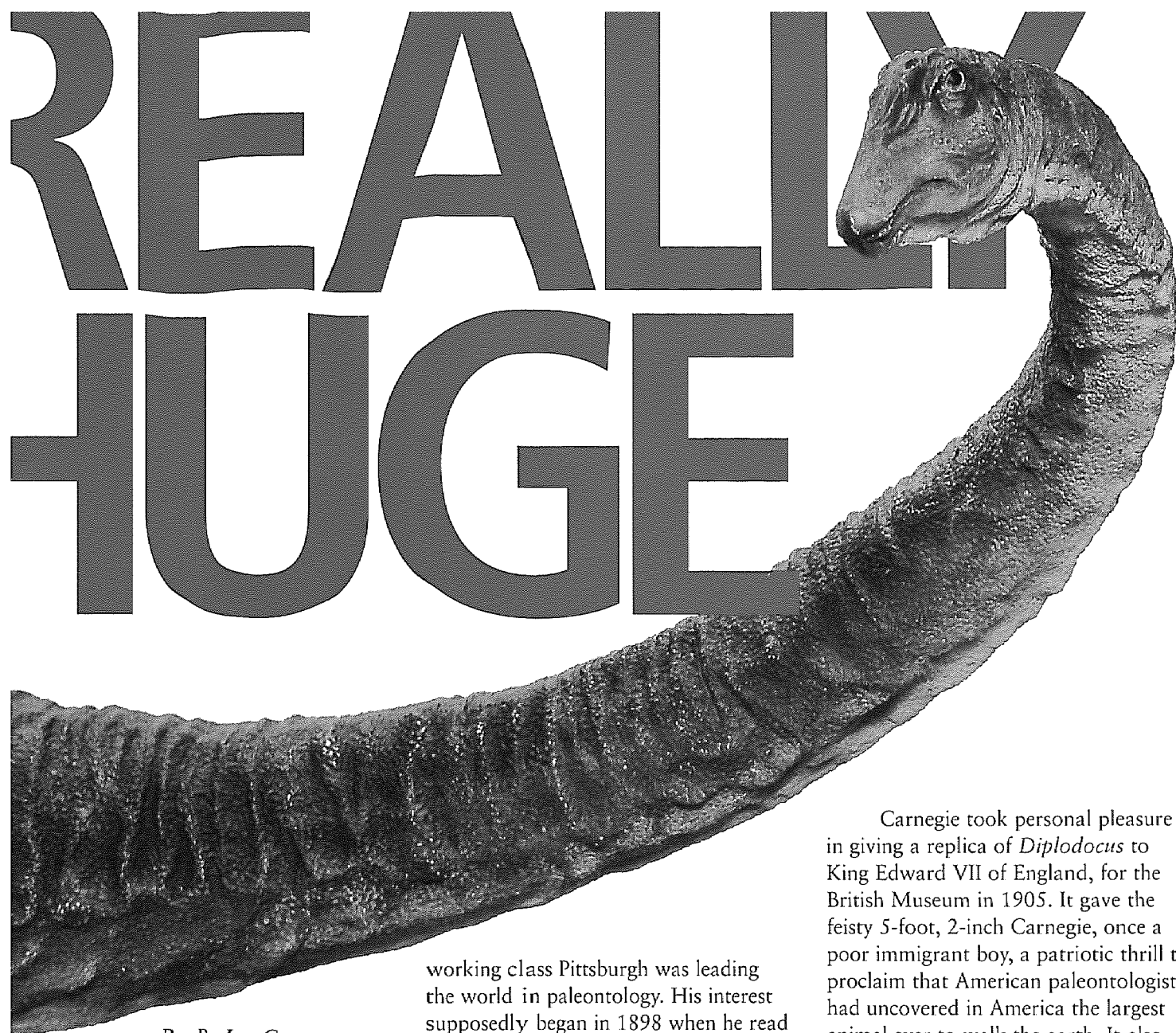


REALLY HUGE



By R. Jay Gangewere

There is no better story about dinosaurs and America than the rich brew of science, personal ego, and international politics that made *Diplodocus carnegii* an international star 150 million years after it died. Andrew Carnegie reached his prime as a big spender for scientific research just as the Golden Age of dinosaur paleontology flowered—from the 1890s to the 1920s. Carnegie wanted his own Museum of Natural History fossil hunters to be in the field, bringing back to Pittsburgh exciting discoveries to rival or surpass those of other great museums, such as the American Museum of Natural History in New York.

