Harness the Power of Dinosaurs®

Vol. I No. II

DINO RIDERS®

.....Stegosaurus.....Pachycephalosaurus.....Brontosaurus.....

THE KNIGHT OF THE DINOSAURS

This dinosaur was certainly one of the strangest looking animals that Mother Nature ever made. The largest of its kind weighed up to 4 tons and measured 25 feet from the tip of its small, pointed head to the huge spike-covered war club at the end of its powerful tail. That's about as long and heavy as three small cars parked end to end. Straight up from the center of its back stood huge, pointed armor plates, some over three feet tall. The front legs were so much shorter than the back ones that it almost looked like it was doing push-ups. If you know your dinosaurs, you have probably guessed this one by now. It's the great armored dinosaur, the Stegosaurus.

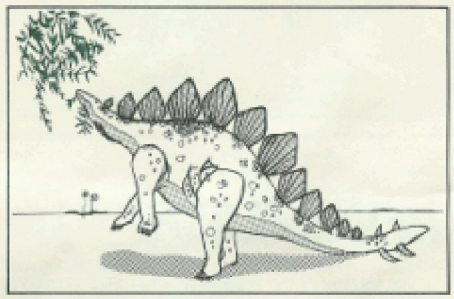
Not only is the **Stegosaurus** an odd looking dinosaur, it has a funny name. "Stego" comes from the old Greek word meaning "shingle", like a roof. "Saurus, means "lizard". So the name means "shingle lizard". The scientist who first discovered it named it that because the armor plates reminded him of the shingles on a roof.

There were many types of Stegosaur living in that ancient world. Some were 12 feet long, others 25 feet. Some weighed 1 ton, others 4 tons. Some had 4 spikes on their tails, others 8 and one had 12. They even had different numbers of plates on their back.

There are 6 known species of Stegosaurs stretching out over 10 million years of time. The big species with four tail spikes is called **Stegosaurus stenops.** An even bigger species with eight spikes is called **Stegosaurus ungulatus.** And not all of them lived at the same time.

When you look at the head of the Stegosaurus, it appears small compared to the rest of the body. Its brain was no larger than a golf ball. That's tiny for such a large animal. But that does not mean it was stupid. A crocodile has a small brain. Anyone who has ever seen a crocodile hunting would not call it dumb.

The Stegosaurus was a plant eating animal (plant eaters are called **herbivores).** It would eat leaves from tree tops.



Despite its huge size, it was not clumsy. It could stand up on its rear legs much like a kangaroo. But with a strong tail for support, it could sit back and relax while it munched on lunch.

The Stegosaurus used its tail for more than just a big chair. A Stegosaurus was armed with sharp two foot long spikes at the end of its powerful tail – without a doubt – one of the nastiest weapons a plant eater ever had. The **Stegosaurus** was a member of a group called the Armored Dinosaurs. They even had armor plates on their eyebrows! Like medieval knights, these dinosaurs developed suits of ar-

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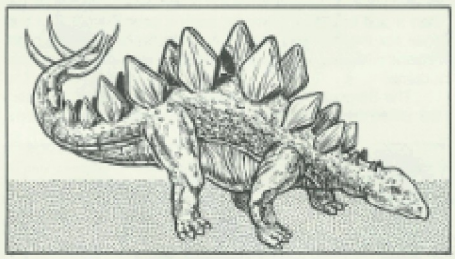
mor and dangerous weapons to defend themselves from their enemies, the vicious meat eating dinosaurs (meat eaters are called **carnivores**).

Spinning rapidly on its short but powerful front legs, a Stegosaurus could swing this war club with deadly force. Few animals could survive a direct hit. Obviously, the Stegosaurus wasn't going to just let itself be eaten.

So, let's get in our time machine and go back to the time of the Stegosaurus. Let's go to North America 130 million years ago. As we step out of the time machine, we can see a Stegosaurus off in the distance. The Stegosaurus is sitting back on its tail, lazily munching on the top of a pine tree. Out of the corner of its eye, it notices two Ceratosaurs sneaking up. These one ton, 30 foot long carnivores cannot be ignored.

