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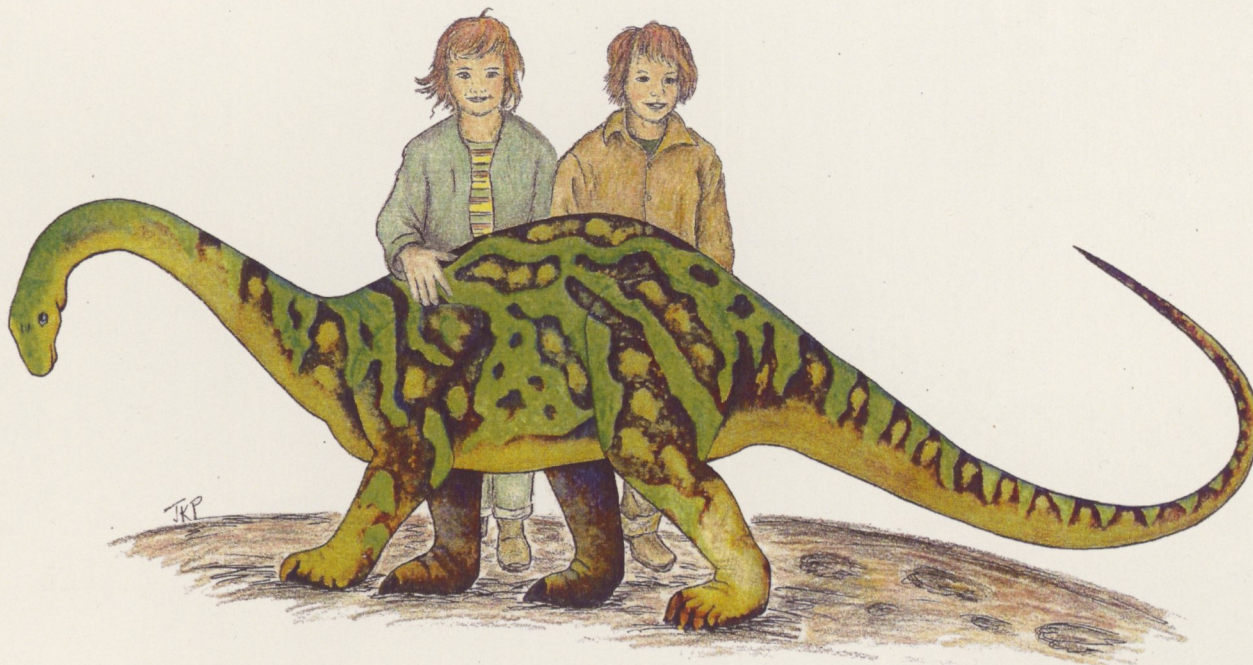


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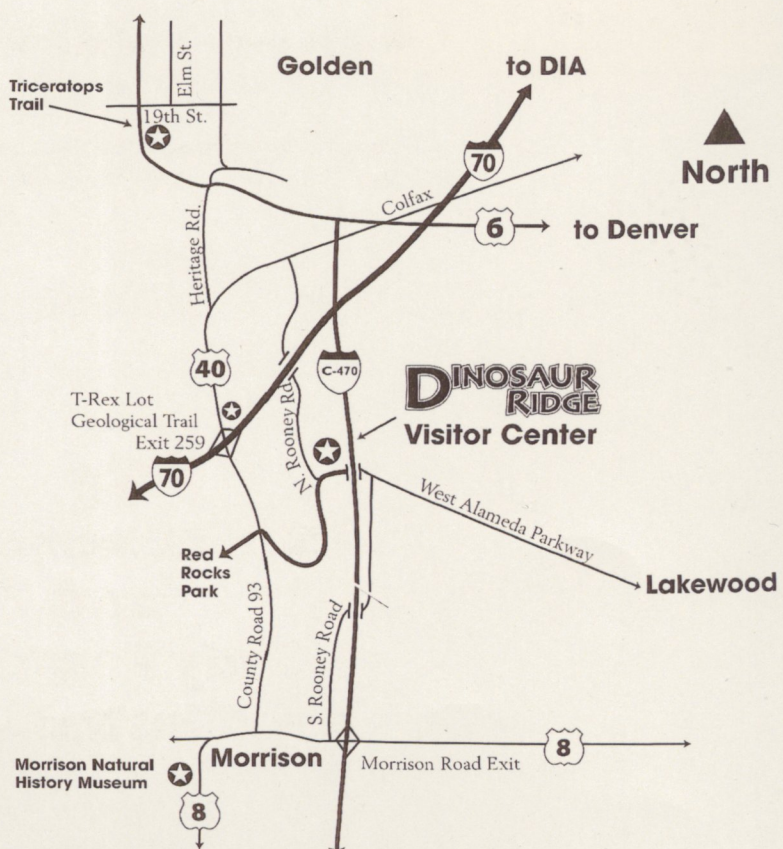
**DARIN AND DENISE
DISCOVER
DENVER'S DINOSAURS**