Personally, Carnegie liked to boast that his Carnegie Institute in

working class Pittsburgh was leading the world in paleontology. His interest supposedly began in 1898 when he read in his New York newspaper about “The most colossal animal ever on earth” being found in Wyoming. Legend has it that he sent the clipping with a \$10,000 check to his museum director to “bring this back to Pittsburgh.” The truth, says collection manager Elizabeth Hill of the Carnegie Museum’s Vertebrate Paleontology department, is that the check came later. First came a tug-of-war between the University of Wyoming and Carnegie’s agents over the right to remove the fossils. After no more *Diplodocus* bones were actually found at the site, Carnegie’s bone hunters moved to a new location and uncovered the remains of two more creatures. The *Diplodocus* which went on display in Pittsburgh in 1907 is largely made of bones discovered north of Medicine Bow, Wyoming.

Carnegie took personal pleasure in giving a replica of *Diplodocus* to King Edward VII of England, for the British Museum in 1905. It gave the feisty 5-foot, 2-inch Carnegie, once a poor immigrant boy, a patriotic thrill to proclaim that American paleontologists had uncovered in America the largest animal ever to walk the earth. It also tells you about Carnegie’s salesmanship that he managed to get the British Museum replica on display two years before the original was erected in Pittsburgh, where Carnegie Institute was being expanded to hold it, in 1907.

“Science is a successive approximation of the truth,” says paleontologist Chris Beard. “One convincing new fossil discovery about Dippy could send scientists back to their evidence for a new interpretation of the animal,” explains curator Mary Dawson.

Carnegie's personal presentation of a *Diplodocus* cast to the British Museum triggered requests for replicas from European presidents, kings and emperors. This entrée to the ruling class of Europe took museum director Dr. William Holland across Europe, gathering honors for Carnegie Museum of Natural History wherever he went to supervise the assembly and make presentations. Casts were installed in the capital cities of Germany, France, Austria and Italy. After the first five, Holland authorized four more replicas, which went to Russia, Spain, Argentina and Mexico.

It was a sign of the times that after receiving new medals for the museum's research from European rulers, Holland would paint each new medal with his own hand on an existing portrait of himself in Pittsburgh. This was more than personal vanity. European scientists still condescended to American science. Holland, like Carnegie, had an agenda to promote America's scientific honor. A distinguished scientist, Holland spent two decades aggressively promoting Carnegie Museum of Natural History as "the Home of the Dinosaurs."

In 1910 he defended in *The American Naturalist* his view of how to assemble *Diplodocus* bones (with the legs directly below the torso, like a horse), rather than spread to the sides (like an alligator) as proposed by European critics. He ridiculed his critics as "broomcloset naturalists," calling their analogy between *Diplodocus* and living lizards false. If this dinosaur had been like an alligator its belly would always be moving in a trough while the feet were employed for locomotion along the banks. This would explain the creature's early extinction, said Holland, since (and here he scores against the Europeans), "It is physically and mentally bad to 'get into a rut.'"

Holland became a national spokesperson for paleontological research, and was embroiled in the political fight to preserve for science the fossil-rich lands where *Diplodocus* and other dinosaur fossils were found. He helped to modify the federal Homesteading Act, which would have turned over fossil-rich dinosaur lands in

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the west to speculators. In 1915 President Woodrow Wilson signed a bill preserving 80 acres around the old Carnegie Quarry in Utah as Dinosaur National Monument Park.

