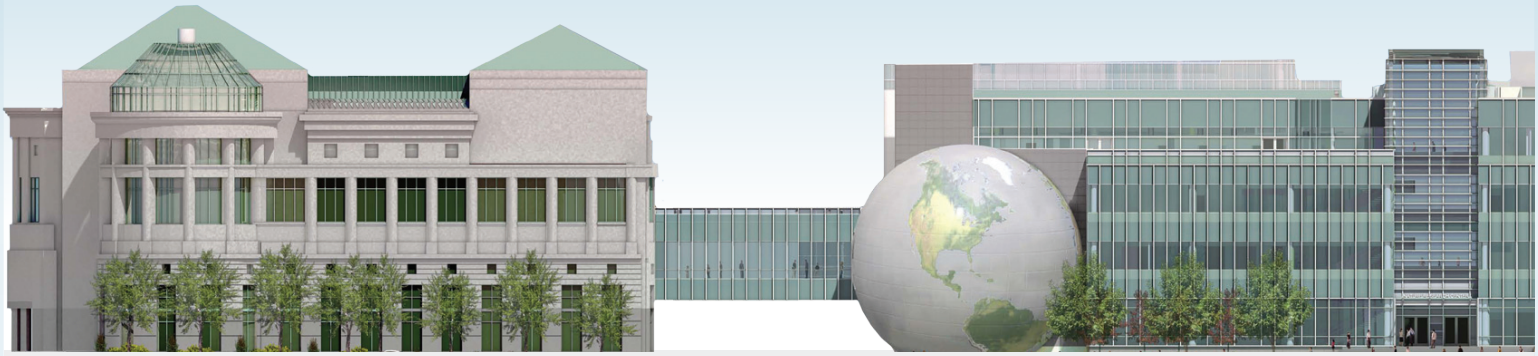
NATURESEARCH NEWSLETTER



Issue 01
September 2011

Welcome

Welcome to the first issue of our newsletter *NATURESEARCH*! Its mission is to report the research, discoveries, grants and publications of the North Carolina Museum of Natural Sciences and its new wing, the Nature Research Center (NRC). With over two million specimens, The Museum houses one of the largest natural history collections in the southeastern United States, amassed over its 132-year history, and is the largest natural science museum in the Southeast. In 2012, the Museum will significantly add to its scientific and education staff with the opening of 80,000 square feet of exhibits, new laboratory space, and innovative educational venues for science communication ***(www.naturesearch.org)***. The iconic technology theater, called the SECU Daily Planet, has the capability to broadcast broader impacts of scientific discoveries to all classrooms throughout North Carolina as well as a global reach, using the Internet2 network. To celebrate the scientific achievements of the past, and to inspire transformational research into the future, we are honored to launch the first issue of *NATURESEARCH*. Historically, most museum exhibits have featured "what we know about science." As an innovative departure from this conventional mission, the NRC will focus on "how we know what we know about science." Many exhibits will feature the concept of how scientists work and engage the public in experiencing scientific research first-hand.

The NRC opens April 20, 2012. Thank you for your partnership, support and ideas as we work together to inspire science literacy both locally and globally. STEM (science, technology, engineering and mathematics) education is the backbone of a sound economy, and the Museum looks forward to contributing to this important goal for the next generation. We hope to foster unique collaborations and programs with our team of scientists, educators, technology experts, staff and volunteers.

Dr. Karen Giroux
Director,
Research & Collections

Dr. Meg Lowman
Director,
Nature Research Center

The NRC has four priorities:

1. Cutting-edge, professional science expanding on existing research at the Museum;
2. Engaging a diverse audience, including "citizen scientists," in scientific re-search projects in innovative ways;
3. Diversity in our staff and audience, to ensure role models for the next generation of scientists;
4. Integration of "virtual" with "real" nature, by linking our collections and fieldwork to technologies that include modeling, simulation, mobile applications and gaming.

Millipeds and Continential Drift

How can studying living creatures with tiny legs and no wings today tell us something about the world 300-500 million years ago?