And Other Denizens of Deep Time

**By
Beth Simmons, Ph.D.
Author
&
Judy Peterson
Illustrator**



ROAD MAP TO DINOSAUR RIDGE & TRICERATOPS TRAIL



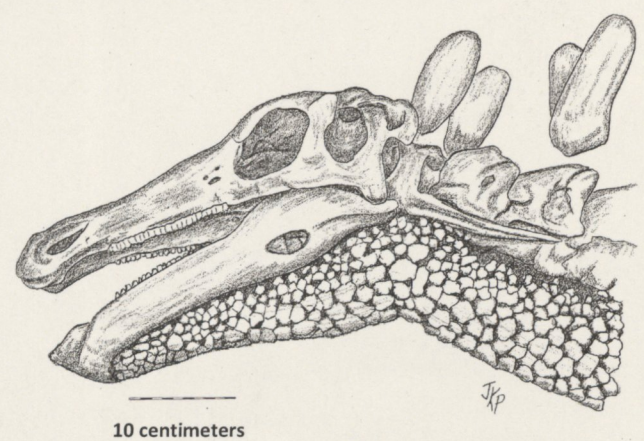
MOST OF THE ROCKS IN THIS STORY ARE MESOZOIC IN AGE
Late Jurassic to Late Cretaceous

COLORADO GEOLOGICAL SURVEY TIME CHART				
Era	System/Period	Series/Epoch	Age (Ma)	
CENOZOIC	Quaternary	Holocene	0.0117	
		Pleistocene	U/L	0.126
			Middle	0.781
			L/E	2.588
	Neogene	Pliocene	5.33 ± 0.005	
		Miocene	23.0 ± 0.05	
	Paleogene	Oligocene	33.9 ± 0.1	
		Eocene	55.8 ± 0.2	
		Paleocene	Upper/Late	65.96 ± 0.04
			Lower/Early	99.6 ± 0.9
MESOZOIC	Cretaceous	Upper/Late	145.5 ± 4.0	
		Middle	161.2 ± 4.0	
		Lower/Early	175.6 ± 2.0	
	Jurassic	Upper/Late	199.6 ± 0.6	
		Middle	228.0 ± 2.0	
		Lower/Early	245.0 ± 1.5	
Triassic	Upper/Late	251 ± 0.4		
	Middle	260.4 ± 0.7		
	Lower/Early	270.6 ± 0.7		
PALEOZOIC	Permian	Upper/Late	299.0 ± 0.8	
		Middle	307.2 ± 1.0	
		Lower/Early	311.7 ± 1.1	
	Carboniferous	Upper/Late	318.1 ± 1.3	
		Middle	328.3 ± 1.6	
		Lower/Early	345.3 ± 2.1	
	Mississippian	Upper/Late	359.2 ± 2.5	
		Middle	385.3 ± 2.6	
		Lower/Early	397.5 ± 2.7	
	Devonian	Upper/Late	416.0 ± 2.8	
Lower/Early		422.9 ± 2.5		
Silurian	Upper/Late	443.7 ± 1.5		
	Lower/Early	460.9 ± 1.6		
Ordovician	Middle	471.8 ± 1.6		
	Lower/Early	488.3 ± 1.7		
Cambrian	Upper/Late	501.0 ± 2.0		
	Middle	513.0 ± 2.0		
	Lower/Early	542.0 ± 1.0		
Eonthem/Eon	Erathem/Era			
PRECAMBRIAN	Proterozoic	Neoproterozoic	1,000	
		Mesoproterozoic	1,600	
		Paleoproterozoic	2,500	
	Archean	Neoarchean	2,800	
		Mesoarchean	3,200	
		Paleoarchean	3,600	
		Eoarchean	~4,000	
	Hadean		~4,600	

Updated 12/21/2010

**GEOLOGICAL TIME CHART—
SHOWS HOW THE GEOLOGICAL
PERIODS OF THIS STORY FIT INTO
DEEP TIME**

Courtesy: Colorado Geological Survey



Stegosaurus stenops, Colorado State Fossil
Morrison Formation, Fremont County, Colorado
DMNH #1483

3.94 inches = 10 centimeters = ACTUAL SIZE

**DARIN AND DENISE
DISCOVER
DENVER'S DINOSAURS**

And Other *Denizens of Deep Time

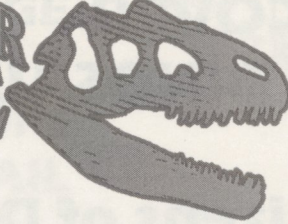
**By
Beth Simmons, Ph.D.
and
Judy Peterson,
Illustrator**



**Darin and Denise pose with "Lacy," a camouflaged baby *Apatosaurus*
Can you find ten-foot-long Lacy in the "Trek Through Time" at Dinosaur Ridge?**

***Denizens = animals that live in certain places**

DINOSAUR RIDGE



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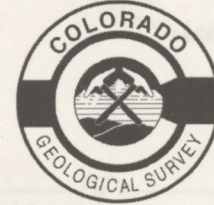
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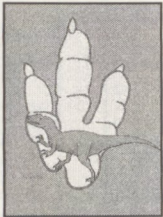
Darin and Denise Discover Denver's Dinosaurs
was generously funded by
Greater Denver Area Gem and Mineral Council



Colorado Geological Survey
Dr. Vince Matthews, Director



Lockley-Peterson Publications LLC
Dr. Martin Lockley and Judy Peterson



A DINOSAURIAL DOSE OF DEEPLY OWED DEBT

For Previewing *Darin & Denise Discover Denver's Dinosaurs*

Dr. Kenneth Carpenter, Utah State University-Eastern, Director and Curator of Paleontology
Judy Peterson also says "DANKE!" to John Peterson for introducing his mother to dinosaurs and to
Dr. Ken Carpenter for teaching her how to do illustrations!