A lawn mower, not a giraffe

Scientists still debate vigorously the best way to interpret dinosaurs to the public. Holland's decision about the morphology or shape of *Diplodocus* was validated by modern evidence in "trackways," or fossil footprints, which confirm that its legs were straight down and it had a narrow gait.

But new evidence has surfaced in the 20th century about its behavior. Modern studies of the head, neck and tail reveal that the neck was carried low and forward, says curator of Vertebrate Paleontology Mary Dawson. It was not like a giraffe with an erect neck, chewing on the leaves of high trees. Anatomical studies during the past 30 years point out that the shoulder and neck of *Diplodocus* would not support great vertical weight, says Carnegie paleontologist Chris Beard, although

Diplodocus carnegii

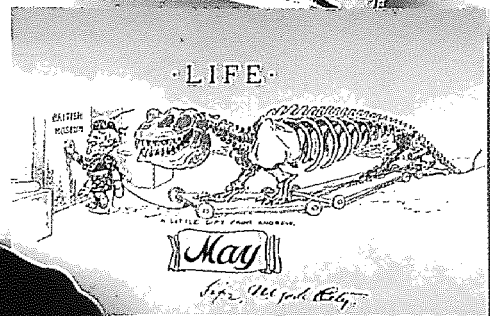
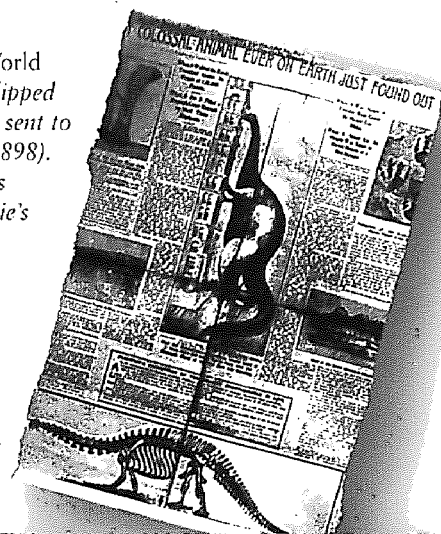
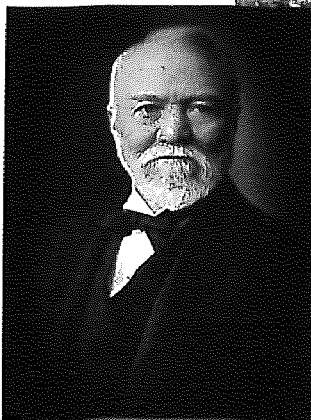
Called *Diplodocus* (double-beam) because of double bony chevrons in its tail, the dinosaur was given the species name *carnegii* because of Andrew Carnegie's support of scientific research.

Museum director William Holland (below right) worked at the site himself with his bone-hunters.

(right) The New York World article which Carnegie clipped from the newspaper and sent to Holland in Pittsburgh (1898). (below right) Cartoonists loved the idea of Carnegie's giving a dinosaur to the British Museum.



Andrew Carnegie, 1896



other sauropods like *Camarasaurus* were equipped to feed on trees. *Diplodocus* probably fed like a widespread, horizontal mowing machine, moving its head and neck in wide swaths while its body could remain stationary.

Science also now confirms that the tail was probably raised off the ground, unlike early reconstructions (including the one at Carnegie Museum) that show a tail being dragged behind. Trackways provide no evidence of a dragging tail and not many animals slow themselves down by dragging an extremely long tail behind them. But as a flexible, balancing counterweight to the extended neck at the front, the long tail has a dynamic function. The 1999 reconstruction has a raised tail.

Curator Dawson rejects for *Diplodocus* the latest whiplash theory that its tail was used as a defensive weapon. For a big sauropod with a shorter tail, like *Apatosaurus*, that might work, she says. But if the extremely long *Diplodocus* tail reached such whiplash speeds, it could have snapped off its own end.

