

Museum Quarterly

LSU Museum of Natural Science

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Letter from the Director...

An Ugly Beauty

It hunkers outside curator **Prosanta Chakrabarty's** window like a miserable angular dinosaur, and when it comes alive it makes an outrageous roar that rattles windows and sends students and staff diving for cover. But we love it. It's our new, natural gas powered, super generator. No longer during hurricane season do we have to worry that the world's largest collection of wild vertebrate tissues will melt into a pool of slime. When the electricity goes out, this baby comes alive.



We owe our newest acquisition to a group of University folks who have continuously supported our tissue collection. First and foremost are Associate Vice Chancellor **Joe Kelley**, the head of Facilities Services, and **Kevin Carman**, the Dean of Basic Sciences, who together came up with the money to buy and install the generator. Facilities manager **Neil Pendleton** oversaw the installation, and **Steve Cardiff**, the Foster Hall building supervisor, made sure things went smoothly on the Museum side.

We are extremely grateful to the University for giving us the generator, especially in these tough economic times. And we appreciate all the gifts our alumni, friends, and supporters donated to the same end. Sometimes things work out.

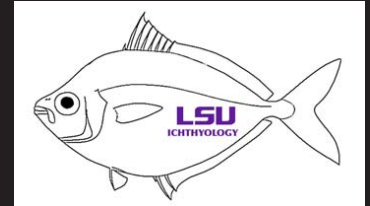
Fred Sheldon

Curator of Fishes, **Prosanta Chakrabarty**, with the Museum's newest acquisition. It blocks the view from his office, but he doesn't mind.



Going Down Under: Caving for Fish in Australia

By Prosanta Chakrabarty



In May and part of June, I traveled to Western Australia for a three-week trip that was equal parts collecting, museum work, and fish conference. For this trip I had to go down under, literally. The first part of the trip involved entering some tight subterranean habitats in search of blind cave fish. The second part of the trip was working up some bioluminescent fishes collected for me at the Western Australia Museum in Perth and the third leg was the Indo-Pacific Fish Conference in Freemantle. It was a very interesting and worthwhile adventure all around. This trip was also notable at a personal level because I was able to have my wife, Annemarie Noël, join me. I'll spare you the details about the conference (I won an award!) and museum work (I found a new species!) so that I can focus on the collecting.

The collecting trip was nearly derailed before it got started. Despite more than six months of planning and negotiation, my permits were nullified at the last minute. The permits were voided because of a miscommunication between the Western Australia Museum (WAM) and the Australian government. The timing could not have been worse; I got the news via e-mail the Friday before I was to leave. Because our Friday morning is already Saturday in Australia, I was unable to remedy the situation before my flights. I spent the entire time traveling to Australia worried sick that I wouldn't be able to collect. After flying for what seemed like three days (actually only two days) and finally arriving in Perth I immediately called the collection manager of the WAM. She explained that there was a terrible misunderstanding and that she would talk to the government to reinstate my permit. Unfortunately the new permits were much more limiting than the originals, but certainly better than nothing.

The next morning Annemarie and I boarded a flight to Exmouth, which is about 1300km north of Perth. The town of Exmouth is in the Northwest Cape, a small peninsula that is nearly the most western tip of Australia. Around that peninsula, also called Ningaloo, is the only part of Australia with cave fish. Their habitat is distributed around the few hundred kilometers of the peninsula. Only one species is known, *Milyeringa veritas*, commonly known as the blind

gudgeon. Based on some preliminary work I suspect that there is more than one species. These fish are poorly known and the populations are likely much bigger than the few specimens we find in caves. Their real homes are the inaccessible underground water chambers that span many kilometers.