Daniel Brinkman, Yale Peabody Museum, Asst. Collections Manager

Armand Morgan, Yale Peabody Museum, Educational Office

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Daniel Fanelli: Dan, the Dapper Docent at Dinosaur Ridge
The Dynamic Dinosaur Detectives

Matthew Jessup: Darin Doolittle; Louisa Peterson: Denise Doolittle
Lacy, the camouflaged baby *Apatosaurus* from *Trek Through Time*

For Providing Information

Dr. Kenneth Carpenter, Utah State University-Eastern, Director and Curator of Paleontology

Dr. Vince Matthews, Colorado Geological Survey, Director

Dr. Martin Lockley, UCD Trackers' Group, Director

Steve Wallace, Colorado Department of Transportation, Paleontologist

For Printing

FedEx Office, Boulder, CO

For Patience

Joe Tempel, Friends of Dinosaur Ridge, Executive Director

THE T-REX TOOTH AT THE YALE PEABODY MUSEUM

One day in December, Darin and Denise, the delightful, redheaded Doolittle twins from Denver, Colorado, visited the Yale Peabody Museum (YPM) in Connecticut. There they saw a fossil dinosaur tooth, about 4 inches long (~10 centimeters), labeled **Tyrannosaurus rex*. Their father, Mr. Dennis Doolittle, noticed that the tooth was from Golden, Colorado.

"That's almost in our backyard!," Darin exclaimed. "I didn't know T-rex lived in Denver! Where was it found? Who found it? When did they find it?" Darin had dozens of questions.

The label gave a date - June 20, 1874. "That was decades ago!" Denise said. The label also read "Collector: Arthur Lakes."



The first T-rex tooth found

Tyrannosaurus rex tooth
Yale Peabody Museum
YPM VP #4192
Golden, Colorado
June 20, 1874
Collector A. Lakes

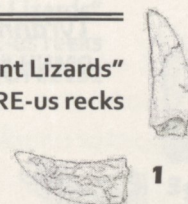


10 centimeters

"Let's go to Golden when we get home," Denise said, "and see if we can find more!"

So Darin and Denise Doolittle started on their own "dinosaur discovery" in Denver.

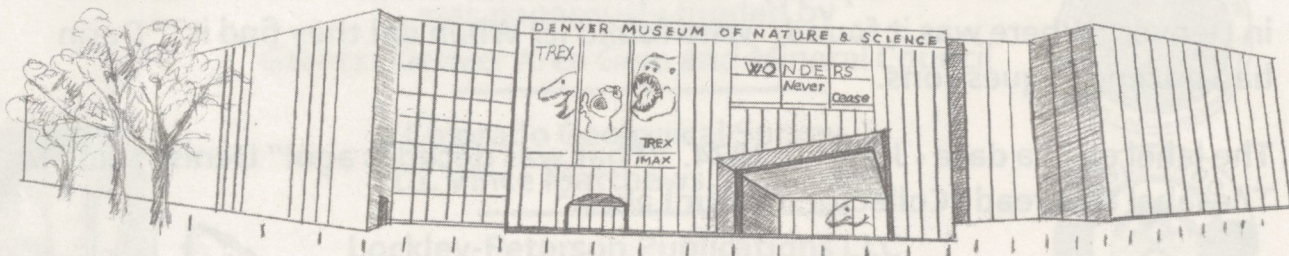
**Tyrannosaurus rex* (T-rex) = "King of the Tyrant Lizards"
Tie-RAN-oh-SORE-us recks



DINOSAURS AT DENVER MUSEUM OF NATURE & SCIENCE

The Doolittle twins went to the Denver Public Library. There they found dozens of books about Denver's dinosaurs. The books described denizens of deep time that roamed the land millions of years before the state of Colorado developed.

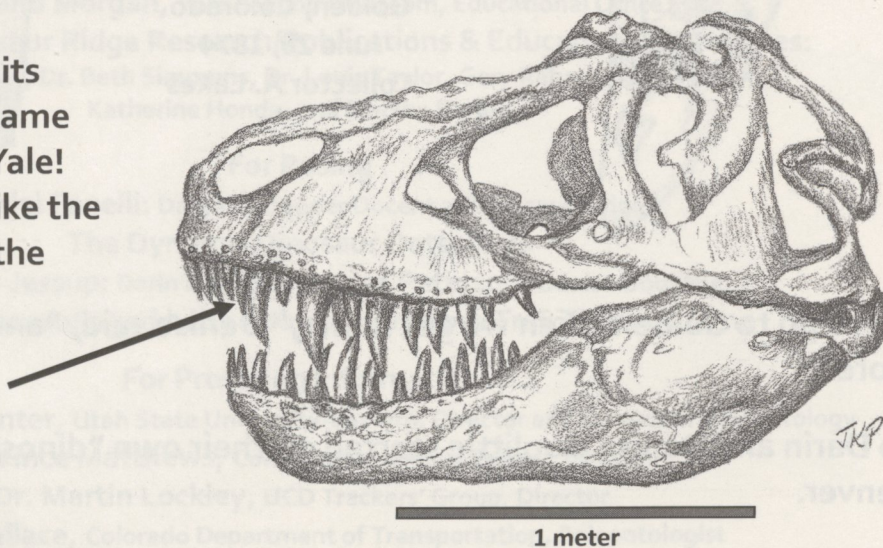
The duo asked, "What did the dinosaurs look like? What dinosaurs lived here? Where did dinosaurs dwell? What did dinosaurs have for dinner? When did dinosaurs disappear? Who discovered their bones?"



