

DINOS BY DESIGN

Piecing together eons-old jigsaw puzzles can lead to some odd problems.

By Cynthia Graber



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Paleontologist James Kirkland had a puzzle on his hands. On a trek in New Mexico, his research partner Doug Wolfe and Mr. Wolfe's 6-year-old son Christopher came across what turned out to be the oldest horned dinosaur ever found. But one thing stumped them—a thin, small, strangely shaped bone.

Dr. Kirkland couldn't figure out exactly where it belonged. He guessed it must be part of a frill on the dinosaur's head.

Later, Dr. Kirkland was

working near the same site and discovered a bone he knew to be similar to the neck bone of a meat-eating dino from Asia. It sent him back to that original find to compare the two creatures. Upon careful research, he realized that what he had thought was a bone on the head of one di-

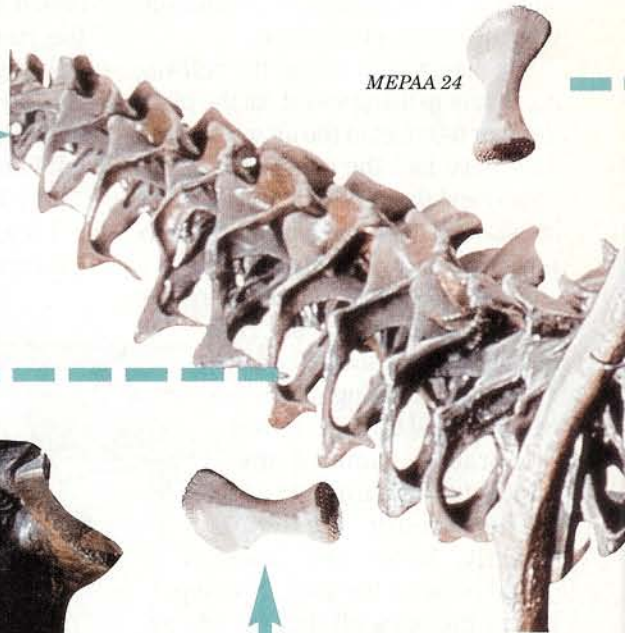
nosaur actually was a hip bone of another.

Dr. Kirkland's story is not unusual. It's just one piece of the scientific jigsaw puzzle that is designing dinosaurs.

Correcting the Past

Much of re-creating dinosaurs is fixing past mistakes. Though the dinosaurs we see in museums get their looks through solid scientific evidence, the steps to get there are loaded with possible slip-ups. After all, the goal is to create an accurate picture of something that has not been alive, many scientists say, for more than 65 million years.

When fossil hunters in the mid-1800's found what they thought were huge lizard bones, they related them to the size and scale of animals they knew best. Thus, many of the first dinosaur drawings looked like



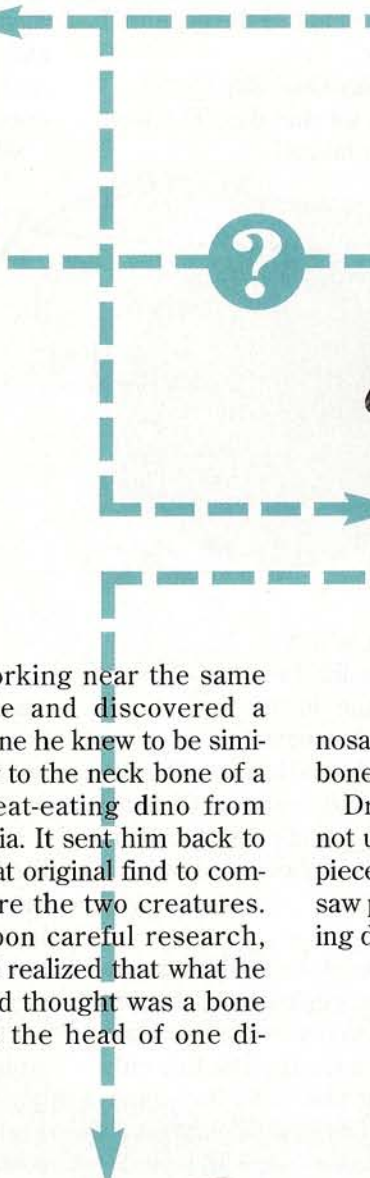
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large elephants or rhinoceroses with lizard skin.

Although paleontologists have dug up much more information since then, the only way they could be positive would

be to find an entire mummified dino. This happened once, in 1908 when Charles Sternberg discovered the fossilized carcass imprint of a duck-billed dinosaur in Wyoming.

Without more of these mummies, scientists have to look elsewhere for the answers.