I became interested in blind subterranean fishes after collecting them in parts of Madagascar last year. The first thing I noticed about the Northwest Cape of Australia is how much it resembles Southeastern Madagascar. Both locations are dry landscapes with a bright maroon colored soil, baobab trees and short stubby brush. The other thing they have in common is the presence of blind, pigmentless, subterranean fishes. From my previous work I learned that the closest relative of the blind fishes in Madagascar are the blind fish in Australia. [Editorial note: fish and fishes can both be used in the plural form, but "fishes" must be used if discussing more than one species]. These helpless blind aquatic animals can't travel 10 feet out of the caves let alone across the Indian Ocean. Their long history of living underground and being isolated from predators made pigment and vision unnecessary. The only explanation for the disjunct distribution of this Malagasy/Australian lineage is that these fishes were once part of a continuous landmass that subsequently broke apart. That former continuous landmass is known as Gondwana, and it included both Australia and Madagascar and possibly the common ancestor of these fishes. These fishes are part of a lineage that has survived the 130 million years since the break up of Gondwana. They've managed to survive in isolation oblivious to the changes above ground. The extinction of non-avian dinosaurs, bolide strikes, climate change, and the rise of humanity has not caused them to blink an eye (if they had eyes to blink).

On our first collecting day, we went to six locations where Milyeringa had been collected previously. At our first site, Woburi Rockhole, we drove a little bit off the road in Exmouth to a small hole in the ground that led to a larger underground chamber. We had to shimmy down a metal pole that was rigged up for cave divers to enter from above into the water below.



Two specimens of *Milyeringa veritas*.

As we entered you could see fossil marine shells in the limestone deposits lining the walls of the entrance. Inside the cave, which was tiny compared to what I experienced in Madagascar, we saw eight specimens of *Milyeringa veritas*. I was glad to have Annemarie with me as this was her first experience with caves. Inside the cave we found the skeleton of a large kangaroo that must have fallen into the cave about a month earlier. We were lucky we didn't discover it a week earlier because it was surrounded by thousands of fresh fly egg casings. It will make for a fine fossil one day. We spent about a half an hour in the cave before moving on. The next sites were mostly wells that were built next to small enclosed caves. Aboriginals had used the caves to get ground water for hundreds of years and you could still see the shards on the ground from the shells they once used to bring up water. Later settlers built wells for easier access to the water. I shimmied down some of the wells by pressing my back and hands against the wall while my feet were pressed against the other side. In other wells our guide, the wonderful spelunker **Darren Brooks**, used repelling equipment to drop sometimes more than 30 feet to get to the water and fish below.

The most interesting cave was a site we en-

tered on the second day. At first glance I thought it would be impossible to enter. The entrance was just two small holes, one that looked to be about 45 inches around and the other perhaps 15 inches around. Neither looked particularly inviting. The larger opening and the tunnel below were so tight that I needed to take my helmet off in order to fit. The cave itself was shaped like an Erlenmeyer flask with a tight elbow shaped entrance. After dropping a small chain ladder down the hole (making the entrance even tighter) we slowly slipped down about 15 feet into a small pocket that led to a short horizontal shelf that led to another drop of 15 feet into the main chamber. This chamber was filled with water and luckily a couple of blind gudgeon. We needed the ladder for the last drop because there was nothing to grab onto for the last ten feet. The bowl shaped chamber was dark and damp and the high CO₂ levels meant that we couldn't stay there very long. We collected a single specimen from that cave and headed back out. The climb back out of that cave was one of the scariest most physically challenging things I've ever done. After climbing out of the first chamber relatively easy I made a stupid mistake and tried to exit by climbing out facing a different direction than I had gone in. I found myself stuck like a fly in a pitcher plant.

I could feel the cool air above me but I couldn't move my arms above my head nor could I move my knees to leverage myself upward. It was extremely claustrophobic and terribly frustrating. After doing the equivalent of a hundred push ups and making no progress in getting out I headed back down to turn around. Finally, after 15 minutes of scraping myself against limestone and brushing biting ants from my face, I got out. All for a little blind fish – but in the end it was worth it. (My wife took excruciating video of my progress out of the cave that nobody reading this will ever see.)

The collecting part of the trip was much shorter than I had hoped but I gained enough materials to do what I had intended. Before heading to Perth Annemarie and I decided to do something completely different from hunting little three-inch fish in holes. We went swimming with the largest fish, the whale sharks. After dealing with dark and tight spaces it was great to actually get into the great Indian Ocean and follow some 20 foot sharks around for a day. The remainder of the trip was also fruitful and enlightening but nothing will be as memorable as our time in the Northwest Cape.