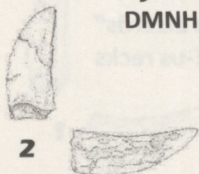
DENVER MUSEUM OF NATURE & SCIENCE

To find answers to their questions, Mr. Dennis and Mrs. Debbie Doolittle drove the duo and their little brother, Derek, to Denver's Museum of Nature and Science (specimens labeled DMNH). Inside the entrance towered a tremendous skeleton of a *Tyrannosaurus rex*.

Darin pointed up to its head. "There's the same tooth as we saw at Yale! See? It looked just like the fourth one back on the top!"



Tyrannosaurus rex skull
DMNH #1597



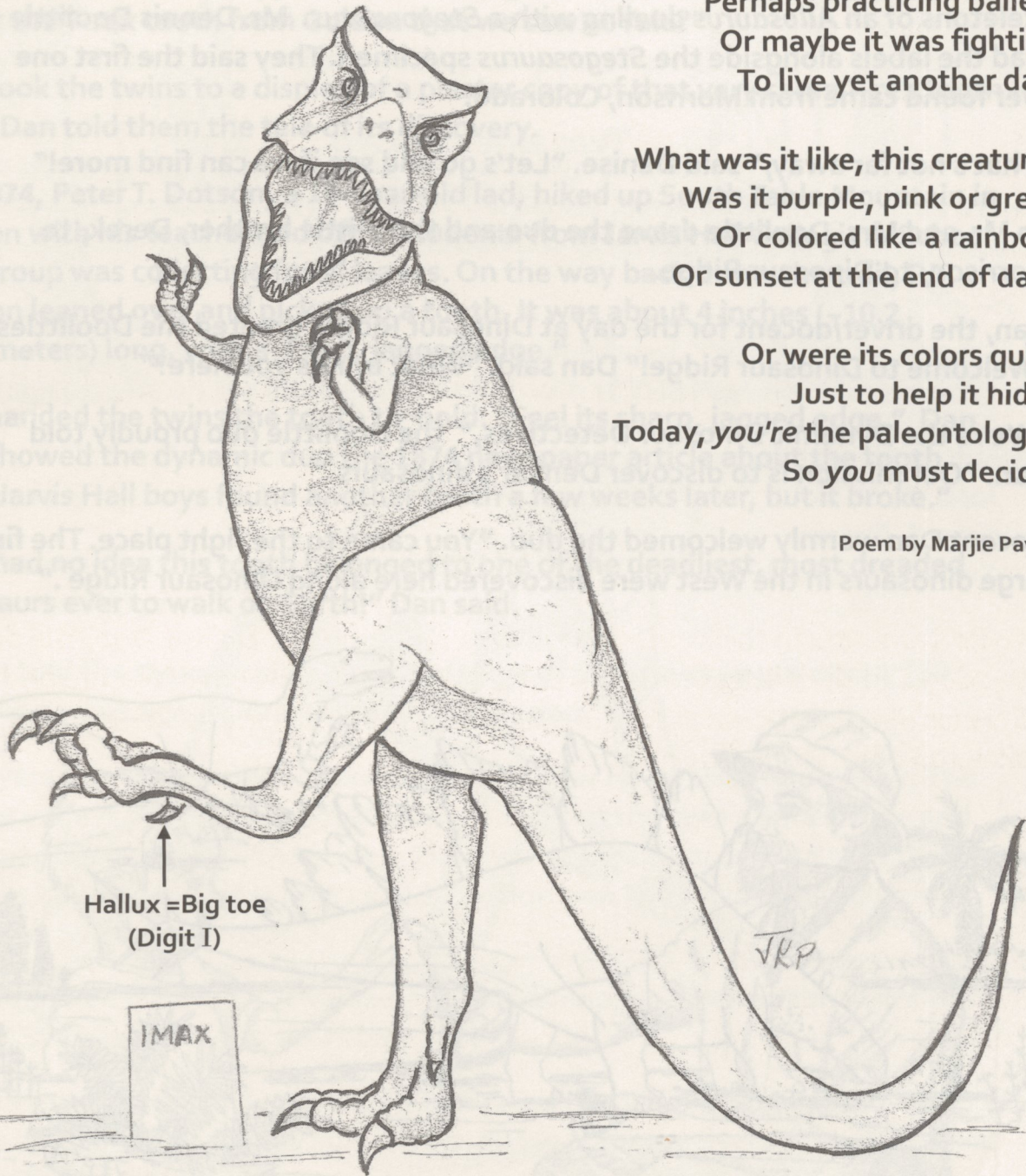
**Tyrannosaurus rex*

Was this dinosaur dancing?
Perhaps practicing ballet?
Or maybe it was fighting
To live yet another day.