Quickly dropping onto all four legs, the Stegosaurus faces the attackers (and lowers its pointed armor plates to protect its sides). One Ceratosaur goes for the Stegosaur's neck only to get a cut on the face for its trouble. The other Ceratosaur goes for the plant eater's side. The Stegosaurus spins rapidly, its spike covered tail slashing out narrowly missing the meat-eater's chest. The Ceratosaurs look at one another and decide to find a meal somewhere else. The Stegosaurus catches its breath and goes back to eating.

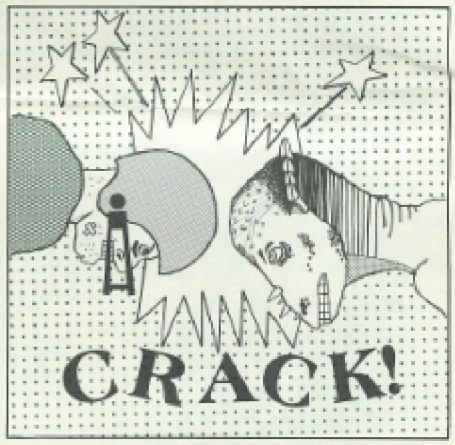
The genus Stegosaurus lasted 10 million years. That's certainly a success story. The last ones died out 135 million years ago. Exactly why they died off is not known. Perhaps, one of the readers of this newsletter will be able to answer that question. ▼



NEWS FLASH!

An ancestor of the **Stegosaurus** has been discovered in China. Chinese paleontologists have named it **Huayangosaurus.** It looks a lot like a Stegosaurus but is just 15 feet long and only has small 9 inch armored plates on its back. You can see it now on display at the Burke Museum of Natural History in Seattle, Washington, where it is on loan from the Chinese government.

THE DINOSAUR BATTERING RAM: THE BONEHEAD OF DINOSAURS



Thunk!! Kerr-THUNK!!! OOOOFF!! Just when we are ready to step back into our time machine, we are startled by a sudden noise.

We look up in wonder at a huge cloud of dust tossed into the air not far from us. In the middle of this cloud are two dinosaurs that look like incredibly large, fat kangaroos with huge heads. Watcing them are perhaps a dozen of the same dinosaurs. One lowers its head and charges, butting the other in its side. Ooof-thunk! The battle is on! Back and forth they go, charging and ramming. This butting goes on until one is finally knocked down. He gets back up, only to be knocked down again. Out of breath, he lies still. He finally gets up, sore but hurt. The other, content with his victory, leaves him alone. What we witnessed was a contest between two dinosaurs called the Pachycephalosaurus.

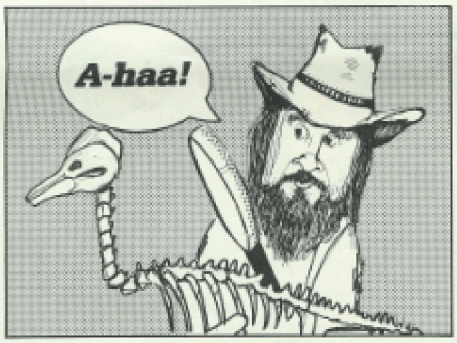
The Pachycephalosaurus was a plant eating animal (an herbivore). It was not very big by dinosaur standards. Standing at ten feet, it was about four feet taller than an ostrich.

Like the ostrich, the Pachycephalosaurus was bipedal. Bipedal means that it walked on its two rear legs much like a person does (The T-rex was also a bipedal dinosaur). The body of Pachycephalosaurus looked a bit like a small, chubby T-rex. The rear legs were long and the arms were short and it had a long stiff tail. It weighed around 2,000 pounds, about as heavy as a big buffalo. But what made this dinosaur really different was its thick dome-shaped head.

The name Pachycephalosaurus comes from the ancient

Greek language. "Pachy" means thick and "cephalo" means head. So put together with "saurus" (lizard) it means "thick headed lizard". Scientists named it this because its skull was incredibly thick. But why was its head so thick? Nature just does not put something on an animal without a reason.

Almost everything paleontologists know about dinosaurs comes from fossils. Fossils, as you also know, are the remains that living things leave behind when they die. These are usually (but not always) the hard parts of the body like bones and teeth. It is the job of the paleontologists to "interpret" these fossils. Interpret means to explain or figure something out. The paleontologist uses fossils to interpret how dinosaurs were in real life much like a detective uses clues to solve a crime.