Pictured Above: **Prosanta** and Annemarie climbing through Woburi Rockhole, note the kangaroo skeleton in the foreground.



Pictured Above: **Prosanta** entering New Moubowra cave on Day 2.

Microfossils Donation

Richard P. Zingula, LSU Geology alumnus (M.S. 1953, PhD. 1958), recently made a donation of microfossil specimens and reference materials to the Section of Fossil Protists and Invertebrates. His donation includes several slides of topotypes which will be added to the H.V. Howe Type Collection of Microfossils. **Dick Zingula**, a retired geologist/micropaleontologist for Humble Oil Company and Exxon, was selected by the National Oceanic and Atmospheric Administration (NOAA) for its 2008 Environmental Hero Award. The award honors his work to have the Flower Garden Banks designated as a National Marine Sanctuary as well as his contributions as a researcher, instructor, and volunteer. Through his donation to the museum, **Dr. Zingula** continues to share his enthusiasm and scientific interest in micropaleontology.



Borneo Update

By Fred Sheldon



Pictured Above from Top to Bottom:
- Google Earth view of the Malay Archipelago with LSU's Bornean work sites marked with yellow pins. The sites are in the Malaysian states of Sabah and Sarawak.
- Banded Pitta (*Pitta guajana*). Photo by Doug Wechsler (VIREO)
- Alison Styring surveying birds in a peatswamp forest in Sarawak. Photo by Chi'en Lee (www.wildborneo.com.my).

For 10 years, LSU ornithologists have plied the forests of Borneo in search of such gems as the Crested Fireback, Honeyguide, Dusky Broadbill, Bristlehead, and Fruithunter. These expeditions have taken two forms: trips to obtain specimens for evolutionary studies of Bornean birds, and surveys to determine how Bornean birds are faring in the face of habitat destruction. Leading the evolutionary studies is LSU alumnus **Rob Moyle**, who is now an assistant professor at the University of Kansas, and leading the bird surveys is alumna **Alison Styring**, now a tenured professor at The Evergreen State College near Seattle. Numerous undergraduate and graduate students have participated in the Bornean work, including **Phred Benham**, **Cheryl Haines**, **HC Lim**, **Ben Marks**, and **Julia Raddatz**. I also join in these adventures because I love everything about Borneo—its animals, forests, people, and food—and I'll do anything I can to get there and experience the place.

LSU's molecular genetic studies of Bornean birds have uncovered some extremely interesting biogeographic patterns. We've found, for example, that lowland forest species in western Borneo are usually more closely related to lowland populations of the same species in Sumatra and the Malay Peninsula than to populations in eastern Borneo. We've also found that endemic montane birds tend to be more closely related to species in Java than to lowland species in Borneo.

Most of our conservation surveys have focused on exotic tree plantations and are intended to answer the basic question: do Bornean forest birds use such plantations? For economic sustainability, Malaysia and Indonesia are replacing large forested areas with agricultural trees, like oil palm for edible oils, and fast growing "industrial" trees, like *Acacia* and *Eucalyptus*, for pulp and plywood production. In numerous surveys, we've found that native forest birds can live fairly well in groves of the pulp and plywood trees, because these groves rapidly develop into lush secondary forests. On the other hand, oil palm has virtually no under-story and is almost devoid of birdlife.

Most of our work in Borneo has been made possible by a grant from the Coypu Foundation, a generous legacy of Museum patron **Jack McIlhenny**.

Check online for more amazing pictures!

MNS Welcomes its Newest Additions!



Dency Flenny

The Museum welcomes its newest graduate student from Malaysia, **Dency Flenny** anak Augustine Gawin. Dency is a Bidayuh from western Sarawak in Malaysian Borneo. She got her B.S. and M.S. degrees from the University Malaysia Sarawak, and when she finishes her Ph.D. at LSU she will assume a faculty position at that university. Her M.S. degree was on the population genetics of Mountain Black-eyes (*Chlorocharis emiliae*). This enigmatic “white-eye” is a Bornean endemic that occurs in isolated populations on the tops of the island’s highest mountains, including Mts. Kinabalu, Trus Madi, and Mulu. Dency trudged to the top of every mountain where this species occurs, collected specimens, and compared populations using DNA sequences. She will pursue further comparisons of Bornean populations for her Ph.D. studies.