Delicate teeth and high nostrils

Dippy must have been an eating machine, because the small head and long neck supplied food to an immense body. The long and narrow skull has protruding peg-like and delicate teeth—not equipment for chopping up and chewing the high-fiber vegetation of trees. Perhaps *Diplodocus* was a water feeder, browsing on algae and aquatic plants, or on tender vegetation close to the ground such as ferns.

Its nostrils are located high on its head above the eyes, suggesting that it could look for food under the water surface when it browsed. If its head was poked straight down into thick succulent vegetation, its nostrils were well positioned above its eyes for breathing. Many scientists now believe *Diplodocus* was primarily terrestrial, and not an aquatic monster as portrayed in early 20th century illustrations.

More toes than claws

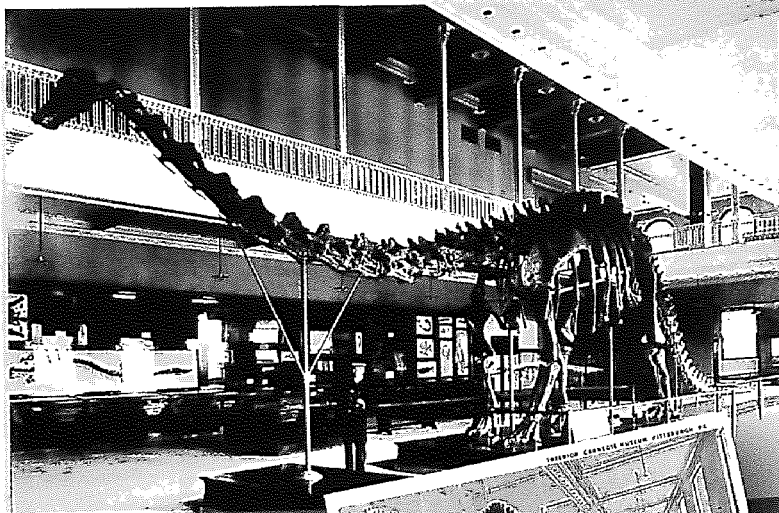
Carnegie Museum paleontologist David Berman says that research has changed the arrangement of this dinosaur's feet.

A century ago it was known that the dinosaur had five digits on each of its front and hind feet, but the lack of fossil claws for each digit was written off by field researchers as a failure in the fossil record. Now trackways evidence of foot prints, and new fossils, indicate that there was only one claw on the front foot, and three claws on the rear feet. The new model has the new feet.

Making an accurate model

Arranging fossil bones in the form of a living creature was always a challenge. Carnegie scientist Arthur S. Coggeshall solved the problem for his time a century ago by using a framework of structural steel. This specimen was mounted so its vertebral column had the position we now know, with the tail along the ground.

But with new structural material come new possibilities. In 1957 the Utah Field House of Natural History in Vernal, Utah, used the deteriorating original Carnegie molds for the last time in constructing a replica made of lighter weight cement-and-cinder bones. The

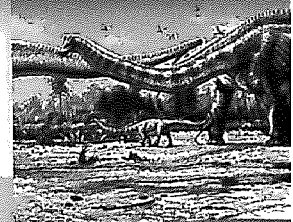


(above) A large space was created in the 1907 Carnegie Institute to display the fossil skeleton. (right) Postcards of Pittsburgh made "The Home of the Dinosaurs" a tourist destination.

In the 1920s Charles Knight's painting of *Diplodocus* was given to the museum as a scientifically correct interpretation.



Dinosaur Hall has a dramatic new mural of the dinosaur created by Canadian artist Michael Skrepnik.





A cast of the Diplodocus skull was happily received at The Andrew Carnegie Birthplace Museum in Dunfermline, Scotland, a few years ago.

material deteriorated, and in 1989 these cast bones were used to recreate molds for new bones. This time *Diplodocus* was given a more dynamic shape, its neck curled in one direction while its tail curled in the opposite direction.

A fleshed-in-version over 80 feet long was created in the 1960s for West Yellowstone National Park. In 1977 it was moved to the "Dinosaur Garden" at the Utah Field House. Through the years this dinosaur has had different colors, going from elephant color grey with a green belly, to a more recent tan and brown. Dinosaur colors, like dinosaur sounds, are not in the fossil record and will probably always be a mystery to scientists.

