TRACKING DINOSAURS THROUGH NEW JERSEY HOUSING DEVELOPMENTS

Retired high school science teacher Chris Laskowich picks through the rubble left behind from a previous day's blasting at an old basalt quarry that is now a condominium tract in northern New Jersey. He flips over small pieces of red shale and sandstone and examines the exposed sides of rocks too heavy to move. Within minutes, he sees the outline of something fascinating: a dinosaur footprint.

Below: Refuse pile at the condo development with the New York skyline in the background. Amateur paleontologists Howie Cohn (middle) and Henry Vila (bottom) excavate tracks at the development.

Track of *Batrachopus*, a crocodile-like reptile.

It's a 33-centimeter-long *Eubrontes giganteus* track, a trademark footprint from the Early Jurassic period. Laskowich calls the New Jersey State Museum to report the find, left behind about 200 million years ago. The footprint, along with its three-ton host rock, is now on display on the museum's front lawn in Trenton — ceremoniously loaded on a truck and moved to its current resting place last October following a press conference to announce the find, orchestrated by K Hovnanian Homes, the developer building townhouses on the site.

This site "really is unique in the world," says Paul Olsen, a paleontologist at Columbia University's Lamont-Doherty Earth Observatory who has done research at the quarry. It's one of the few places on the planet where scientists can study how life at the Triassic-Jurassic boundary began to rebound from the mass extinction event that marked the beginning of the age of dinosaurs. "There's nowhere else where you can walk up and put your hand on the very earliest, large theropod dinosaur layers," he says.

Laskowich's discovery is just one of many fossil footprints that have been unearthed at this quarry over the past 50 years — and may be among the last, as the site is privately owned and under development. There are no laws protecting paleontological finds in New Jersey and rarely does a project get halted for them in the Garden State, although researchers have lauded K Hovnanian for its cooperation. For now, the old quarry remains the province of salvage paleontology. As blasting and excavation continue, teams of mostly amateur fossil hunters and a few researchers are allowed in during off-hours — a cold Saturday afternoon, a Wednesday night long after the sun has set — to recover tracks that tell a rare story.

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– Paul Olsen,
Lamont-Doherty Earth Observatory

Left and above: Microbiologist and amateur paleontologist John McCauley excavates dinosaur tracks at the site.

Below left: Two-hundred million years ago, this region was covered in mudflats like this. Below right: *Grallator* tracks — tracks left by various three-toed early theropods.

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New Jersey at the onset of the Jurassic

Two-hundred million years ago, this part of New Jersey was covered with mudflats at the edge of a lake that advanced and retreated seasonally. North America's location near the equator made for a semi-arid climate. However, this was a site in flux.

This time period marks the end-Triassic mass extinction, during which volcanic activity during the breakup of Pangaea was spewing carbon dioxide into an atmosphere already oversaturated with the gas, raising levels to some 6,000 parts per million (today's atmosphere contains 380 ppm). The subsequent heat trapping may have helped kill off the dinosaurs' reptilian competitors, Olsen says, opening the door to the rise of the dinosaurs seen throughout the Jurassic. Furthermore, Olsen and his colleagues have also found evidence of a magnetic reversal just below the track-bearing layers at the quarry — a guide to the time interval right before the mass extinction, perhaps just 10,000 years earlier, he says.

Retired science teacher and amateur paleontologist Chris Laskowich points to where a trackway-laden layer used to be; it's now buried under the development.

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At the quarry, over the past 50 years, researchers have identified hundreds of tracks from the crocodilian ancestor *Batrachopus* and three dinosaurs: *Eubrontes giganteus*, *Grallator* and *Anchisauripus* — all carnivorous theropods. Herbivores are absent. The fact that only these four types of tracks have been found at the site is "probably related to the fact that the ecosystem was so decimated that the animals running around weren't really living on a terrestrial ecosystem; they were living on an aquatic one," even though they weren't aquatic animals, Olsen says.

One thing is clear, Olsen says: "These prints are occurring just after the mass extinction — perhaps just thousands of years after. That's ultimately what makes this site so important."