Rebuilding Those Giants

Paleontologists must rely on clues from other skeletons, from skeletons of related dinosaurs and from careful studies of reptiles and birds to re-create dinosaur appearances.

When faced with only remnants of a skeleton,

paleontologists first examine the bones they have, then turn to complete skeletons of the same or related dinosaurs to fill out the picture. Muscles leave scars on bones, helping scientists determine where and how they

CHEEKS OR BEAKS

For more than 25 years, scientists have said Triceratops had cheeks. In fact, they built up theories about the survival of the heavy, horned dinosaurs based almost completely on the existence of cheeks. But scientist Lawrence Witmer believes otherwise.

Dr. Witmer (above, with a Triceratops skull) realized that no known living relatives of dinosaurs, either reptiles or birds, have cheeks like the pudgy ones scientists and artists depicted surrounding the small, beaked mouths of Triceratops.

To unravel this mystery, he and fellow scientists dissected heads of animals that do have muscular cheeks, such as horses and cows. They also scanned fossils and skulls, painting a more detailed picture of how the cheeks would have hooked up. In all these animals, Dr.

Witmer saw that the cheeks latched on to the skull in the same way. Triceratops had no matching hook-up.

What the dinosaurs did have, though, was an unusual concave area in the back of the upper jaw. If this wasn't a part of the cheek structure, what could it be?

Dr. Witmer found a match: Modern-day animals with long, extended beaks that begin at the back of the jaw have the exact same equipment. His conclusion: Triceratops had a large beak, not cheeks.