Top Picture: A Mountain Black-eye. Photo by Doug Wechsler of VIREO

Middle Picture: **Dency Flenny** and **Fred Sheldon** about to ascend Mt. Trus Madi in Sabah, Malaysian Borneo, to seek the wily Mountain Black-eye.

Bottom Right Picture: **Sandra Garzon** photographed on campus.

Sandra Garzon is a new graduate student in the MNS and the Geology and Geophysics department. She began in August 2009. She received her bachelor’s degree in Geology from a Colombian University called Universidad Industrial de Santander. She is working with **Dr. Warny** doing Palynological analysis of Upper Cretaceous sequences from Northern South America. Her research focuses on taxonomy and biostratigraphy of organic-walled dinoflagellate cysts, pollen and spores. The aim of her study is to use paleopalynology as a tool for hydrocarbon exploration.



Sandra Garzon

MNS's Latest Publications

Retired adjunct curator **Barun K. Sen Gupta** and collections manager **Lorene Smith** (microfossils and invertebrate paleontology) have had two large works on Foraminifera published recently:

Sen Gupta, B.K., M.K. Lobegeier, and **L.E. Smith**. 2009. Foraminiferal communities of bathyal hydrocarbon seeps, northern Gulf of Mexico: A taxonomic, ecologic, and geologic study. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2009-013, 385 pp.

Sen Gupta, B. K., L. E. Smith, and M. L. Machain-Castillo. 2009. Chapter 6, Foraminifera of the Gulf of Mexico. Pp. 87–129 in Darryl L. Felder and David K. Camp, eds., *Gulf of Mexico Origin, Waters, and Biota*. Volume 1, Biodiversity. Texas A&M University Press, College Station.

