

hyper-romantic artwork of Charles R. Knight, whose career he made (aided by J.P. Morgan financing), and whose dinosaur and other prehistoric paintings became the standard image for some five decades of children and others, both at the museum and reproduced in countless books from the 1920s to the present. Through Knight, and his many imitators, the gnostic “dark world” ideology was also preserved. How many *T. rex* landscapes have you ever seen *without* a belching background volcano—iconic representation of the violent “primeval Earth”? Knight was Osborn’s visual myth-propagandist as Hawkins was Owen’s; and though Owen denied “transformism” while Osborn embraced it, on the more profound level, they shared an antipathy to the “rabble,” and a dedication to preservation of oligarchic rule.

Osborn also made the museum a world center for the eugenics movement and associated “race science,” which accompanied the dino-show as twin pillars of the new Darwinian universe: “Progress,” for those who still believed in it, was now nothing more than the extinction of the deficient (who deserved it), and their replacement by the superior—dinosaurs by mammals, lesser races by the Anglo-Saxon.

### Science vs. mythology

It is probably as a result of this ideology, that the prevailing 20th-century nonsense about dinosaurs took root: that they were reptilian in every detail, including “cold-bloodedness”; that the sauropods (large *Brontosaurus* types) were too heavy to support their own weight and had to live in swamps; that both these and the so-called duckbills lived on diets of mushy water vegetation; that the dinos wallowed, plodded, and otherwise stupidly and clumsily lurched their way through 160 million years of geological time.

Throughout the entire history of dino-shows, as a part of this myth function, there has been an unbroken continuity of a certain sort of popular drivel, antithetical to scientific thinking, yet embedded in the images projected by the scientific institutions themselves. This is the notion that individual dinosaur species can be characterized as certain “personality types,” or by crudely defined human emotional states, as in the “unamiable” ichthyosaur pictured for the children of 1937. Thus, *Tyrannosaurus*, as for Osborn, is “ferocious,” “savage,” and of course “tyrannical.” *Brontosaurus* is a “gentle giant,” or herbivores (“vegetarians”) in general are “harmless.”

Oh? Try to characterize living mammal species in the same way. If you eat meat, you “rule.” If you eat plants, you may be a “gentle giant”—perhaps like a rutting bull elephant or charging hippo or boar? All that really “rules” is the mythic bipolarity of “bad” carnivores and “good” herbivores, merged into the oligarchical form of social pecking order appropriate to a street gang or an English public school. Perhaps those children who have projected a stern father-image onto *Tyrannosaurus* and a “gentle giant” mother-im-

age onto *Brontosaurus*, have merely played back to us what our absurd pictures, museums, and books have fed them?

Filmmaker Spielberg, so publicly attentive to “scientific

## New research fuels interest in dinosaurs

Behind the anti-scientific *Jurassic Park* lies an extraordinary quarter-century overhaul of scientific thinking about dinosaurs, starting especially with John Ostrom’s 1964 discovery and evaluation of the small carnivore *Deinonychus*, an agile creature capable of rapid maneuvers beyond those previously associated with dinosaurs. The evidence for its activity levels further suggested a “warm-blooded” metabolism (more precisely, the ability to maintain a constant high body temperature), akin to that of mammals and birds. Its anatomy also strengthened a newly re-argued hypothesis, also due to Ostrom, that birds descended directly from dinosaurs, rather than from an older common ancestor.

Robert Bakker, Ostrom’s one-time student, ran with these ideas, putting forth a series of dinosaur “heresies” starting in the late 1960s. He argued that *all* dinosaurs were warm-blooded; that they were quite active; and that their intelligence and complexity of behavior and social organization were comparable to that of most mammals; that their dietary and other physiological characteristics bore little or no resemblance to the traditional “sluggish reptiles.” Bakker summarizes his own theories and much of the other new evidence and thinking as of 1985 in his delightful, densely informative, and polemical *The Dinosaur Heresies* (New York: William Morrow & Co., 1986).

Slightly later, John Horner unearthed the first-ever fossils of dinosaur communal nesting, including evidence that distinguished between two species’ growth patterns—one in which hatchlings were up and about immediately, the other in which the young hatched at a more immature stage and remained for some time in the nest, fed by “nurturing” parents. Horner’s *Digging Dinosaurs* (New York: Workman Publishers, 1988), co-authored with James Gorman, is one of the best general introductions to the field practice of dinosaur paleontology, as well as a report on the author’s own work; his more recent, *The Complete T. Rex*, co-authored with Dinosaur Society cofounder Don Lessem (New York: Simon & Schuster, 1993) is a good popular account of the famous title creature, with valuable material on historic delusions.

