Striking a New Pose

Boning up on comparative anatomy helped clarify how dinosaurs really stood and moved in life.

When they were first reconstructed in the late 1800s, dinosaurs were assumed to have looked like giant reptiles. Through the early half of the 20th century they were portrayed in 3-D skeleton mounts and in artists' depictions either in a four-legged stance with their tails dragging on the ground like huge lizards or in awkward upright positions on their hind legs.

But during the late 1960s and early 1970s, paleontologists began to question the conventional understanding of these animals' appearance. To gain a better appreciation of how dinosaurs may have looked in life, scientists began comparing their bones to those of living animals—a process called comparative anatomy. Bones tell us a lot. The shape and position of joint surfaces, and roughened areas on the bones indicating where muscles and tendons were attached in life, are among the many clues to how these animals stood and moved. The latest research goes beyond examining the bones to include hi-tech computer modelling of dinosaur locomotion. Thanks to this information we know more today than ever before about

ILLUSTRATION, PAUL WATSON, WITH PHOTOGRAPHIC IMAGE FROM SHEILA DALTON

By David Evans and Janet Waddington

BRIAN BOYLE, ROM

dinosaur posture and movement.

Particularly difficult for scientists to discern was the gait and stance of the duck-billed dinosaurs, or hadrosaurs, because of the great disparity in the size of their front and hind limbs. When the ROM's *Corythosaurus* was mounted in 1932 at the entrance to the dinosaur gallery, this hadrosaur stood on its hind legs like a giant kangaroo, with its head almost touching the 17-foot (5-metre) ceiling and its tail drooping along the ground. This pose was generally accepted as the correct one at the time—and certainly presented an imposing presence to an awe-struck public.

By the early 1970s, when paleontologists were questioning whether this pose was correct, many intact complete hadrosaur skeletons had been found, helping to provide clues. In an undisturbed hadrosaur skeleton, the backbone and tail are usually straight, lining up with one another. Bony tendons that run alongside the backbone from about the middle of the tail to the shoulders keep the back straight and stiff. With the backbone braced in this way, it would have been impossible for the animal to stand tall on its hind legs as depicted in the early mounts. In fact, to get the animals into these upright poses, the original mounters had to break and dislocate the tail vertebrae! You can see the bony tendons along the backbone of the ROM's *Gryposaurus*, which is still partially enclosed in the sandstone blocks in which it was collected.

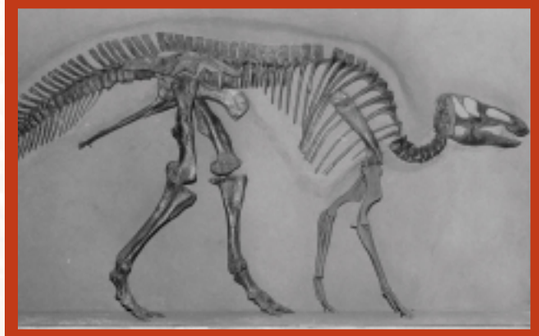
Further evidence of a horizontal stance is found in hadrosaurs' hip bones. Standing on the hind legs would have placed the greatest weight load directly on the weakest part of the dinosaur's pelvis. It is unlikely the creature could have stood for long periods of time in that position, if at all. But when the backbone is brought to a horizontal position, the tail sticks out behind the animal—and off the ground—and the weight is borne by the strongest part of the pelvis, a much more likely scenario.

When the animal's backbone is positioned horizontally, the shoulders are located well below the hips, and the front feet are able to touch the ground. Unlike the clawed hands of the theropod dinosaurs (meat eaters), hadrosaurs had hoof-like structures on three fingers of each hand, suggesting that they actually did walk on four feet most of the time. Fossilized footprints attributed to hadrosaurs or closely related dinosaurs corroborate this posture. There are two clear sets of footprints preserved together: large back feet and smaller front feet.

Such footprints can be seen clearly in a trackway that has been exhibited with the ROM's *Lambeosaurus* skeleton since 1974. At that time, the ROM was on the cutting edge of science when it exhibited its newly mounted *Lambeosaurus* skeleton in a horizontal walking pose with its feet in the tracks. The fact that the other existing mounts were not changed at the same time is more a function of the great difficulty of totally dismantling their welded metal frameworks than a belief that the old postures were accurate. But in the new galleries, we have been able to correctly re-mount *Corythosaurus* and eight other dinosaurs.

Similar reasoning can be applied to other dinosaurs. Until 2005, the ROM's theropod *Albertosaurus* was mounted standing almost upright on its back legs, with its tail touching the ground. Its short arms and clawed hands leave no doubt of its bipedal stance (in contrast to the quadrupedal stance of the hoofed hadrosaur), but its awkward hunched-over posture was anatomically incorrect. The *Albertosaurus* is another of the dinosaurs to be remounted, and now appears with its backbone horizontal and its tail straight out behind it to counterbalance the weight of its body and head—a much more dynamic and scientifically informed posture.

In the new James and Louise Temerty Galleries of the Age of Dinosaurs opening December 15, 2007, all the 3-D mounted dinosaur skeletons are posed to represent our best understanding of them to date, fuelling the imaginations of countless children with a realistic sense of how these magnificent animals really moved on the Earth millions of years ago. ROM



ROM ARCHIVES EXCEPT PHOTO OF SIGNATURE: JANET WADDINGTON

The Early Years Clockwise from top left: W. A. Parks collected the ROM's first dinosaur *Gryposaurus* in the Red Deer River Valley, Alberta, in 1918. The pieces are wrapped in protective plaster for transport; the raising of *Edmontosaurus* in 1934. Perhaps one of these individuals is H. F. Tulloch; *Gryposaurus* on the wall at the back of the original third-floor gallery; *Corythosaurus* as it appeared at the entrance to the gallery in 1932; signature on the back of the *Edmontosaurus* mount; *Edmontosaurus* on the wall.

Dinosaurs Get a Move On

Digging through ROM history for clues about how these behemoth skeletons made a move

By Janet Waddington

BRIAN BOYLE, ROM

In December 2005, for the first time ever, two dinosaurs were installed on the ROM's main floor, giving them new prominence for visitors entering the building. With the opening of the Michael Lee-Chin Crystal, *Prosaurolophus* and *Edmontosaurus* are visible