So, it is possible to tell something about how a dinosaur lived by studying its fossils. The way the Pachycephalosaurus' head was built tells us something about how it "behaved" in life. The skull was certainly a lot thicker than it had to be in order to protect its tiny, walnut sized brain. Its two foot long head had a skull of solid bone that was nine inches thick! Even the skull of a grizzly bear is only half an inch thick. What did the Bone Headed Dinosaur use its head for? Probably for two good purposes.

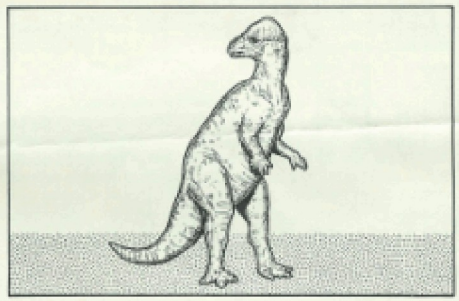
The Pachycephalosaurus was a member of a group of dinosaurs known as the Armored Dinosaurs. These were dinosaurs that had "armor" and weapons on their body to protect themselves from their enemies.

But how did the Pachycephalosaurus protect itself? It did not have spikes or a specially thick skin. It did not have fangs or a warclub. Compared to other dinosaurs, it was not very big. Did it just run away from its enemies? You have probably already guessed how it protected itself.

Some paleontologists think that the Pachycephalosaurus used its thick head the same way a mountain sheep uses its horns to butt. The head of a Pachycephalosaurus is built very much like a football player's helmet. These helmets are built to take a great blow from the outside and still protect the person's head. But more than that, these helmets can be used to deliver a good hard knock.

The Pachycephalosaurus used its head like a giant battering ram. This thick domed head on top of its strong muscular neck would make it more dangerous than a charging bull. Even a large predator like the Tyrannosaurus might think twice before attacking a Pachycephalosaurus and risk getting broken legs or ribs. The mountain sheep defends itself by butting with its head and could chase off a much larger enemy.

Mountain sheep use head butting for more than just defense. In the spring, the males in the herd fight for the females by butting heads with each other. Sheep rarely get hurt or killed in these battles. It is just a contest of strength and the winner gets his choice of the females.



It was probably the same for the Pachycephalosaurus. Like mountain sheep they may have lived in herds. The males probably showed and butted each other around to see who got to be "top dog". But unlike mountain sheep they probably did not butt heads. Sheep have horns that are flat in front so they can butt each other horn-to-horn without slipping. Pachycephalosaurus had such a round head that it couldn't butt head-to-head without sliding off. And so they probably hit each other in the side of the body. ▼

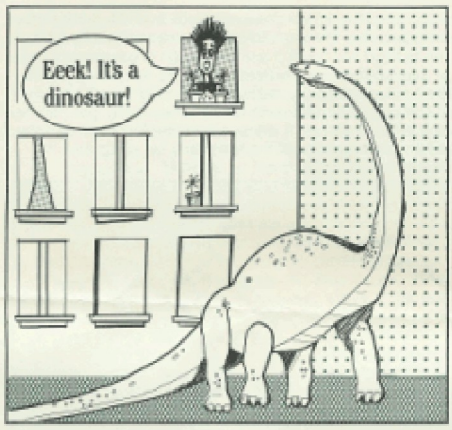
THE THUNDER LIZARD

The ground shook as this 30 ton giant walked by with easy 6 foot strides. Smaller dinosaurs and tiny mammals hurried out of its way as it cruised by at a lazy 10 miles an hour. Weighing as much as ten circus elephants, it was one of the largest animals the world ever saw. A big school bus would be small compared to a creature measuring 90 feet from nose to tail. The small head on top of its incredibly long, snake-like neck could easily have looked into the window of a three story building.

This is often one of the first creatures that come to people's minds when they think of DINOSAURS. It's the gigantic Brontosaurus.

The name Brontosaurus comes from the ancient Greek words "bronto" and "saurus". "Bronto" means thunder and, as you already know, "saurus" means lizard. It's easy to see why scientists would call it the "thunderlizard". The earth must have trembled like the sound of distant thunder when this giant went for a stroll.