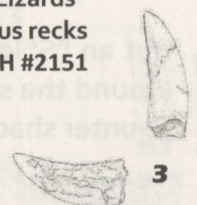
What was it like, this creature?
Was it purple, pink or grey?
Or colored like a rainbow
Or sunset at the end of day?

Or were its colors quiet
Just to help it hide?
Today, *you're* the paleontologist
So *you* must decide!

Poem by Marjie Payne



**Tyrannosaurus rex* (T-rex)= "King of the Tyrant Lizards"
Tie-RAN-oh-SORE-us recks
Based on DMNH #2151



In the museum's Prehistoric Journey exhibit, the twins ducked under the skeletons of an *Allosaurus* dueling with a *Stegosaurus*. Mr. Dennis Doolittle read the labels alongside the *Stegosaurus* specimen. They said the first one ever found came from Morrison, Colorado.

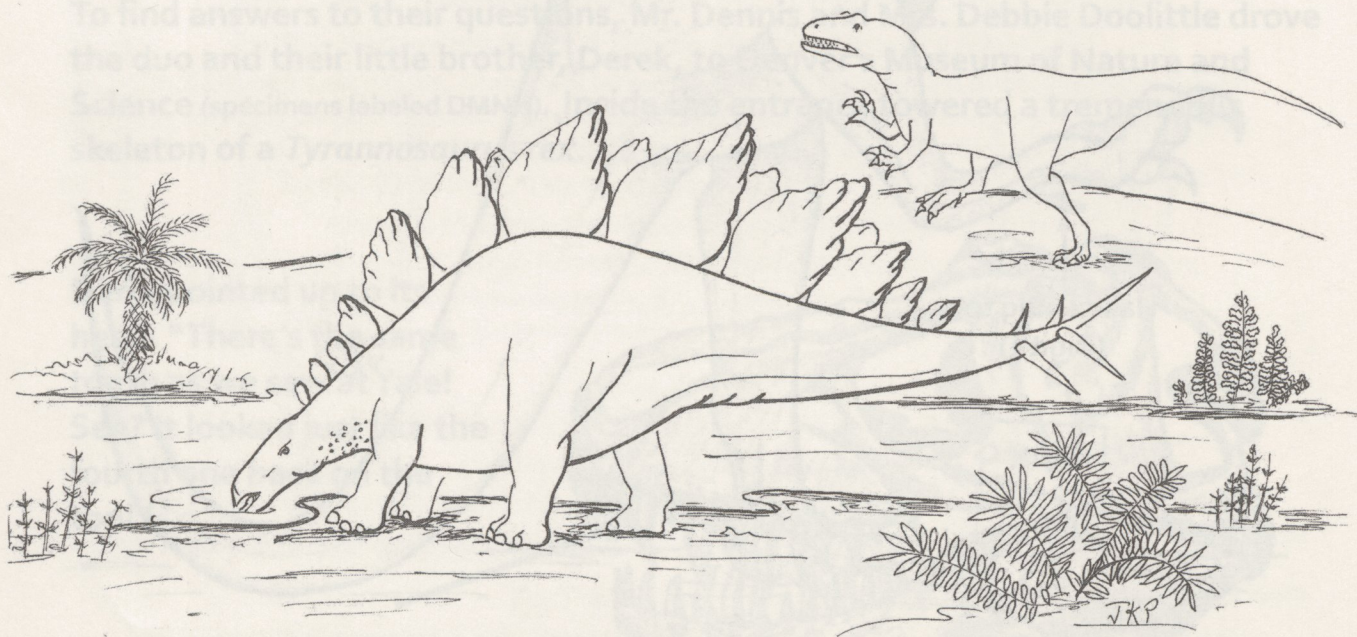
"That's not far away," said Denise. "Let's go and see if we can find more!"

So Mr. and Mrs. Doolittle drove the duo and their little brother, Derek, to Morrison, to Dinosaur Ridge.

Dan, the driver/docent for the day at Dinosaur Ridge, greeted the Doolittles. "Welcome to Dinosaur Ridge!" Dan said. "What brings you here?"

"We're the Dynamic Dinosaur Detectives," the Doolittle duo proudly told Dan. "Our mission is to discover Denver's dinosaurs."

Docent Dan warmly welcomed the duo. "You came to the right place. The first large dinosaurs in the West were discovered here along Dinosaur Ridge."



Stegosaurus and *Allosaurus* with scouring rushes and cycads.

In 1979, 13-year old India Wood found DMNS's *Allosaurus* in Moffat County, Colorado!

Put an "S" on the *Stegosaurus*. Put an "A" on the *Allosaurus*. Circle the cycad. Put a rectangle around the scouring rush. Color the *Stegosaurus* to blend in (camouflage) with its environment. Counter shade the *Allosaurus* (dark on the back/light on the belly).



