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Extreme Dinosaurs

A bizarre gallery of Mesozoic monsters prompts John Updike to ask: What has evolution wrought?

By John Updike

Before the 19th century, when dinosaur bones turned up they were taken as evidence of dragons, ogres, or giant victims of Noah's Flood.

After two centuries of paleontological harvest, the evidence seems stranger than any fable, and continues to get stranger. Dozens of new species emerge each year; China and Argentina are hot spots lately for startling new finds. Contemplating the bizarre specimens recently come to light, one cannot but wonder what on earth Nature was thinking of. What advantage was conferred, say, by the ungainly eight-foot-long (2.4 meters) arms and huge triple claws of *Deinocheirus?* Or, speaking of arms, by *Mononykus*'s smug dependence on a single, stoutly clawed digit at the end of each minimal forearm? Guesses can be hazarded: The latter found a single stubby claw just the thing for probing after insects; the former stripped the leaves and bark from trees in awesome bulk. A carnivorous cousin, *Deinonychus*, about the size of a man, leaped on its prey, wrapped its long arms and three-fingered hands around it, and kicked it to the death with sickle-shaped toenails.

Tiny *Epidendrosaurus* boasted a hugely elongated third finger that served, presumably, a clinging, arboreal lifestyle, like that of today's aye-aye, a lemur that possesses the same curious trait. With the membrane they support, the elongated digits of bats and pterosaurs enable flight, and perhaps *Epidendrosaurus* was taking a skittery first step in that direction. But what do we make of such apparently inutile extremes of morphology as the elaborate skull frills of ceratopsians like *Styracosaurus* or the horizontally protruding front teeth of *Masiakasaurus knopfleri,* a late Cretaceous oddity recently uncovered in Madagascar by excavators who named the beast after Mark Knopfler, the lead singer of the group Dire Straits, their favorite music to dig by?

Masiakasaurus is an oddity, all right, its mouth bristling with those slightly hooked, forward-poking teeth; but, then, odd too are an elephant's trunk and tusks, and an elk's antler rack, and a peacock's tail. A difficulty with dinosaurs is that we can't see them in action and tame them, as it were, with visual (and auditory and olfactory) witness. How weird might a human body look to them? That thin and featherless skin, that dish-flat face, that flaccid erectitude, those feeble, clawless five digits at the end of each limb, that ghastly utter lack of a tail—ugh. Whatever did this creature *do* to earn its place in the sun, a well-armored, nicely specialized dino might ask.

Dinosaurs dominated the planet's land surface from some 200 million years ago until their abrupt disappearance, 135 million years later. The vast span of time boggles the human mind, which took its present, *Homo sapiens* form less than 200,000 years ago and began to leave written records and organize cities less than 10,000 years in the past. When the first dinosaurs—small, lightweight, bipedal, and carnivorous—appeared in the Triassic, the first of three periods in the Mesozoic geologic era, the Earth held one giant continent, Pangaea; during their Jurassic heyday Pangaea split into two parts, Laurasia and Gondwana; and by the late Cretaceous the continents had something like their present shapes, though all were reduced in size by the higher seas, and India was still an island heading for a Himalaya-producing crash with Asia. The world was becoming the one we know: The Andes and the Rockies were rising; flowering plants had appeared, and with them, bees. The Mesozoic climate, generally, was warmer than today's, and wetter, generating lush growths of ferns and cycads and forests of evergreens, ginkgoes, and tree ferns close to the Poles; plant-eating dinosaurs grew huge, and carnivorous predators kept pace. It was a planetary summertime, and the living was easy.

Not *that* easy: Throughout their long day on Earth, there was an intensification of boniness and spikiness, as if the struggle for survival became grimmer. And yet the defensive or attacking advantage of skull frills and back plates is not self-evident. The solid-domed skull of *Pachycephalosaurus,* the largest of the bone-headed dinosaurs, seems made for butting—but for butting what? The skull would do little good against a big predator like *Tyrannosaurus rex,* which had the whole rest of *Pachycephalosaurus*'s unprotected body to bite down on. Butting matches amid males of the same species were unlikely, since the bone, though ten inches (25.4 centimeters) thick, was not shock-absorbent. The skulls of some pachycephalosaurs, moreover, were flat and thin, and some tall and ridged—bad designs for contact sport. Maybe they were just used for discreet pushing. Or to make a daunting impression.

