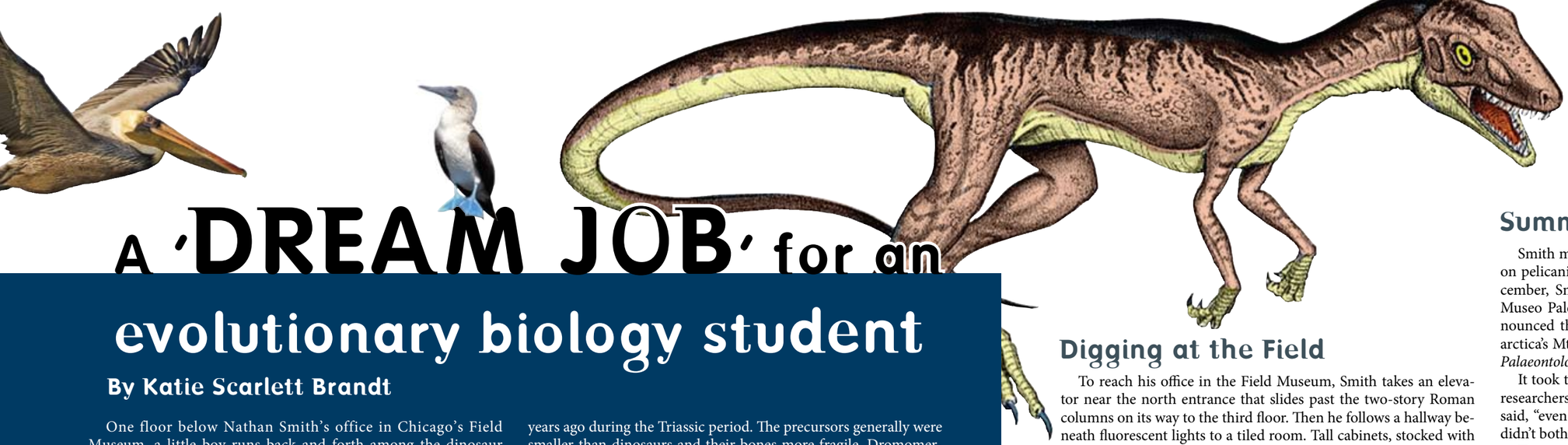

A 'DREAM JOB' for an evolutionary biology student

By Katie Scarlett Brandt

One floor below Nathan Smith's office in Chicago's Field Museum, a little boy runs back and forth among the dinosaur bones on display.

"Look at all these fossils they dug up, Mom!" he shouts in unconcealed awe.

Distracted by the boy's younger siblings, his mom doesn't respond immediately, but that doesn't dampen his enthusiasm.

Upstairs, Smith is just as enthusiastic about fossils. Since 2005, he has been working toward a PhD in evolutionary biology through the program that the University of Chicago offers in conjunction with the Field Museum. As the introductory sign reads in the exhibit below, "Everything on Earth that has ever lived is connected through, and the result of, evolution. This is where our story begins."

Nathan Smith *(above)* works at the Field Museum while pursuing a PhD at the University of Chicago. *Right:* Smith and his colleagues at work on digs.
Photo of Nathan Smith by Dan Dry; on-site photos provided by Nathan Smith

The statement fuels Smith's zeal. "Paleontology gives us access to life's history. We need that historic perspective," he said.

Earth's history began 4.5 billion years ago, but Smith focuses on the Triassic and Jurassic periods, beginning about 248 million years ago. As a third-year student, he spends most of his time either at the Field Museum creating phylogenetic trees or out in the field digging.

His work has taken him to Antarctica, China, Argentina and remote parts of the southwestern United States. He's published seven papers from those trips, including an article in the July 20, 2007 issue of *Science*—all braggable feats for a 20-something graduate student, though Smith considers the work of his peers at the university much more interesting.

'Reptile A'

The *Science* paper focused on a new species, *Dromomeron romeri*, which Smith and a team of graduate students from institutions across the country discovered in 2006. Dromomeron wasn't a dinosaur, but part of a group of reptiles that scientists refer to as "dinosaur precursors." It roamed the Earth roughly 212 million years ago during the Triassic period. The precursors generally were smaller than dinosaurs and their bones more fragile. Dromomeron's length, for example, only reached about three feet, and it was bipedal, walking on its two hind legs.

Until recently, general scientific thought was that the precursors went through a rapid extinction at the end of the Middle Triassic period, never co-existing with dinosaurs, whose arrival scientists marked with the Late Triassic period 227 million years ago. The theory was shaky, but there wasn't strong enough evidence to refute it. That is, until Smith's group, Dromomeron and studies of a few similar fossil assemblages in North America began to prove otherwise.

The Hayden Quarry in New Mexico where Smith and his colleagues discovered Dromomeron had preserved ideal evidence. The area's smooth mudstone maintained the small, fragile bones better than most sites. And in the same layer of sediment, the earth held Dromomeron and other precursor fossils side-by-side with true dinosaur fossils. This indicated to Smith that the dinosaur precursors co-existed with dinosaurs through the Late Triassic period, perhaps even for millions of years.