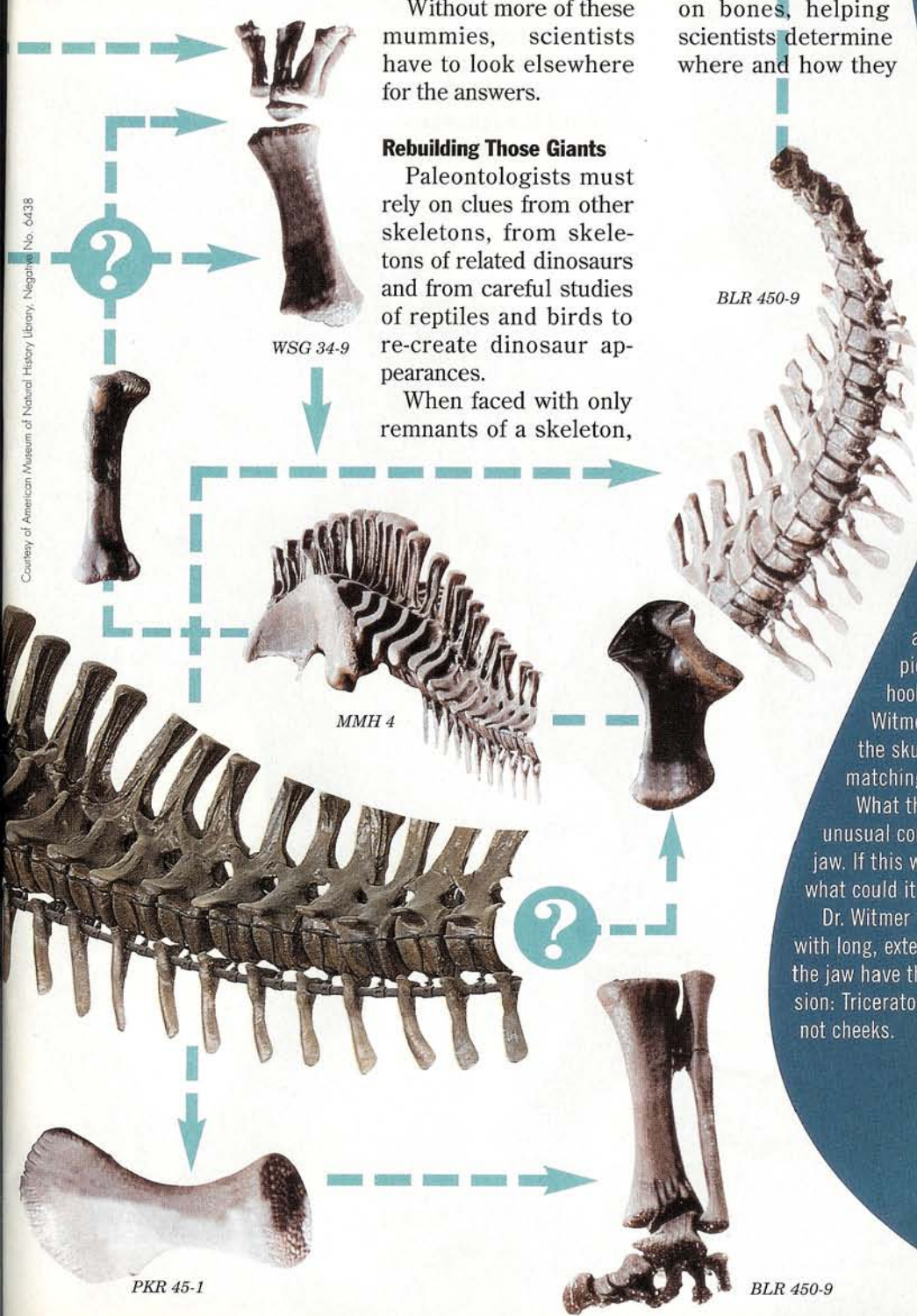


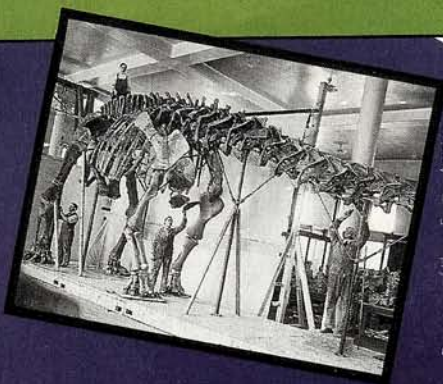
With a CT scanner (it's like a fancy X-ray), Dr. Witmer, left, and researcher Jim Hatton get inside *Diplodocus's* head.

Courtesy of American Museum of Natural History Library, Negative No. 6438

Courtesy of X-Fluor

Courtesy of John Scallor, OJCOM





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WRONG HEAD, WRONG NAME

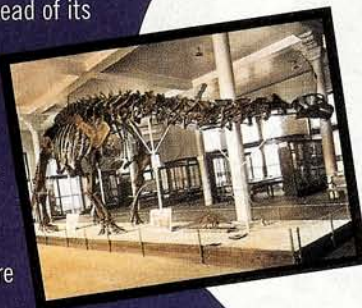
One of the most imposing dinosaurs at Yale University's Peabody Museum of Natural History got not only a face lift but an entire head lift. Even its name changed.

In 1877, Yale paleontologist O. C. Marsh described a sauropod he named *Apatosaurus*. Two years later he described another skeleton he named *Brontosaurus*. A few years later, one of his co-workers realized the bones were from the same animal. So the name *Brontosaurus* is actually just a wrong, second name for an *Apatosaurus*.

Enter the museum's skeleton, originally called a "*Brontosaurus*." This *Apatosaurus* skeleton was made up of bones found in 1899 from a number of individuals. It was to be the first fully mounted dinosaur skeleton. The people putting it together argued about what skull it should have.

Paleontologists working on the project thought that *Apatosaurus* was related to *Camarasaurus*. The skull they used was one Marsh had identified as belonging to "*Brontosaurus*" but was actually a *Camarasaurus* skull.

In the 1970's an dinosaur skull that had been unearthed in Utah was accepted by scientists as that of an *Apatosaurus*. In 1981, the Peabody Museum replaced the head of its *Apatosaurus* with a cast of that skull. In addition to its new head and name, it got a few more vertebrae and a 20-foot longer tail sticking straight out behind it. The dino re-creation is now correct—until the next discoveries reveal even more clues about its appearance.