PETER T. DOTSON'S TALE OF A T-REX TOOTH

Darin asked Dan, the dapper Dinosaur Ridge docent, "Do you know anything about the T-rex tooth from Golden that we saw at Yale?"

Dan took the twins to a display of a plaster copy of that very same T-rex tooth. Then Dan told them the tale of its discovery.

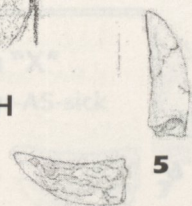
"In 1874, Peter T. Dotson, a 16-year-old lad, hiked up South Table Mountain in Golden with his teacher and other students from Jarvis Hall Collegiate School. The group was collecting fossil leaves. On the way back down the trail, P.T. Dotson leaned over and picked up a tooth. It was about 4 inches (~10.2 centimeters) long, with a sharp, jagged edge."

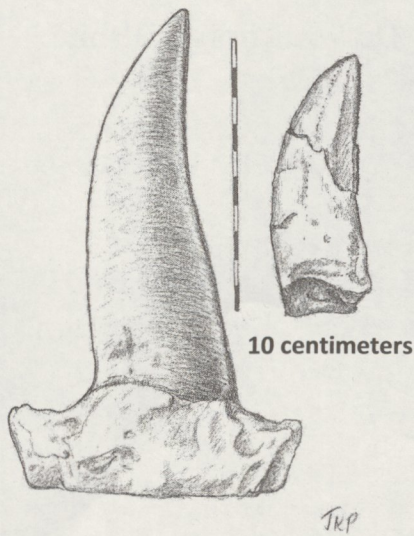
Dan handed the twins the tooth to hold. "Feel its sharp, jagged edge." Dan also showed the dynamic duo the 1874 newspaper article about the tooth. "The Jarvis Hall boys found another tooth a few weeks later, but it broke."

"P.T. had no idea this tooth belonged to one of the deadliest, most dreaded dinosaurs ever to walk on Earth!" Dan said.



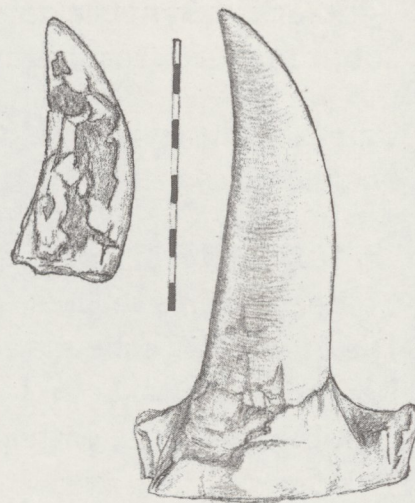
DAN, THE DANDY DOCENT, SHOWS DEREK DOOLITTLE A T-REX TOOTH



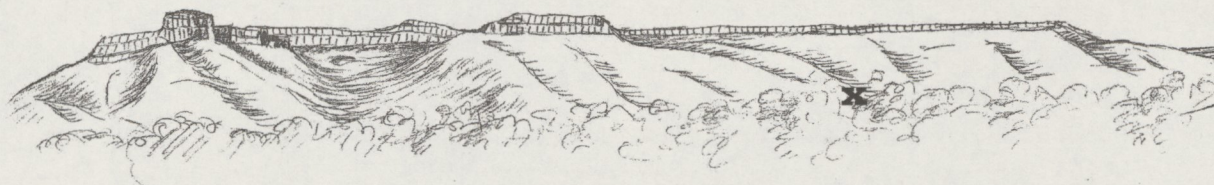
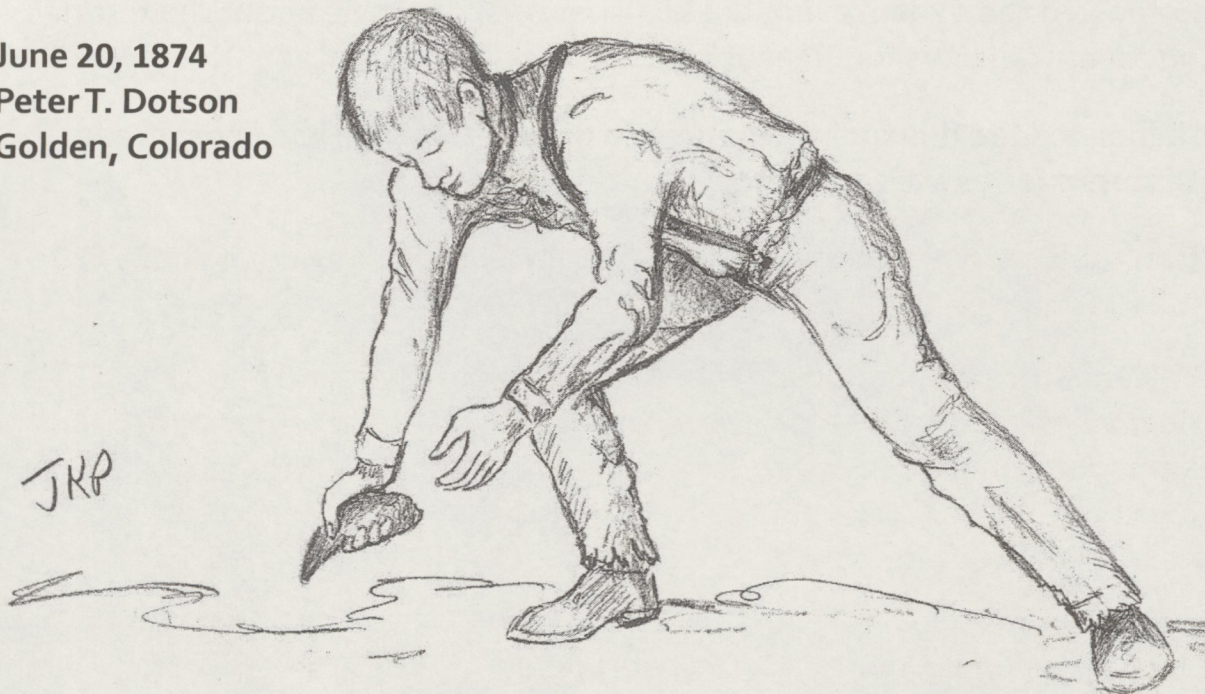