An even more impractical design shaped the skull of the pachycephalosaurid *Dracorex hogwartsia*—an intricate sunburst of spiky horns and knobs, without a dome. Only one such skull has been unearthed; it is on display, with the playful name derived from Harry Potter's school of witchcraft and wizardry, in Indianapolis's Children's Museum. Duck-billed *Parasaurolophus walkeri,* another late Cretaceous plant-eater, sported a spectacular pipelike structure, sweeping back from its skull, that was once theorized to act as a snorkel in swimming. But the tubular crest had no hole for gathering air. It may have served as a trumpeting noisemaker, for herd communication, or supported a bright flap of skin beguiling to a *Parasaurolophus* of the opposite gender. Sexual success and herd acceptance perpetuate genes as much as combative prowess and food-gathering ability.

Dinosaurs have always presented adaptive puzzles. How did huge herbivores like *Brachiosaurus, Apatosaurus,* and *Diplodocus* get enough daily food into their tiny mouths to fill their cavernous guts? Of the two familiar dinosaurs whose life-and-death struggle was memorably animated in Walt Disney's 1940 *Fantasia* (though in fact they never met in the corridors of time, failing to overlap by fully 75 million years), *T. rex* had puzzlingly tiny arms and *Stegosaurus* carried on its back a double row of huge bony plates negligible as defensive armor and problematic as heat controls. Not that biological features need to be efficient to be carried along. Some Darwinian purists don't even like the word "adaptive," as carrying a taint of implied teleology, of purposeful self-improvement. All that is certain is that dinosaur skeletons demonstrate the viability, for a time, of certain dimensions and conformations. Yet even Darwin, on the last page of *The Origin of Species,* in summing up his theory as "Natural Selection, entailing Divergence of Character and the Extinction of less-improved forms," lets fall a shadow of value judgment with the "less-improved."

In what sense are living forms improvements over the dinosaurs? All life-forms, even such long-lasting ones as blue-green algae and horseshoe crabs and crocodiles, will eventually flunk some test posed by environmental conditions and meet extinction. One can safely say that no dinosaur was as intelligent as *Homo sapiens,* or even as chimpanzees. And none that are known, not even a heavyweight champion like *Argentinosaurus,* was as big as a blue whale. One can believe that none was as beautiful in swift motion as a cheetah or an antelope, or as impressive to our mammalian aesthetic sense as a tiger. But beyond this it is hard to talk of improvement, especially since for all its fine qualities *Homo sapiens* is befouling the environment like no fauna before it.

The dinosaurs in their long reign filled every niche several times over, and the smallest of them—the little light-boned theropods scuttling for their lives underfoot—grew feathers and became birds, still singing and dipping all around us. It is an amazing end to an amazing evolutionary story—*Deinonychus* into dove. Other surprises certainly lurk within the still unfolding saga of the dinosaurs. In Inner Mongolia, so recently that the bones were revealed to the world just this past spring, a giant birdlike dinosaur, *Gigantoraptor,* has been discovered. It clearly belongs among the oviraptorosaurs of the late Cretaceous—90-pound (41 kilograms) weaklings with toothless beaks—but weighed in at one-and-a-half tons (1.4 metric tons) and could have peered into a second-story window. While many of its fellow theropods—for example, six-foot (two meters), large-eyed, big-brained *Troodon*—were evolving toward nimbleness and intelligence, *Gigantoraptor* opted for brute size. But what did it eat, with its enormous toothless beak? Did its claw-tipped arms bear feathers, as did those of smaller oviraptorosaurs?

The new specimens that emerge as tangles of bones embedded in sedimentary rock are island peaks of a submerged continent where evolutionary currents surged back and forth. Our telescoped perspective gives an impression of a violent struggle as anatomical ploys, some of them seemingly grotesque, were desperately tried and eventually discarded. The dinosaurs as a group saw myriad extinctions, and the final extinction, at the end of the Mesozoic, looks to have been the work of an asteroid. They continue to live in the awareness of their human successors on the throne of earthly dominance. They fascinate children as well as paleontologists. My second son, I well remember, collected the plastic dinosaur miniatures that came in cereal boxes, and communed with them in his room. He loved them—their amiable grotesquerie, their guileless enormity, their unassuming small brains. They were eventual losers, in a game of survival our own species is still playing, but new varieties keep emerging from the rocks underfoot to amuse and amaze us.