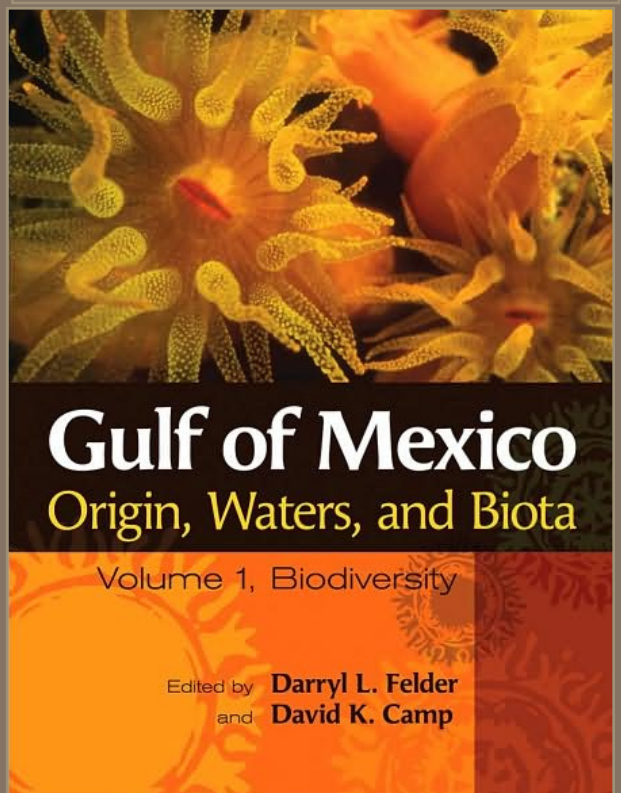
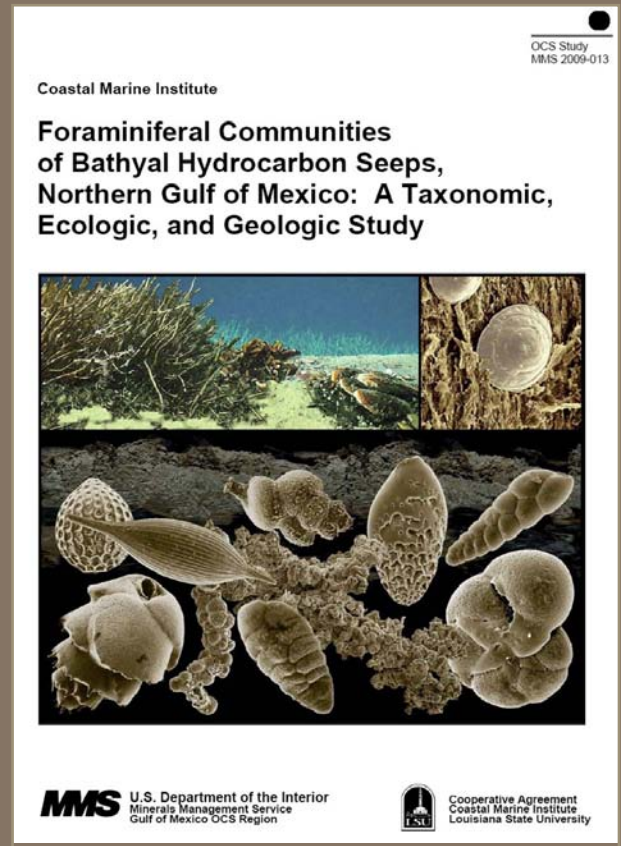
The Minerals Management Service report includes a taxonomic atlas of benthic and epibenthic Foraminifera associated with hydrocarbon seeps in the Gulf of Mexico. At hydrocarbon seeps, methane and sulfide provide primary producers (bacteria) with a source of energy, supporting complex, chemosynthesis-based communities. Foraminifera living beneath bacterial mats may be facultative anaerobes while some foram species that are intolerant of low oxygen can be found in microhabitats above the dysoxic bottom sediment,

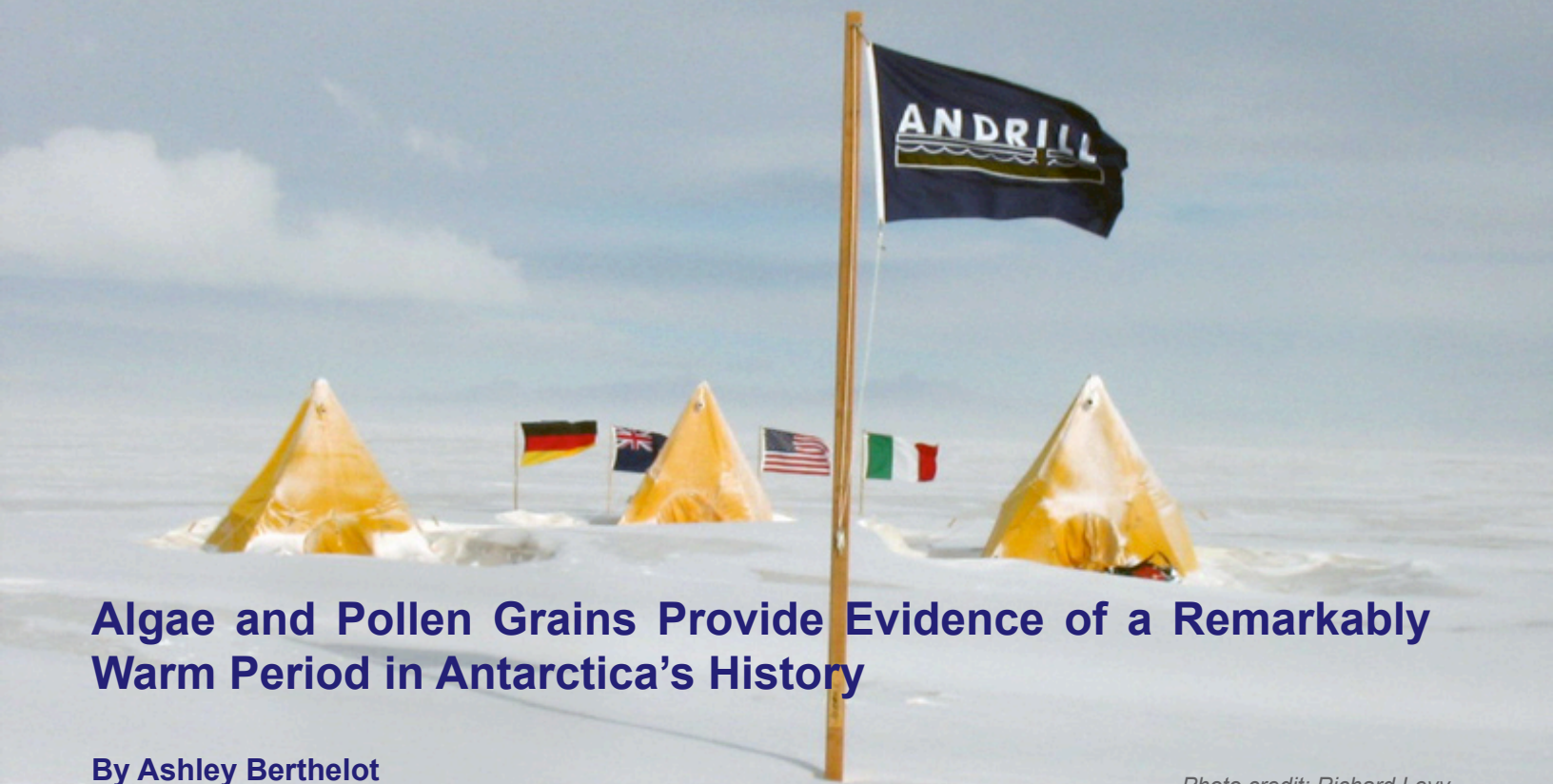
e.g., on tubeworms.

