

Dinosaur science goes high-tech

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They aren't your grandpa's dinosaurs. Feathered, far-flung and far more complicated, dinosaurs as revealed by today's technology look quite unlike the dumpy denizens of old-time dioramas.

A fanged fruit-eating dinosaur described as a "nimble two-legged porcupine" made news earlier this fall, a pint-sized creature that sported quills. Duck-billed dinosaurs, old standbys in museum murals, also received a second look from high-tech diamond-tipped probes of their [fossilized teeth](#), in a study reported in a recent edition of the journal *Science*. The study showed duck-bills had teeth that surprisingly rivaled those of bison and horses for eating efficiency.

Dinosaurs died out [65 million years](#) ago, but a gold rush of discoveries, genetic revelations and high-tech bone scans mark the modern-day discipline of the "terrible lizards" and their kin.

"If you look at the history of paleontology, you can see that a significant fraction of the really significant discoveries have come in just the last 20 years," says the University of Chicago's Neil Shubin, author of "Your Inner Fish: A Journey Into the 3.5 Billion-Year History of the Human Body." "That's not a coincidence: We have more tools, more places and more people looking for fossils now."

Blame the "[Jurassic Park](#)" movies for a flood of younger researchers exploring in once-closed locales in Asia, Africa and South America who have opened the sluices of new dinosaur discoveries, says [paleontologist](#) Steve Brusatte of the [American Museum of Natural History](#) in New

York. "I was 9 years old when I saw the first (movie)," he said. "Plenty of my colleagues were influenced by how popular dinosaurs are, too."

That's produced a flood of new relatives to the familiar [Tyrannosaurus rex](#), horned [Triceratops](#) and the four-footed, long-necked and whip-tailed Brontosaurus (Apatosaurus being its real name) almost on a yearly basis. In a sign of the times, one of the biggest controversies in the dinosaur field this year came from a new dinosaur discovery hotbed, Mongolia, where the attempted \$1 million auction in New York of a Mongolian Tarbosaurus, a Tyrannosaurus cousin, was halted by a last-minute court order after complaints from Mongolia's president, Tsakhia Elbegdorj, that it was stolen from his country.

"A lot of dinosaur artists have embraced the computer, too, just to catch up with all the discoveries," says Steve White, editor of the just-released "Dinosaur Art: The World's Greatest Paleoart," a compendium of "paleoartist" images. "The traditional way of doing dinosaur art has been sideswiped by technology."

Beyond new names for school kids to collect, the changes in the field go much deeper:

-FEATHERS. Small two-legged feathered dinosaurs discovered in China have not only sealed the connection between modern-day birds and dinosaurs, Brusatte says, they also have opened up explanations for the evolution of such features as insulation or as mating display features, like a peacock's tail.

-TOOLS. Scanning electron microscopes have even revealed traces of black and blue pigments still trapped in those dinosaur feathers. And CT scans allow paleontologists to see inside casts containing fossils, speeding discovery time, Shubin notes. "We can do in one day in the lab what took a Ph.D. student an entire thesis 15 years ago."

-GENETICS. Today's explosion in genetic information allows scientists to pinpoint how features such as fins became wings through evolution, building on fossils that reveal transitory stages in the transformation over hundreds of millions of years.

"Fossils are more important than ever," says Shubin, who wrote on the interplay between modern gene mapping and targeted fossil expeditions in the American Academy of Arts & Science journal, *Daedalus*, this summer. One such targeted expedition was his team's 2006 jaunt that found Tiktaalik, a 375-million-year-old fish with a neck and wrist bones. "We can ask questions now that targeted expeditions to uncover fossils can answer."

All of these advances add up to paleontologists answering questions about the biology of dinosaurs they couldn't before, says Gregory Erickson of Florida State University in Tallahassee, who led the recent work on duck-billed dinosaur teeth, published in the journal *Science*. Knowing how fast [dinosaurs](#) grew, ran or spread across continents is painting a much more vibrant picture of the world that ended 65 million years ago, he says. "We're almost literally bringing these animals back to life, and just explaining all kinds of things about them."

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