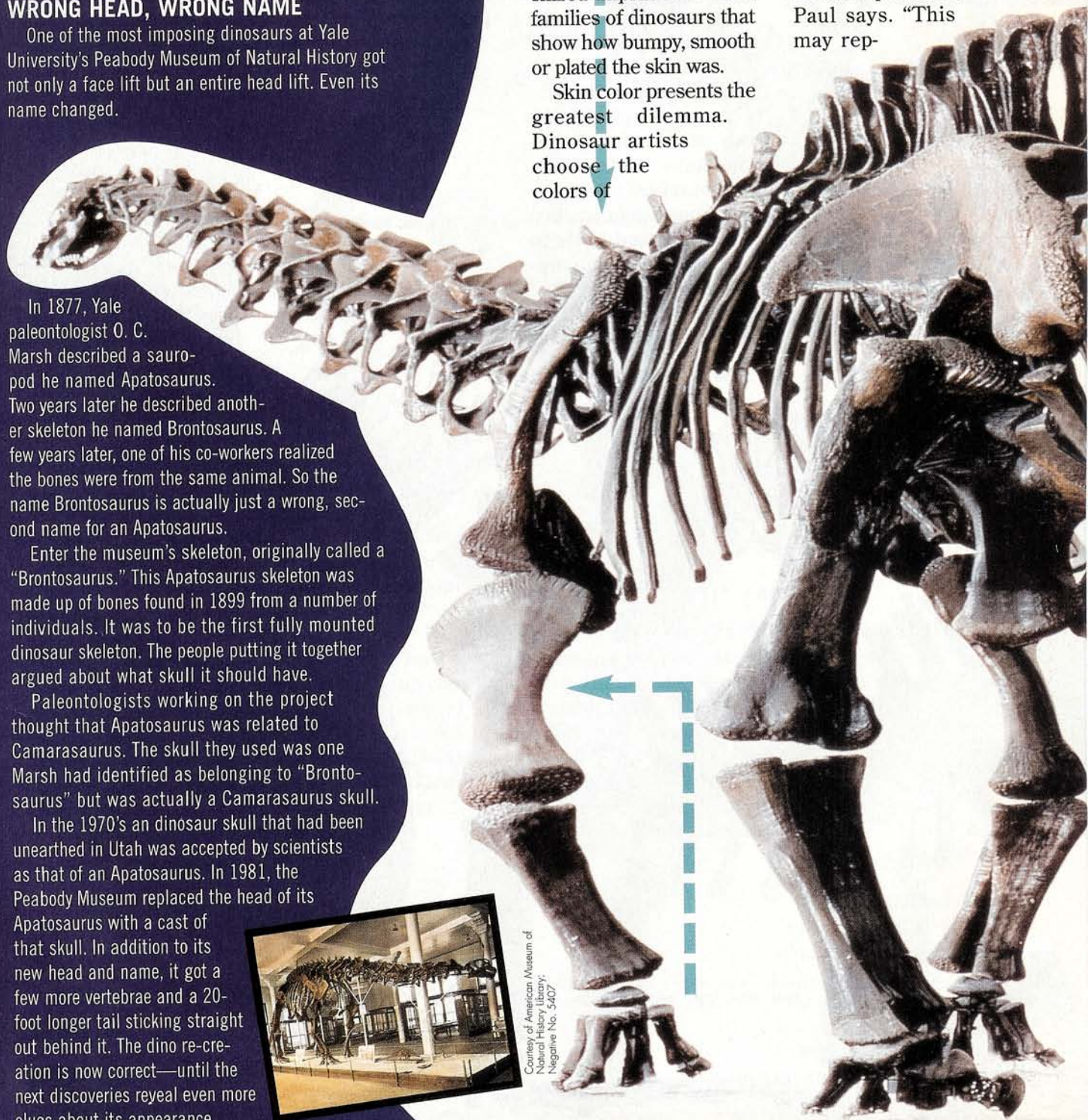
Courtesy of American Museum of Natural History Library, Negative No. 5407

were attached. To complete the picture, paleontologists examine living reptiles and birds to see how the muscles match up. Once the size and placement of the muscles are determined, skin is draped over the entire creature. There are fossilized imprints for most families of dinosaurs that show how bumpy, smooth or plated the skin was.

Skin color presents the greatest dilemma. Dinosaur artists choose the colors of

dinosaurs based more on what they think might look nice than on scientific evidence. This, though, may eventually change, says scientist and artist Gregory Paul.

"The fossils found of feathers on the Chinese dinosaurs had some banded patterns," Mr. Paul says. "This may rep-



resent traces of pigment. Skin has been found, and there may someday be a way of eventually discovering what color it was.”

Always Changing

Taking new discoveries and reexamining existing material has sometimes offered new insights. In old paintings,

dinosaurs are commonly pictured with their tails dragging behind them. But unbroken tail skeletons and fossils of tracks with no accompanying dragging tail have suggested that dino tails stuck out straight behind them.

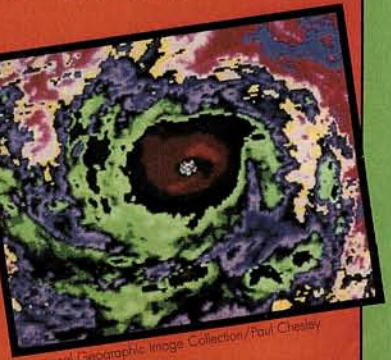
Without a time machine, we'll never know exactly how dinosaurs looked. Meantime, scientists will continue to use new discoveries, techniques and ideas to create dinos by design.✦



Paleontologists like James Kirkland are scientists who study dinosaurs. Geologists are scientists who study rocks and the earth. Meteorologists are scientists who study weather. You can become a scientist with next month's suggested program theme. The focus is on weather and

energy—the weather bivouac features an adventure obstacle trail that pits your patrol against a hurricane. Just as Dr. Kirkland uses science to predict what a dinosaur might look like, you'll use science to predict the weather.

Find complete details on the Science theme in "Troop Program Features" Volume III (BSA Supply No. 33112, phone 800-323-0732). See the "Weather" merit badge pamphlet (No. 33274) for information on predicting the weather.



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