Two sides of two
T-rex teeth

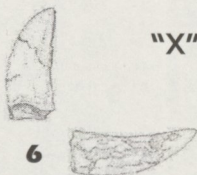
YPM VP #4192



June 20, 1874
Peter T. Dotson
Golden, Colorado



"X" marks site of 1st T-rex tooth, South Table Mountain, Golden, Colorado



DINOSAUR BONES ON DINOSAUR RIDGE

"P.T. Dotson's teacher," Dan explained, "was Arthur Lakes. He sent the tooth to O.C. Marsh at the Yale College Museum where you saw it. Yale's Professor Marsh, one of the world's great paleontologists, never commented on it."

Dan continued his tale. "In 2000 Denver's own dinosaur expert, Dr. Ken Carpenter, saw the tooth at Yale. Dr. Carpenter instantly identified it as from a *Tyrannosaurus rex*! P.T.'s tooth turned out to be the first piece of T-rex ever found!"

Darin and Denise, the Doolittle duo, both wondered, "Why wasn't P.T. Dotson's name on the label of the T-rex tooth at Yale Peabody Museum?"

Peter T. Dotson's tale of the T-rex tooth was just the tip of the Doolittle duo's discovery of Denver's Dinosaurs!

"When did the dinosaurs live here?," Darin asked Dan, the docent at Dinosaur Ridge.

Dan told the dynamic duo, "Denver's Age of Dinosaurs began about 150 million years ago, during the *Jurassic Period."

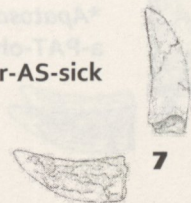
"Rivers flowed off a mountain south of Denver now called Pikes Peak. The river valleys looked like today's African Serengeti where rhinoceroses and hippopotami wade in the water. The river sediments turned to rock. The rocks belong to what is now called the Morrison Formation, named for nearby town of Morrison."

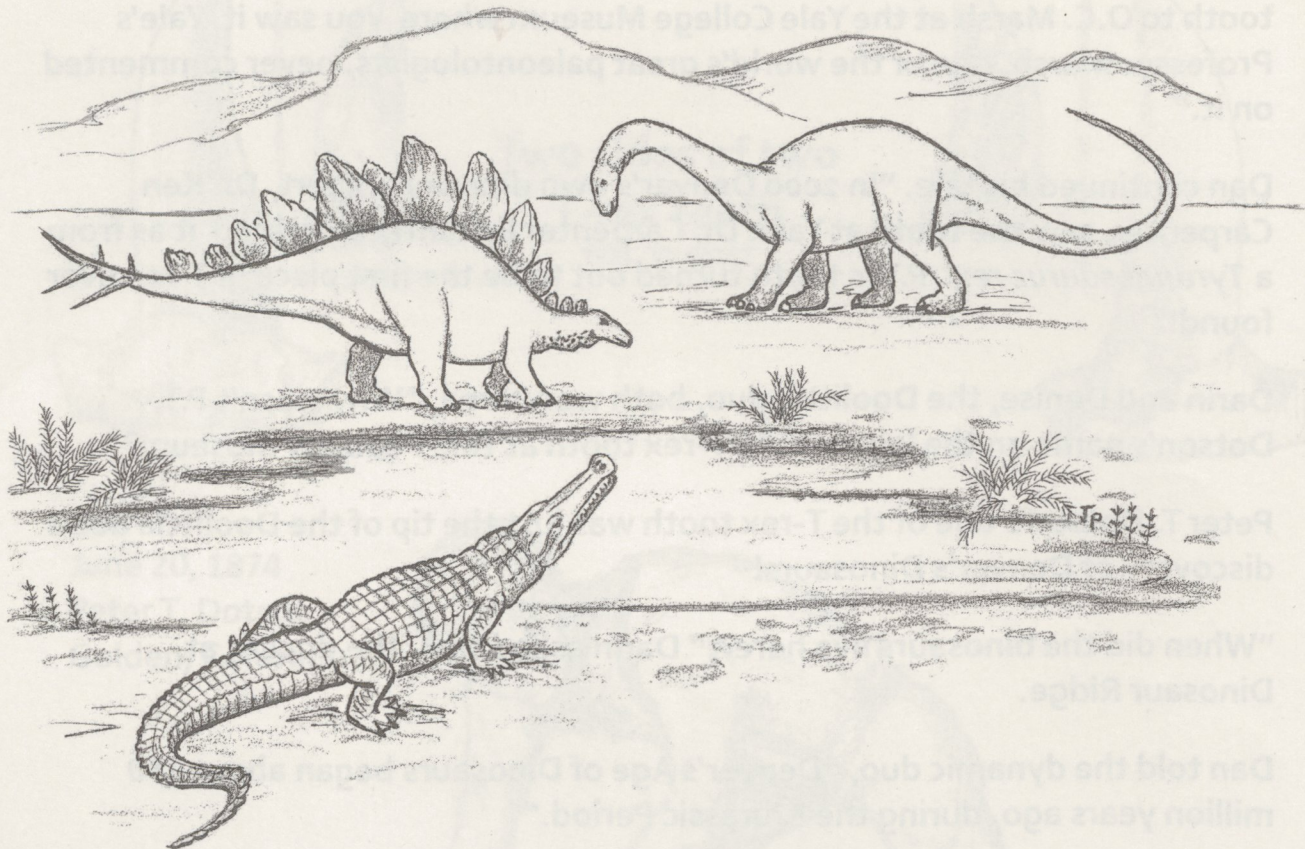
Darin asked Dan, the dandy docent, "What happened when the rivers went dry? Wouldn't the dinosaurs die?"