A large (159 MB) pdf of the report can be downloaded for free from the MMS website through the Environmental Studies Program Information System (ESPIS) (http://www.gomr.mms.gov/homepg/regulate/enviro/techsumm/rec_pubs.html).

The first two volumes of the seven volume 50-year update of U.S. Fishery Bulletin 89, *The Gulf of Mexico - Its Origins, Waters, and Marine Life* are now available. Barun, Lorene, and coauthor Maria Machain-Castillo (LSU Ph.D. 1985), contributed the chapter on Foraminifera in Volume 1, Biodiversity. Volume 2, *Ocean & Coastal Economy* was also released this year. Sponsored by the Harte Research Institute and published by Texas A&M University Press, the multi-volume set will include *Geology, Ecosystem-based Management, Physical Oceanography, Chemical Oceanography, and Human Issues*.

The 1,393 page Volume 1 covers 15,419 species in 40 phyla (including 951 species of Foraminifera). Each chapter provides a species inventory with information on habitat, depth range, distribution, and a list of references. According to Editor David Camp, Volume 1 will become “a benchmark publication on the biology of the Gulf of Mexico.”





Algae and Pollen Grains Provide Evidence of a Remarkably Warm Period in Antarctica's History

By Ashley Berthelot

Photo credit: Richard Levy

For **Sophie Warny**, LSU assistant professor of geology and geophysics and curator at the LSU Museum of Natural Science, years of patience in analyzing Antarctic samples with low fossil recovery finally led to a scientific breakthrough. She and colleagues from around the world now have proof of a sudden, remarkably warm period in Antarctica that occurred about 15.7 million years ago and lasted for a few thousand years.

Last year, as **Warny** was studying samples sent to her from the latest Antarctic Geologic Drilling Program, or ANDRILL AND-2A, a multinational collaboration between the Antarctic Programs of the United States (funded by the National Science Foundation), New Zealand, Italy and Germany, one sample stood out as a complete anomaly.