Mapping the distributions of the 16 milliped orders (Phylum Arthropoda: Class Diplopoda) led Dr. Rowland Shelley, Curator of Terrestrial Invertebrates, to a hypothesis that may hold relevance for other nonflying, poorly mobile, soil organisms. Today, millipeds occur on most continents and islands but they originated in only one place and at one time. How did organisms that cannot run, fly, swim or float spread throughout the world without aid by man or other vertebrates? Dr. Shelley's detective work indicates that for hundreds of millions of years, millipeds "rode" small and large tectonic "land rafts" as they drifted atop Earth's liquid mantle of magma and became separated by past and present oceans. Life began in the sea, but there are no known marine milliped fossils. Their unique anatomical features, including adaptations for a burrowing lifestyle, logically evolved on land since they would not have provided an advantage for burrowing in soft marine sediments. The clues reveal that only one scenario accounts for the long-distance movement of a taxon with tiny legs and no wings. Around 525 million years ago (mya), an unknown marine ancestor crawled ashore onto the Avalonia section of the continent, Gondwana, the giant land mass that now represents South America, Africa, Arabia, Madagascar, India, Australia, New Zealand and Antarctica. A period of rapid evolution and radiation ensued as ancestral millipeds dispersed. About 480 mya, Avalonia rifted or separated from Gondwana and began drifting northward, thereby dividing the existing milliped populations. The ancestral populations on Avalonia were trapped there while it drifted for 30 million years. Around 450 mya, Avalonia collided with the uninhabited "micro-continent" Baltica, enabling its milliped populations to spread. Another period of rapid divergence and radiation resulted and evolution proceeded in a different direction. Ten million years later, the fused land mass of Avalonia + Baltica collided with the unoccupied micro-continent Laurentia creating Euramerica, now represented by Europe, North America and Greenland. A third period of rapid divergence and radiation ensued in Euramerica while Gondwanan populations continued to evolve and disperse. Around 415 mya, simultaneous with the first milliped fossilizations in the part of Euramerica that now forms Scotland, the land terrane that has become northern China rifted from the region of Gondwana that now represents Australia, and around 400 mya, the land masses that formed southern China and southeastern Asia rifted from the same area of Gondwana. Each carried Gondwanan millipeds while colliding sequentially with the micro-continents of Siberia + Kazakhstania, thereby ferrying their inhabitants to present-day Asia, where they intermingled with forms that had dispersed from Euramerica after it too merged with Siberia + Kazakhstania. Likewise ~306 mya, Euramerica merged with the region of Gondwana that became South America, thereby allowing their faunas to mix. A complete explanation of the taxonomic and biogeographic study of millipeds is far more complex and helps to explain how ancestral millipeds, and perhaps other poorly mobile organisms, spread over time throughout Earth's land masses.

Geology and Biology converge to describe a young planet.

What we now know as stable continents formed from many collisions and "rifts" over many millions of years and the distribution of relatively immobile fauna confirms this history that was first documented by geologists.

Recent Research

Dr. Chris Tacker

Curator of Geology

Dr. Chris Tacker is finishing the second year of a three-year NSF grant supporting apatite group mineral synthesis and analysis by infrared spectroscopy and electron microprobe. He recently attended a volcanology conference in Montserrat, British West Indies, and returned with specimens from the Soufrierre Hills volcano. Apatite minerals in the volcanic rocks record the behavior of gases that drive explosive eruptions. Analysis should yield new insights on the behavior of these gases deep below the volcano. He continues collaborative research on Ediacaran fossils and tissue preservation in coleoid cephalopods with Trish Weaver, the geology and paleontology collections manager. Additional collaboration with Lisa Gatens, our curator of mammals, examines mercury in NC bats and sediments.

Dr. Bryan Stuart

Curator of Herpetology

Turtles are harvested and traded throughout Asia for food, traditional medicine and pets. The demand for turtles now threatens the majority of Asian species with extinction in the wild, a phenomenon known as the "Asian turtle crisis." Dr. Bryan Stuart reports the wild discovery of one such species in the journal *Biological Conservation* — a major step in advancing Asian turtle conservation efforts. During three field surveys, Stuart's colleagues Tri Ly and Huy Duc Hoang from the University of Science in Ho Chi Minh City, Viet Nam, along with three local villagers and their turtle-tracking dogs, found a total of eight Vietnamese box turtles. "This discovery provides the first opportunity to conserve this species," Stuart said, "and provides hope for determining the wild origin of other rare species that are known to scientists only by turtles bearing price tags."

Vince Schneider

Curator of Paleontology

For the second year, Vince Schneider led a small group of volunteers to our Arizona field site located in the Triassic Chinle Formation in eastern Arizona, not far from where the large Arizona fire occurred in June. They worked an historic Triassic fossil locality, the Placerias Quarry, considered by many to be one of the world's richest Triassic vertebrate sites. They met with Dr. Andy Heckert and his students from Appalachian State University and spent the next eight days excavating the remains of numerous crocodilian-like archosaurs, especially those of aetosaurs and phytosaurs. The aetosaurs were completely covered with dermal armor that looks like a reptilian version of an armadillo. The phytosaurs looked superficially like modern-day gavials. This work compliments the Museum's work in the North Carolina Triassic where they have uncovered many of these same types of animals.

2010 Publications *(* indicates not peer-reviewed)*

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*__Beane, J.__ 2010. Portraits of diversity: Reptiles. Wildlife in North Carolina 74(5):20-25

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*__Beane, J.__ 2010. The Great Gopher Tortoise. NC Herps 33(3):13-14.

*__Beane, J.__ 2010. Survival tactics. Fifteen501 5(3):72-73.

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*__Beane, J.__ 2010. North Carolina wild notebook: Horde of the flies. Wildlife in North Carolina 74(9):32-35.

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*__Beane, J.__ 2010. Grossing out predators. North Carolina Naturalist 18(2):4-5.

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The SECU Daily Planet Takes Shape

A 24-hour celebration of the opening of our new wing, the Nature Research Center, will begin at 5:00 PM April 20, 2012 on Earth Day weekend. As you can see, the SECU Daily Planet is well underway. The keys to the building should be handed to our Museum Director, Dr. Betsy Bennett, in January 2012. It will then take a few months to install the exhibits and get the laboratories and new programs up and running before opening day. There will be lots of activities and entertainment for the entire 24-hour opening so we hope you will join us. We are in the final stage of our fundraising effort. If you would like to make a tax-deductible contribution toward this truly unique museum experience, please contact the Friends of the Museum (919-733-7450 x350) or http://naturalsciences.org/support-us.

KAREN SWAIN

Construction of the SECU Daily Planet in August 2011 on Jones Street, Raleigh, NC.