The first Brontosaurus was found in 1877 at Morrison, Colorado. Its discovery caused a sensation around the world. People were totally amazed. How could any land animal possibly be so big? Just a few years later, its picture could be seen in books and encyclopedias on every continent and in dozens



of languages.

You have probably seen pictures of the Brontosaurus standing in deep water, lazily munching on some plants. But this is an old idea. For many years **paleontologists** (scientists who study dinosaurs and ancient life) figured the Brontosaurus was so heavy it had to stay in the water to support its great weight. They thought it was slow and clumsy on dry land. But paleontologists looked at new facts and changed their minds about the Brontosaurus and the world it lived in.

First, they took another look at the bones in the Brontosaurs' legs. What they discovered was that its legs were built very much like an elephant's. Now, an elephant has heavy, strong legs that are built to walk on dry land, not mud. It has thick pads on its feet that absorb shock like a good set of sneakers does when you run. The feet are not much wider than its legs. A four ton elephant is able to walk great distances and can actually run faster than a man.

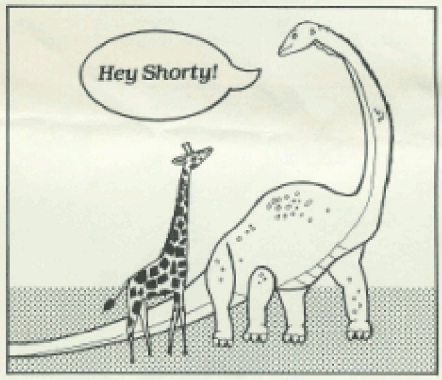
The Brontosaurus' legs were much the same. It had massive, sturdy legs that could move its gigantic weight with ease. And Brontosaurus' feet were built like elephant feet. With feet like that it would not want to walk in a swamp. Just like an elephant, it would get stuck in the thick, sticky mud and die.

Then, after looking at the Brontosaurus' legs, paleontologists took another look at the world that was its home. Why would it have feet like an elephant if it lived in a swamp? It has been known for many years that the weather was warmer back in the days of the Brontosaur than in today's world. But did that mean the whole world was a hot, swampy jungle? It did not look that way.

Geologists are scientists who study the earth. They examined the rocks where Brontosaurus bones were found. What they discovered was that the rocks were like the kind found in deserts and dry forests, not in jungles. So, instead, the Brontosaurus lived in deserts and dry forests much like those in the American West today.

This new evidence completely changed how paleontologists saw the Brontosaurus. Far from being slow and clumsy, the Brontosaurus was an animal that could walk great distances. Much like elephants do today in Africa, they probably followed the rain to be able to drink.

Like the Stegosaurus, the Brontosaurus was an herbivore (an animal that eats plants). They ate leaves from tree tops or high bushes. That was easy for the Brontosaurus, seeing as it was so tall. Like the Stegosaurus, the Brontosaurus was able to stand up on its rear legs. Despite its immense size, it could push off the ground with its powerful front legs and lean back on its massive tail. Now it was able to eat the leaves way up on the tops of the trees. Sitting back like this, it would be able to look into the window of a four story building. The highest even a long necked giraffe could reach is 18 feet.



The size of Brontosaurus footprints is huge. The largest footprints are three feet long, two feet wide and deep enough to hold as much water as a large bath tub.

Fossils are usually the hard parts of the dinosaur, like bones and teeth, that have slowly turned to stone. But footprints can become fossils, too. Paleontologists can tell a lot about how Brontosaurs lived from studying their footprints.

Their footprints are almost always found in large groups of 30 to 40 other Brontosaurs. So it looks like they traveled in a herd much like deer or elk do. Can you imagine a herd of these animals! It must have been incredible to see dozens of these magnificent creatures thundering by. The ground must have rumbled like a passing freight train. What an awesome sight!

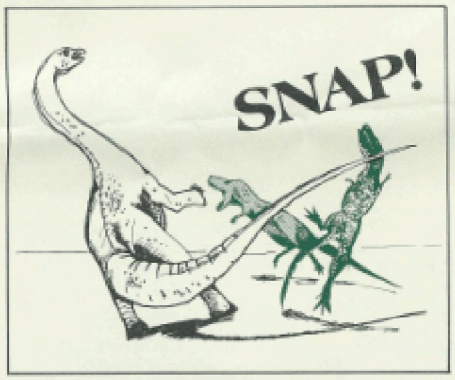
The largest footprints are found at the front of a herd. The smallest are found in the middle and they are never found by themselves. What do you thing that means? It looks like the larger animals must have been guarding the smaller ones from attack. This is similar to how herds of elephant or elk protect their young.

