Award for their paper "Global latitudinal species diversity gradient in deep-sea foraminifera." Published in *Deep-Sea Research*, the paper demonstrates for the first time that foraminifera species show diversity gradients latitudinally in the ocean's depths at a greater 2000m, in both hemispheres. Funded by an endowment of the Helms family, the award focuses on the impact of a single publication published within the last three years. The world's largest collection of the sand-sized unicellular foraminifera is lodged in the Smithsonian's NMNH. This collection contains over a half-million identified specimens belonging to tens of thousands of species from modern and ancient marine sediments deposited around the world during the last 500 million years. Because of the abundant and ubiquitous nature of foraminifera, these organisms are a unique monitor of both past and present global climate and ocean environmental change.




## Experiencing Science Firsthand

Learning through inquiry helps students develop a broad conceptual understanding of scientific principles and applications, along with enhanced critical thinking capabilities and positive attitudes toward science. The Center for the Study of Testing, Evaluation, and Education Policy recently found that the Smithsonian's National Science Resources Center's (NSRC's) inquiry-based, physical science modules *Light* and *Properties of Matter* "were more effective in teaching scientific concepts assessed than were the more traditional instructional approaches employed with the control groups."

To date, more than 4,000 middle school teachers are using NSRC's eight modules, along with approximately 480,000 middle school students in school districts representing at least 30 states. And the success of this teaching method is spreading globally. For example, the University of Chile's Faculty of Medicine has translated *Properties of Matter into* Spanish to introduce inquiry-based curriculum materials into Chilean schools.

## The Squawk about "Squaw"

In February, the Canadian Broadcasting Corporation interviewed Smithsonian linguist Ives Goddard at CBC's station in Yellowknife, Northwest Territories, whose listeners are about 60 percent First Nations (Canada's equivalent of Native Americans).

Since 1992 when a guest on the Oprah Winfrey show falsely claimed that "squaw" meant "vagina," there has been widespread interest in this word. During this national broadcast, Goddard explained that "squaw" originates from the word for "woman" in the eastern Massachusetts Algonquian family of languages. "Squaw" was in use in the Plymouth Colony as early as 1622, and appears in the Bible translation printed in Harvard Yard in 1663 as the translation of "female" and (in the plural) "younger women." In 1752, an Indian preacher on Martha's Vineyard used "squaw" in his will to describe his unmarried daughters.

## Recent Publications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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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