"First I thought it was a mistake, that it was a sample from another location, not Antarctica, because of the unusual abundance in microscopic fossil cysts of marine algae called dinoflagellates. But it turned out not to be a mistake, it was just an amazingly rich layer," said Warny. "I immediately contacted my U.S. colleague, Rosemary Askin, our New Zealand colleagues, Michael Hannah and Ian Raine, and our German colleague, Barbara Mohr, to let them know about this unique sample as each of our countries had received a third of the ANDRILL samples."

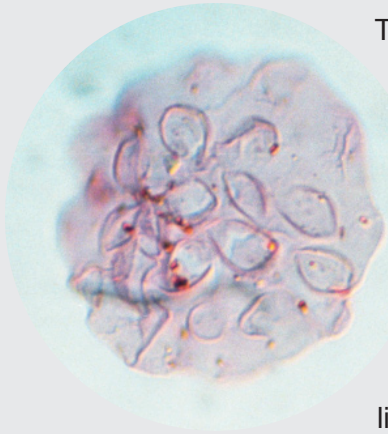
Some colleagues had noted an increase in pollen grains of woody plants in the sample immediately above, but none of the other samples had such a unique abundance in algae, which at first gave Warny some doubts about potential contamination.

"But the two scientists in charge of the drilling, David Harwood of University of Nebraska – Lincoln, and Fabio Florindo of Italy, were equally excited about the discovery," said **Warny**. "They had noticed that this thin layer had a unique consistency that had been characterized by their team as a diatomite, which is a layer extremely rich in fossils of another algae called diatoms."

All research parties involved met at the Antarctic Research Facility at Florida State University in Tallahassee. Together, they sampled the zone of interest in great detail and processed the new samples in various labs. One month later, the unusual abundance in microfossils was confirmed.

Among the 1,107 meters of sediments recovered and analyzed for microfossil content, a two-meter thick layer in the core displayed extremely rich fossil content. "This is unusual because the Antarctic ice sheet was formed about 35 million years ago, and the frigid temperatures there impede the presence of woody plants and blooms of dinoflagellate algae on the shelf," said Warny.

"We all analyzed the new samples and saw a 2,000 fold increase in two species of fossil dinoflagellate cysts, a five-fold increase in freshwater algae such as Zygnemaceae (right page, top) and up to an 80-fold increase in terrestrial pollen such as *Podocarpidites* (right page, bottom)," said **Warny**. "Together, these shifts in the microfossil assemblages represent a relatively short period of time during which Antarctica became abruptly much warmer."



These palynomorphs, a term used to describe dust-size organic material such as pollen, spores and cysts of dinoflagellates and other algae, provide hard evidence that Antarctica underwent a brief but rapid period of warming about 15 million years before present.

“This event will lead to a better understanding of global connections and climate forcing, in other words, it will provide a better understanding of how external factors imposed fluctuations in Earth’s climate system,” said Harwood.



“The Mid-Miocene Climate

Optimum has long been recognized in global proxy records outside of the Antarctic region. Direct information from a setting proximal to the dynamic Antarctic ice sheets responsible for driving many of these changes is vital to the correct calibration and interpretation of these proxy records.”

These startling results will offer new insight into Antarctica’s climatic past – insights that could potentially help climate scientists better understand the current climate change scenario.

“In the case of these results, the microfossils provide us with quantitative data of what the environment was actually like in Antarctica at the time, showing how this continent reacted when climatic conditions were warmer than they are today,” said Warny.

According to the researchers, these fossils show that land temperatures reached a January average of 10 degrees Celsius – the equivalent of approximately 50 degrees Fahrenheit – and that estimated sea surface temperatures ranged between zero and 11.5 degrees Celsius. The presence of freshwater algae in the sediments suggests to researchers that an increase in meltwater and perhaps also in rainfall produced ponds and lakes adjacent to the Ross Sea during this warm period, which would obviously have resulted in some reduction in sea ice.

These findings most likely reflect a poleward shift of the jet stream in the Southern Hemisphere,

which would have pushed warmer water toward the pole and allowed a few dinoflagellate species to flourish under such ice-free conditions. Researchers believe that shrub-like woody plants might also have been able to proliferate during an abrupt and brief warmer time interval.