Work by French paleohistologist Armand de Ricqlès

accuracy," has worked particularly hard to ensure the sanctity of this myth, through such frightful absurdities as cozying up to a megaton *Brachiosaurus*—safe because it is a herbivo-

rous "gentle giant"—and allowing a small child next to an ill *Triceratops*—probably about as safe as a sick rhino of half the size and probably of comparable temperament.

complemented Horner's, by comparing the microscopic internal structure of dinosaur bones with that of living animals (reptile and mammal), to suggest that rates of growth were so rapid as to constitute further evidence for high metabolic rates. Other lines of evidence further filled out the new picture of dinosaurs as rapid-moving, effective animals, including study of dinosaur tracks combined with analysis of the tracks of living large animals and the biodynamics limb structure and musculature. Trackway and other investigations confirmed that many dinosaur species lived in large herds, possibly including such herd-structuring as protecting the young while travelling. Good overviews include Martin Lockley, *Tracking Dinosaurs* (New York: Cambridge University Press, 1991) and R. McNeill Alexander, *Dynamics of Dinosaurs and Other Extinct Giants* (New York: Columbia University Press, 1989).

Meanwhile, new species have come to light at unprecedented rates, both in traditional beds such as the American Badlands and Mongolia, and in previously untapped sites such as in Africa and Argentina. Perhaps some 40% of the 500-plus dinosaur species now known were discovered in the past 25 years.

Finally, a new crop of artists has risen up, who, for the first time since Charles Knight, work intensively with the paleontologists to ensure accuracy in their renditions, while some of the "new" paleontologists—Bakker and Gregory Paul—are themselves proficient illustrators. Unfortunately, many of the paintings, despite respectable anatomical accuracy, perpetuate the romantic images. A good selection, with discussion of the important issue of scientist-artist collaboration, is in *Dinosaurs Past and Present* (Los Angeles County Museum of Natural History and University of Washington Press, 1986).

### **Bakker's provocative 'heresies'**

While many paleontologists reacted with annoyance or disdain to Bakker's cocky and "unprofessional" assertiveness (he is certainly a media showman), there is no question but that his campaign reoriented the field, as scientists increasingly attempted to pursue or refute his "heresies." What makes this so-called *enfant terrible* interesting, however, is not any of the particular "heresies," but rather his scientific method, a rarity today, which proceeds from an examination of the fundamental premises of the science. If these are proven false, then all the conclusions hanging from them fall as well. Most interest-

ing, though Bakker is first and foremost a dino man, he approaches his subject as embedded in the larger questions of biospheric processes generally: transformations of entire ecologies, relationships among types of organisms, and origins as well as extinctions (he thus rejects the "impact" theory as not merely empirically wrong, but scientifically sterile). In this he is a *rara dino-avis* not only in paleontology, but in biology generally.

Whether Bakker is right or wrong on any particular (for example, regulation of body temperature), his *method* is correct. Unfortunately, many of his colleagues persist in the game of obeisance to "objectivity," even when that means giving "equal respect" to useful hypotheses and received opinion with only the weight of unexamined tradition to support it. Christopher McGowan's *Dinosaurs, Spitfires, and Sea Dragons* (Cambridge, Mass.: Harvard University Press, 1992) is typical, though otherwise useful, particularly for its extended discussion—missing from many narrowly defined "dinosaur" books—of the other Mesozoic reptiles, the ichthyosaurs, plesiosaurs, and pterosaurs.

Science journalist John Noble Wilford, another formally "objective" author, provides a tolerable historic overview of the field, detailed but dino-centric (and keen on catastrophism), *The Riddle of the Dinosaur* (New York: Random House Vintage Books, 1987). For a fascinating history of the complex marriage of paleontology and public policy debate, see Adrian Desmond, *The Politics of Evolution: Morphology, Medicine, and Reform in Radical London* (Chicago: University of Chicago Press, 1989) and Martin J.S. Rudwick, *Scenes From Deep Time: Early Pictorial Representations of the Prehistoric World* (Chicago: University of Chicago Press, 1992). For children, among the best are John Horner and Don Lessem, *Digging Up Tyrannosaurus Rex* (New York: Crown, 1993); Patricia Lauber, *Living With Dinosaurs* (New York: Bradbury Press, 1991) and *The News About Dinosaurs* (Bradbury Press, 1989).

As for an oft-cited "smart" dinosaur, the thin excuse for *Jurassic's* clever "raptors," this is *Troodon*, a small cousin of *Velociraptor* and *Deinonychus*, whose cranial dimensions have captivated Canadian paleontologist Dale Russell. Fine print: Its brain is so large by comparative dino standards, that it equals that of a modern ground-dwelling *bird*. Okay, I'd respect even a turkey if it were nine feet tall; and as for dinosaur science—well, as the man said, that's just the way it is.—Richard Welsh