Making an accurate model of an animal that became extinct 150 million years ago requires both guesswork and hard evidence. Paleontologist David Berman remarks that Ford cars did not become extinct when Henry Ford stopped making the Model T.—the Ford car simply evolved into new models, and is still with us today. Artist Michael Skrepnick, who is making a dramatic new mural of *Diplodocus* for Dinosaur Hall, is ready to argue the theory that dinosaurs are still with us—in the form of birds.

"Science is a successive approximation of the truth, not a set of facts," says paleontologist Chris Beard. All it takes, says curator Mary Dawson, is one convincing new fossil discovery—one trackways' sign that Dippy did drag his tail—to send scientists back to their evidence for a new, more accurate interpretation.

There's a New Dinosaur in Town! Join the Celebration

Diplodocus Anniversary Festival

Saturday, July 10, 10:00am–5:00pm

Sunday, July 11, 1:00–5:00pm

The party starts with the unveiling (at 9:50 am) of the life-size model of *Diplodocus carnegii* outside the museum on Forbes Avenue. There are tons of activities:

- Attend a dinosaur symposium the evening before: Friday, July 9
- See the movie *The Lost World*
- Visit vendors with special dinosaur merchandise
- Experience the Dinosaur Hall light show
- Go on a tour of Dinosaur Hall
- Visit Dinosaur Discovery Carts
- See the new exhibit of the discovery of *Diplodocus carnegii*
- Meet Pittsburgh celebrities
- Children's activities: See Science on Stage performances of *Dinosaurs!* and *Paleontology!* Join in a Scavenger Hunt (with great prizes!). Listen to dinosaur stories. Test your skills with these games:

Stones-in-the-Stomach, Gliding Pterosaurs, Dinosaur Tracks.

Call (412) 622-3131 for information.

Dinosaur Camps

Friday and Saturday, July 15 and 16

"Dinosaur Dig" for ages 4-5,

Monday through Friday, Aug. 2 through 6

"Trilobites to T.Rex" for ages 6-7.

Call (412) 622-3288 for information and the camp brochure.

Dinosaur Family Overnights

July 16-17, and Aug. 6-7

Spend Friday night and Saturday morning with the dinosaurs. Call (412) 622-3298 for information and a brochure.

Lunch with A Curator

Wednesday, July 14, 10:30 am- 1:30 pm

Dr. Mary Dawson tells you about *Diplodocus* and the dinosaur discoveries that made the museum famous. Fee includes a visit to the behind-the-scenes fossil collections, and lunch in the Museum Cafe. Registration required. Call 622-3228.

The Making of Diplodocus

Research Casting, International, of Toronto, made this life-size model. Peter May, the company president, is a recognized expert in making dinosaur molds and casts.

The museum's Pat Martin provided the illustrations of a fleshed-out *Diplodocus* from which Research Casting produced a 1/10 size maquette or working model. A copy of the maquette was made and then sliced into sections, and these sections were used as a template to make the full-size model. The basic shape of the dinosaur was carved out of Styrofoam. A 1/2" layer of plaster-cine was then applied to give the model its skin texture, which was based on the fossilized skin texture of a real dinosaur.

Next, latex was applied to the entire model to form the mold. The shape of the rubber mold was supported by a fiberglass jacket. For ease of assembly and future use, the mold was made in pieces. This mold was used to make the final cast of Dippy out of colored gel-coat and fiberglass. The cast is supported by an internal steel armature designed and built separately by Research Casting's metalworking team. At the site, a concrete platform supports the installed cast.

Carnegie Museum of Natural History now has the finest fleshed-out model of *Diplodocus carnegii* ever made, and the museum owns the mold and the cast, just as it did nearly a century ago when the first fossil skeleton was cast.

Dippy takes shape in the Toronto workshop of a company renowned for the accuracy of its dinosaur replicas. (Model and photography: Research Casting, International)