“An understanding of this event, in the context of timing and magnitude of the change, has important implications for how the climate system operates and what the potential future response in a warmer global climate might be,” said Harwood. “A clear understanding of what has happened in the past, and the integration of these data into ice sheet and climate models, are important steps in advancing the ability of these computer models to reproduce past conditions, and with improved models be able to better predict future climate responses.”

While the results are certainly impressive, the work isn’t yet complete.

“The SMS Project Science Team is currently looking at the stratigraphic sequence and timing of climate events evident throughout the ANDRILL AND-2A drillcore, including those that enclose this event,” said Florindo. “A broader understanding of ice sheet behavior under warmer-than-present conditions will emerge.”

This story was published as the cover story of the October 2009 issue of the journal *Geology*.





Special Saturday Schedule 2009-2010

Special Saturdays are science programs especially appropriate for children ages 5-12. A fee of \$3 per child paid at the door is requested for materials. Accompanying adults attend free of charge. Sessions are held in the exhibit area of Foster Hall (LSU) one Saturday per month. All programs begin at 10:00 am and last ~one hour, but our exhibit area will be open from 10:00 - 12:00 pm.

WHAT'S IN THE WATER? September 19th, 2009



Special Guest: Adrienne Lopez, Microscopist. Did you know that there are thousands of little animals in the water that you can't see? Some of them like clean water and some of them are really nasty... Lets find out what's in the water.

LOUISIANA ARCHAEOLOGY November 21st, 2009



People have lived in Louisiana for thousands of years. Come hear of the customs of Louisiana's people and learn to create Native American art.

GLOWING FISHES December 5th, 2009



Special Guest: Prosanta Chakrabarty, Ichthyologist. Fishes come in all sizes and shapes. Some of them can do amazing things like light up the ocean. Come listen to Prosanta Chakrabarty who will show you all the cool stuff fishes can do.

BIRD ADAPTATIONS January 30th, 2010



Special Guest: Gustavo Bravo, Ornithologist. People use chopsticks to eat sushi and a spoon to have soup. Birds have a much better way to do it! Their beaks are the perfect shape for their favorite foods.

SANDWICH FORMATIONS February 27th, 2010



The earth is made up of layers just like a sandwich. Geologists drill deep holes through those layers and find hidden clues about the past inside ancient rocks. Come and travel in time with geology.

ROCKS TELL A STORY March 27th, 2010



Rocks are everywhere! They form the mountains and canyons. You can even find them lying on the ground. But did you know rocks can tell a story? If you want to know what rocks are about to say this is your best chance!

LSU DAY April 24th, 2010



As part of the celebration of LSU's 150th birthday, the museum will have fun displays and activities for kids showing what the museum is all about.

AMAZING MONKEY MOTHERS May 8th, 2010



Special Guest: Amanda Accamando, Primatologist. Come listen to Amanda Accamando share her experience observing rhesus monkeys for four years. Learn what makes you a primate and find out what life would be like without a thumb.

Preregister by the preceding Thursday with Sandra Garzon • sgarzo1@lsu.edu
For more information visit us at www.lsu.edu/MNS-Education



Special Saturdays at the MNS

What's in the Water activities.

The LSU Museum of Natural Science held one of its Special Saturday events on September 19, 2009. Young scholars enjoyed participating in a number of fun activities including coloring macroinvertebrates, crafting refrigerator magnets shaped as diatoms, and using Scope-On-A-Rope to look at water samples. Most of the participants brought their own water samples and analyzed them with the help of Microscopist, **Adrienne Lopez, Sandra Garzon, and Heather Jackson.**

Giving Form to Support the Museum of Natural Science

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If you would like to include items in the next issue of *Museum Quarterly* please send information, articles and photographs to the Museum Education Office c/o Elizabeth Maier, public relations intern. Articles about research, study or any other items of interest are encouraged. Information may be submitted as completed articles with jpeg pictures in attachments, or in list form to be put into article. Simply email your material to emaier2@lsu.edu and cc swarny@lsu.edu or mail to:

The LSU Museum of Natural Science
Education Office
119 Foster Hall

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