This means that the Brontosaurus cared for its children. This is quite a different picture than scientists used to have. The Brontosaurus, like other dinosaurs, were thought to be uncaring parents who just left their little ones on their own.

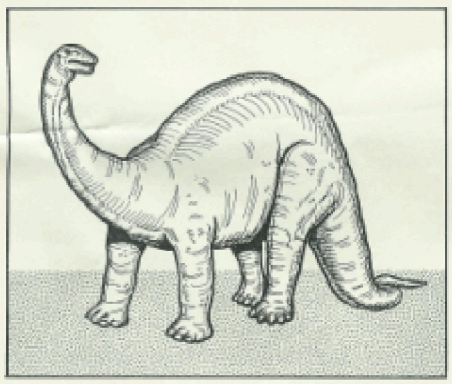
The enemies of the Brontosaurus were the same ones that bothered the Stegosaurus: the vicious meat eating dinosaurs, the Allosaurus and the horn-nosed Ceratosaurus. Sometimes footprints of meat eating dinosaurs have been found following the herd at a close distance. This is like a lion following a herd of deer, waiting for a chance to make a kill.

At first glance, the Brontosaurus appears to be helpless against its enemies. It certainly could not outrun an attacker

like an Allosaurus. It didn't have big, sharp teeth like a T-rex or spikes on the end of its tail like a Stegosaurus. But a close look at the feet shows it had strong claws, making them powerful weapons of defense. Not even the fearsome Ceratosaurus would want this dinosaur to rear up on its back legs and crash down on it, crushing him into the dirt. But the most powerful weapon Brontosaurus had was its long, whip-like tail. When the Brontosaurus snapped its muscular 50 foot tail like a gigantic bullwhip, no attacker would want to be in the way of this bone crushing blow.



Just like Stegosaurus there were many species of Brontosaurus. A species is a group of animals that are just alike. There are three different species of Brontosaur that paleontologists know about. One species was Brontosaurus ajax. It was the last of the Brontosaurus and by far the largest. It weighed 35 tons and was an amazing 100 feet long. There was a "small" thick-legged one called Brontosaurus louisei. It weighed a mere 28 tons and measured 85 feet long. Then there was a slender species called Brontosaurus excelsus. It weighed 25 tons.



When we visited the Stegosaurus in our time machine, traveling at one year per second, it took over 4 years to go back 140 million years. While we were back there, we could also visit the Brontosaurus. And what is it we see in the distance? A pack of five hungry Allosaurs eager for a meal have been following a Brontosaurus herd all morning, checking out the herd for the weak and sick. Aware of the Allosaurs, the herd walked steadily ahead of the pack, keeping a close eye on them. An old Brontosaurus had trouble keeping up with the herd. When it fell far behind the herd, the Allosaurs made their move. They attacked at once like a pack of hungry wolves, two from its right, three from its left. It was all over in an instant.

It was too late for the herd to help. Seeing the attack, the big Brontosauruses formed a protective circle around the young ones and stood their ground. The Allosaurs moved in again looking for another kill. But no easy game this time. The Allosaurs darted in and out at the herd. Huge tails lashed out like the gigantic bullwhips. One Allosaur got too close for his own good. It caught a blow across its neck that made a nasty wound and knocked him down. Raising themselves to their full height the Brontosaurus stormed down at the Allosaur. The earth trembled and clouds of dust filled the air as these giants fought for their lives. Now the predator was the victim. The other Allosaurs retreated. Enough for now. ▼

DINO DICTIONARY

Carnivore (CARN-na-vore): An animal that eats meat. A meat eating animal is usually a predator.

Genus (GEE-nus): A group of different species that are related to one another.

Herbivore (HERB-a-vore): An animal that eats plants.

Paleontologist (pal-ee-on-TAH-low-gist): A scientist who studies dinosaurs and ancient life.

Species (SPEE-shees): A group of animals that are just like one another.

Geologist (gee-OH-low-gist): A scientist who studies the earth.

