Small Footprint, Big Impression

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North Carolina State University's paleontologists may have a small physical "footprint" on campus, but the researchers have managed to make a pretty big impression on the world nonetheless.

In the past four years, two NC State paleontologists have received worldwide attention with discoveries that have captured the imagination of the general public and challenged assumptions both inside and out of the paleontology community.

Dr. Mary Schweitzer's 2005 discovery of soft tissue inside the bone of a 68-million-year-old Tyrannosaurus Rex not only led to endless speculation on whether or not Jurassic Park may be within reach, it also turned the conventional wisdom about the process of fossilization on its head. Prior to Schweitzer's work, most paleontologists had believed that when dinosaurs died and became fossilized, soft tissues didn't preserve – the bones were essentially transformed into "rocks" through a gradual replacement of all organic material by minerals.

Schweitzer took a counterintuitive path when she demineralized a portion of a T. rex's fossilized femur and discovered stretchy soft tissue within – tissue that has recently yielded the first known sample of dinosaur collagen. Colleagues at Harvard successfully sequenced the dinosaur protein that Schweitzer had extracted from the tissue, identifying the amino acids and confirming that the material from the T. rex was collagen. When the researchers compared the collagen sequences to a database that contains existing sequences from modern species, they found that the T. rex sequence had similarities to those of

chicken, frog and newt.

“From a paleo standpoint, sequence data really is the nail in the coffin that confirms the preservation of these tissues,” Schweitzer says. “This data will help us learn more about dinosaurs’ evolutionary relationships, about how preservation happens, and about how molecules degrade over time, which could also have some important medical implications for treating disease.”

But Schweitzer isn’t the only NC State paleontologist to shake up the status quo. Dr. Julia Clarke’s research on two newly discovered species of prehistoric penguin – one of which stood about 5 feet tall – calls into question hypotheses about the timing and pattern of penguin evolution and expansion.

Previous theories held that penguins probably evolved in high latitudes (Antarctica and New Zealand) and then moved into lower latitudes that are closer to the equator about 10 million years ago – long after significant global cooling that occurred about 34 million years ago. But the new fossils indicate that penguins were present near the equator during a period that predates one of the most important climatic shifts in Earth’s history, the transition from extremely warm temperatures in the Paleocene and Eocene Epochs to the development of “icehouse” Earth conditions and permanent polar icecaps. Not only did penguins reach low latitudes during this warmer interval, but they thrived: More species are known from the new Peruvian localities than inhabit those regions today.

“We tend to think of penguins as being cold-adapted species,” Clarke says, “even the small penguins in equatorial regions today, but the new fossils date back to one of the warmest periods in the last 65 million years of Earth’s history. The evidence indicates that penguins reached low latitude regions more than 30 million years prior to our previous estimates.”

Schweitzer and Clarke have made their marks on modern paleontology, and the department is poised to continue this pattern with the work of graduate students Clint Boyd, Jeremy Green and Adam Smith. With research interests ranging from the ancient origins of seabirds, to determining the diet of mastodons based on patterns of tooth wear to figuring out the evolutionary relationships between dinosaurs, it seems likely that another major discovery is right around the corner.

Source: NC State University