"These tracks probably mark the oldest occurrences of *Eubrontes giganteus* anywhere in the world," he adds.

> Preserving the site is an expensive cause both initially and in the long term.
> – William Gallagher, Rider University

The political scene

Mining companies began to drill down into the Orange Mountain basalt — part of the Watchung lava flows that separated Africa from North America during the breakup of Pangaea — in the mid-20th century. The companies were looking for asphalt to build the beginnings of New Jersey's vast network of highways.

Their excavations uncovered the shale and sandstone layers of the Passaic Formation in the Newark Supergroup that were laid down before the lava smothered them. When the dinosaur tracks were discovered about a meter down into these strata in the 1960s, collectors and researchers — including Laskowich — poured in to study them, always maintaining a rapport as quarry ownership changed hands multiple times, Laskowich says. The amicable working relationship resulted in large private collections as well as displays and full storage rooms at the state museum.

In the mid-2000s, long after quarrying operations had ceased, K Hovnanian Homes, New Jersey's largest developer, purchased the property — with its postcard views of New York City — to build townhomes. Collectors continued to work the site while the company completed the first phase of its project there through 2008. When work was halted (largely because of the recession), some of the fossil hunters saw an opportunity to take action.

In November 2009, microbiologist and hobbyist fossil hunter John McCauley started an online petition to preserve the site — particularly a wall in the northeastern corner with an accessible exposure of the track layer. He and others thought the wall, at the least, could be absorbed into an adjacent county park. McCauley gathered more than 2,300 signatures, but it wasn't enough, and construction continued as planned. In August 2010, the wall McCauley had fought to preserve was covered in a thick layer of sediment recycled from other areas in the quarry.

Part of the reason the petition was unsuccessful, says William Gallagher, a paleontologist at nearby Rider University and author of "When Dinosaurs Roamed New Jersey," is that no local politicians championed the preservation — such political pressure can go a long way. Furthermore, he adds, preserving the site is an expensive cause both initially and in the long term.

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Batrachopus track.

As development continues this spring, Laskowich and McCauley, along with former New Jersey Paleontological Society chief Howie Cohn and New Jersey State Museum research associate Gary Vecchiarelli and others, load their cars with sledge hammers, chisels, crowbars and power saws for off-hours field trips, which K Hovnanian still allows.

McCauley says he keeps detailed trip reports and calculates potential "hot spots" — places where tracks are bound to be found — based on where the developers have recently excavated and on his own knowledge of the strata. The Passaic Formation dips further underground as it runs from the northeast to the southwest, he says, so foundation excavations in the right location could pay off. Such field trips are likely to continue as long as development hasn't completely buried access to the trackways (which it may eventually do). Until that happens, it's likely the hobbyists will try to find a way to collect fossil tracks at the site, and Olsen hopes to collect more core samples of the basalt. But in the meantime, the museum is working on a report on what they've recovered that they will give to K Hovnanian, says David Parris, curator of the state museum.

The "amateurs" deserve much of the credit for the recovery and for providing the foundation for any resulting science, Parris says. The volunteers have turned up several important tracks, but the museum has been selective in the samples it keeps. Even so, its collection has been overwhelmed. "My office is full of rocks, my lab is full of rocks," he says. But, he adds, the rocks will all be interpreted before they're put on display at the museum or in the lobby of the townhouse complex.

The tracks that don't get exhibited in either of those places will hopefully find a home in a new museum called the New Jersey Track and Trace Museum, which McCauley is setting up. The museum, McCauley says, will show off what he and others have collected from various locales throughout the state.

In the meantime, Olsen, Parris and other researchers are still asking questions about the tracks that have been recovered over the years. They want to know whether the prints and their assorted shapes and sizes represent different species, or if they're just growth variations. Olsen says he is preparing a detailed description of the quarry and its fossils for publication, and hopes in the near future to lead study groups out there to see what's left of an end-Triassic ecosystem.

Kristina Fiore

Amateur paleontologists excavate tracks as development of the condo complex continues.

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