Animal Behavior (bee-HAYV-your): How an animal acts in real life. Some examples would be how an animal gets along with other members of its own species or how it hunts for food.

Bipedal (by-PEE-dal): An animal that walks on its rear two legs like a person or a Tyrannosaurus rex.

Prey (PRAY): An animal that a predator catches for food. ▼

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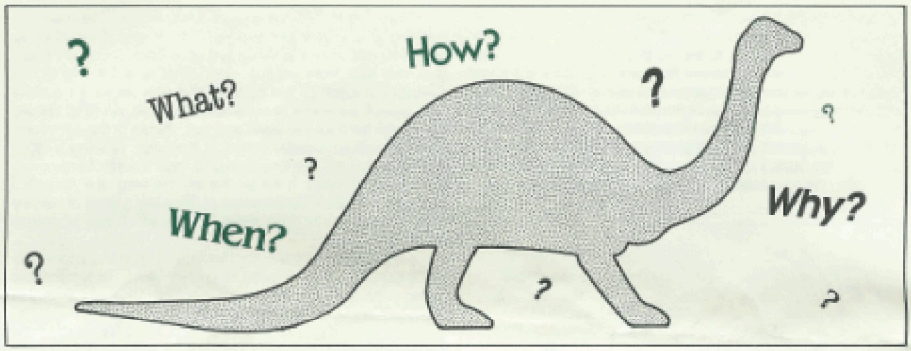

QUESTIONS and ANSWERS

Q: How do dinosaurs get their names?

A: There's no great mystery to naming dinosaurs. Actually, anyone can do it if they know a few simple rules.

Each dinosaur has its own name so it does not get mixed up with another one. Most scientists use old Greek or Latin words to name them but you can use any language. You can name it after a place, a person, something it looks like or whatever you want.

Let's use the example of a Stegosaur called **Stegosaurus stenops.** The first word is the name of the genus of animals and it always starts with a capital letter. Remember, a genus is a group of animals who are close relatives. So **"Stegosaurus"** is the genus name for all of the different kinds of Stegosaurs.

The second word is always the name of the species and it always starts with a small letter. A species is a group of animals that are just like one another. In this case, "stenops" tells us exactly which species of Stegosaur we are talking about. It comes from the Greek words that mean "narrow face".

You can dig up the bones yourself or study one already in a museum. But before you can name a dinosaur, you have to study the bones and be able to prove that it is a new species. To do this, you would use a **type specimen.** A type specimen is the best, most complete skeleton you have of the new species. Paleontologists use the type specimen to see if other bones they have match it. Then you must write about your new species and show that it is different than any other dinosaur ever discovered. Then you can name it.

One last thing. No one is allowed to name a dinosaur after themselves.

Q: How can you tell how much a dinosaur weighed?

A: First, a paleontologist studies the dinosaur's bones and figures out what it looked like in real life. Then, he or she makes a model of it, actually from clay. Of course, this is easier than making it as big as the real dinosaur. Then he has to figure out how much room the model takes up. To do this, the model is put in a container of measured water to see how much space it takes up.

Once the paleontologist knows how big the model is, he can tell how much it weighs. He knows that the weight of an animal is a little less than the same amount of water. Let's say the water that the model takes up weighs 2 pounds. So, if the real dinosaur is 1,000 times larger than the model, we know the real dinosaur weighed about 2,000 pounds.

Q: How do you become a dinosaur scientist?

A: A scientist who studies dinosaurs and ancient life is called a paleontologist. Like all of the different sciences, it takes years of study. The work is hard but exciting. Paleontologists must know something about all of the other sciences. Paleontologists must know about the sciences of life, the earth and its history, how animals are built, and even about plants. They must know math and how to write well.

If you think you would like to become a dinosaur scientist, you don't have to wait until college. The best time to start learning is right now. As you will see, almost everything you learn in school will be useful. Your teachers and librarians will be glad to help you find good books about dinosaurs. Perhaps, you are lucky enough to live near a museum of natural history. They usually have special tours for school classes and actualy seeing the dinosaurs is great. Of course, it's not necessary to go to college if you are interested in dinosaurs. Learning about dinosaurs is just plain fun.

Q: What was the biggest dinosaur?