Part of Ghost Ranch, an educational center 50 miles northwest of Santa Fe, Hayden Quarry didn't exist until 2002. An amateur archaeologist named John Hayden was hiking there when he discovered fossils in the soil. Since then, Smith's team has developed a relationship with the ranch and makes regular excavation trips.

Back in 2006, only a few inches of brownish-gray bone jutted out from the large chunk of rock that he and his colleagues pulled from the ground. Smith couldn't say for sure what they'd found, but they labeled it "reptile A" and trusted their instincts.

"You develop an eye," he said, "but you don't always know what you have until you have it prepped."

In the field, they placed the chunk of rock in a plaster jacket, and "reptile A" joined Smith on the return trek to the Field Museum labs.

Digging at the Field

To reach his office in the Field Museum, Smith takes an elevator near the north entrance that slides past the two-story Roman columns on its way to the third floor. Then he follows a hallway beneath fluorescent lights to a tiled room. Tall cabinets, stocked with shoebox-like containers of fossils from all over the world, divide the long room. His desk sits in the corner next to the door; across from it, more shoeboxes filled with bird skulls cover a table.

The skulls and other delicate bones comprise another of Smith's projects: his dissertation, which he defended this past fall and plans to complete during the next two years. He's mapping the size, shape and structure of pelicaniformes, modern birds that include the brown pelican and the blue-footed booby. Their webbed feet make shore life easier, and many species have a pouch in the lower bill that enables them to scoop up the fish they dive or swim to catch.

Smith chose the topic because he said he loves systematics and tree-building. "It's open-ended," he said of choosing what to study. "We're given a lot of leeway."

His advisor, Peter Makovicky, offers guidance, and Smith shares an obvious passion with him. "People make fun of Pete and me because we just like to work," he said. On digs, this includes staying in the field and passing up opportunities to absorb an area's culture.

As Smith analyzes each species' bones and plots their characteristics into a spreadsheet on his computer, he also traces their lineages, creating trees that lead from these modern birds back to dinosaur ancestors millions of years old. He essentially works from scratch, since birds don't possess a strong fossil record because of their light, delicate bones.

"These things are 200 million years old, and they have so much that they share with birds," he said as he pulled a box containing a small fossilized dinosaur femur from a cabinet.

In order to map their lineages, Smith looks at the relationships of each bird's bones and finds dinosaurs that possess the same structure. Because so many researchers in the Field Museum travel the world on their own excavations, Smith can tailor their findings to his own research.

One group, for example, makes regular trips out to the Green River in Southwestern Wyoming. Smith has never joined, but he uses some of the "exquisitely preserved" fossils they bring back to trace his own birds' phylogeny.

"It's great because there are so many people here doing so many different things. There's always an expert right down the hall you can talk to," he said.

Summer in Antarctica

Smith may rely on other people's excavations to aid his research on pelicaniformes, but he makes his own trips, too. This past December, Smith and co-author Diego Pol, a paleontologist at the Museo Paleontológico Egidio Feruglio in Chubut, Argentina, announced they had discovered a new species of dinosaur on Antarctica's Mt. Kirkpatrick. Their work appeared in the journal, *Acta Palaeontologica Polonica*.

It took two excavation seasons to dig the fossils completely. The researchers traveled in summer, camped on the glacier and, Smith said, "even with no wind and the sun beating down," the weather didn't bother him.

The team helicoptered inland, trailed only by skuas, birds that had followed the helicopter in hopes of finding food, much like their North American gull relatives who chase cars to fast-food parking lots. The helicopter touched down near the Beardmore Glacier, where the team uncovered the partial foot, leg and ankle bones of a massive plant-eating sauropodomorph, the largest animals to ever roam the earth. Significantly larger and younger than the Dromomeron fossils Smith had found in New Mexico, it lived roughly 190 million years ago and weighed between 4 and 6 tons.

Previously, researchers had found fossils of only one other Jurassic period dinosaur in Antarctica, so this latest one helps show how widely distributed sauropodomorphs were during the Early Jurassic period. Smith and his colleagues dubbed their discovery *Glacialisaurus hammeri*, after the Augustana College professor who led the trips that eventually uncovered it.

Professor Bill Hammer was not only the man who coordinated the Antarctica digs, but he was the one who ignited Smith's interest in paleontology during Smith's undergraduate days at Augustana College in Rock Island, Ill. As a student, Smith joined Hammer on an excavation trip to the White River Badlands in Nebraska.

The Badlands earned their name from the Sioux Indians who struggled across the rugged terrain, exceedingly short on water, which stretches from Wyoming and Colorado through South Dakota. Despite the name, the land and Smith's journey there inspired him, and he decided to make paleontology his career. Originally a chemistry major, Smith was tired of "spending eight hours on nice days inside waiting for a chemical reaction." The wide stretches of land and possibilities Smith saw on that first trip made him realize that science didn't have to keep him indoors.

"This would be a dream job," Smith said of what his work has since evolved into at the Field Museum. "I want to do research, and I want to teach classes with everyone on the edges of their seats."

Similar dreams take place just a flight of steps below Smith's office, where one little boy's excitement propels him through the "Evolving Planet" exhibit.

"I wonder how they got this out," he whispers. His mouth hangs agape as he cranes his neck up at *Cryolophosaurus ellioti*, the first dinosaur found in Antarctica.

Smith could explain.