A: That depends on what you mean by "big". If you mean tall and long, then the Seismosaurus was the biggest. Measuring 150 feet, it was 50 feet longer than the Brontosaurus. It lived during the age of Brontosaurus and Stegosaurus. But if you mean "heavy", then the largest definitely was Brachiosaurus, tipping the scales at an awesome 45 tons. It too lived during the Age of Brontosaurus. So our friend the Brontosaurus wasn't the heaviest or the longest. ▼


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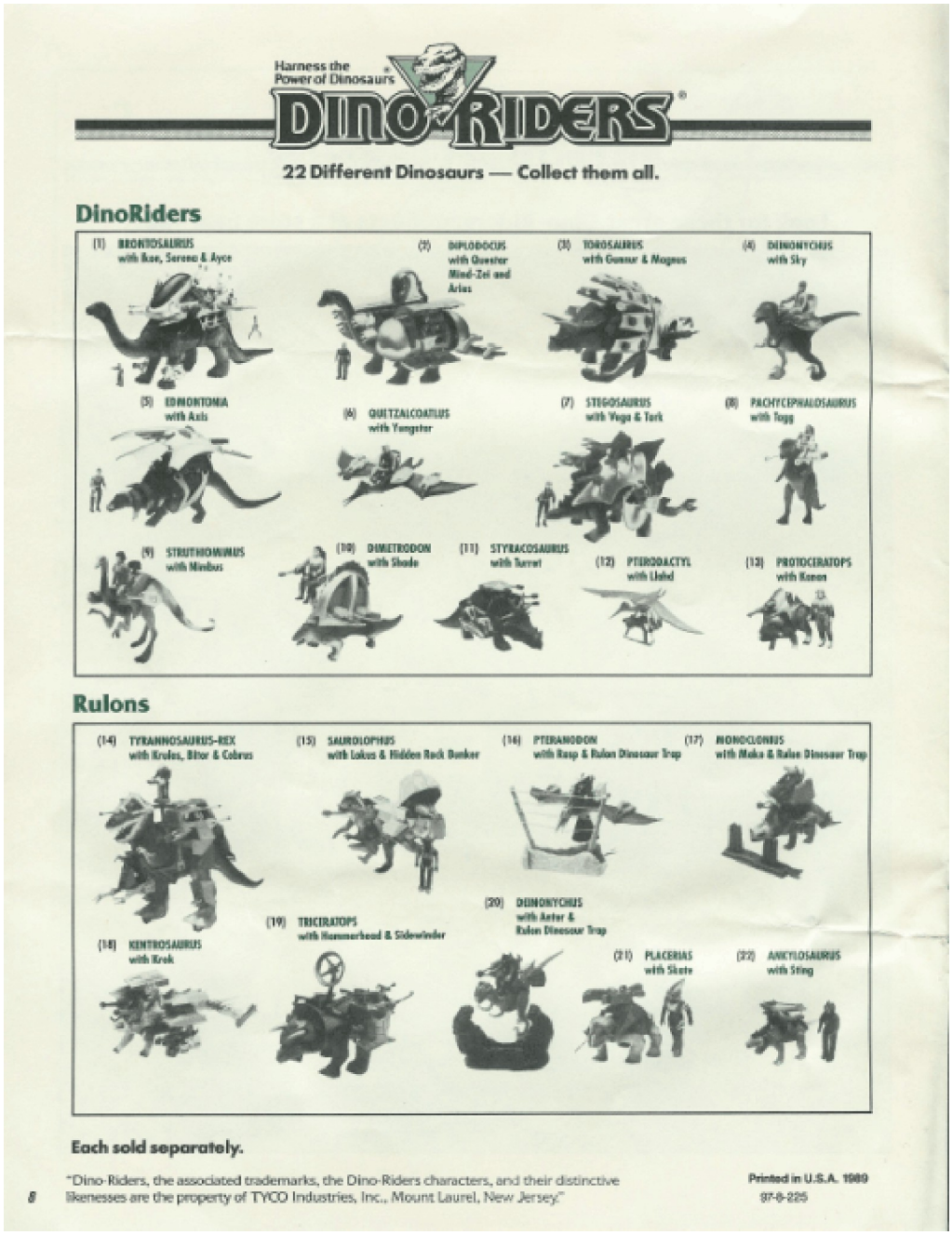
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