"Indeed they did, and they might have died from disease, too," Dan told the duo. "Their bones drifted into the sand alongside the rivers or ponds. There they turned to fossils."

Denise asked Dan, "What other animals lived with the dinosaurs? Which Jurassic dinosaurs left their bones for us to study?"

*Jurassic = Jour-AS-sick





CIRCLE THE *STEGOSAURUS.
PUT A RECTANGLE AROUND THE CROCODILE, *GONIOPHOLIS (DIPLOSAURUS).
PUT AN "X" ON THE *APATOSAURUS.
COLOR THE STEGOSAURUS AND THE APATOSAURUS IN CAMOUFLAGE.
WOULD THE CROCODILE BE COUNTER-SHADED OR WOULD HE LOOK LIKE A LOG?
WERE THERE HILLS IN THE DISTANCE?

*Stegosaurus = "Roofed Lizard"
STEG-a-sore-us

*Goniopholis (Diplosaurus) felix = "Angled Scale (Lucky Double) Lizard"
Go-knee-OFF-ah-lis (DIP-low-sore-us) FEEL-ix

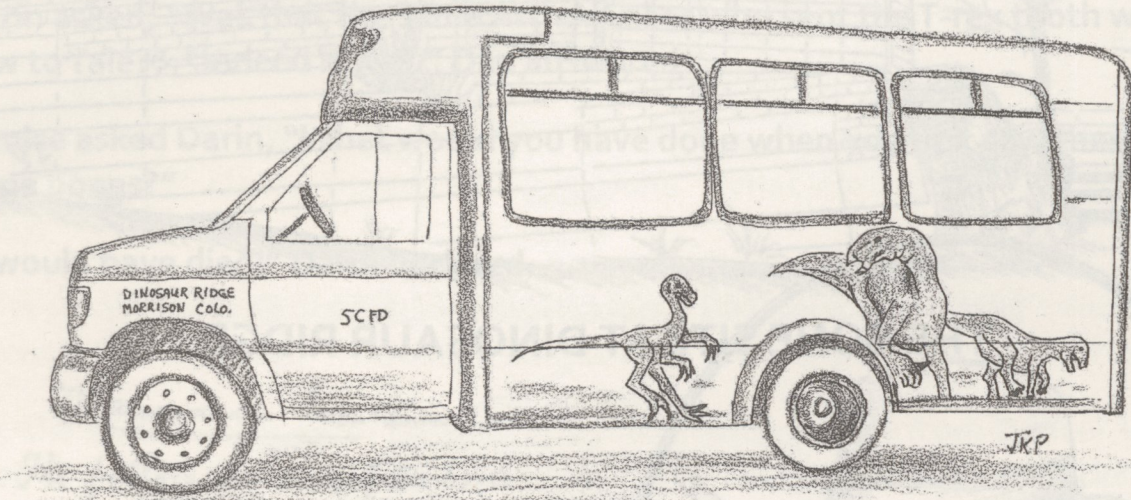
*Apatosaurus = "Deceptive Lizard"
a-PAT-oh-sore-us



DINOSAUR BONES ON DINOSAUR RIDGE

Dan asked the Doolittle family, "Do you want to go see dinosaur bones?"
The Doolittle duo jumped at the chance!

So Dan drove the Doolittles to the west side of Dinosaur Ridge in the
"Vanosaurus," decorated with dinosaurs.

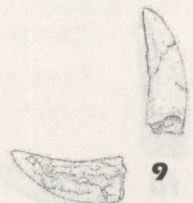


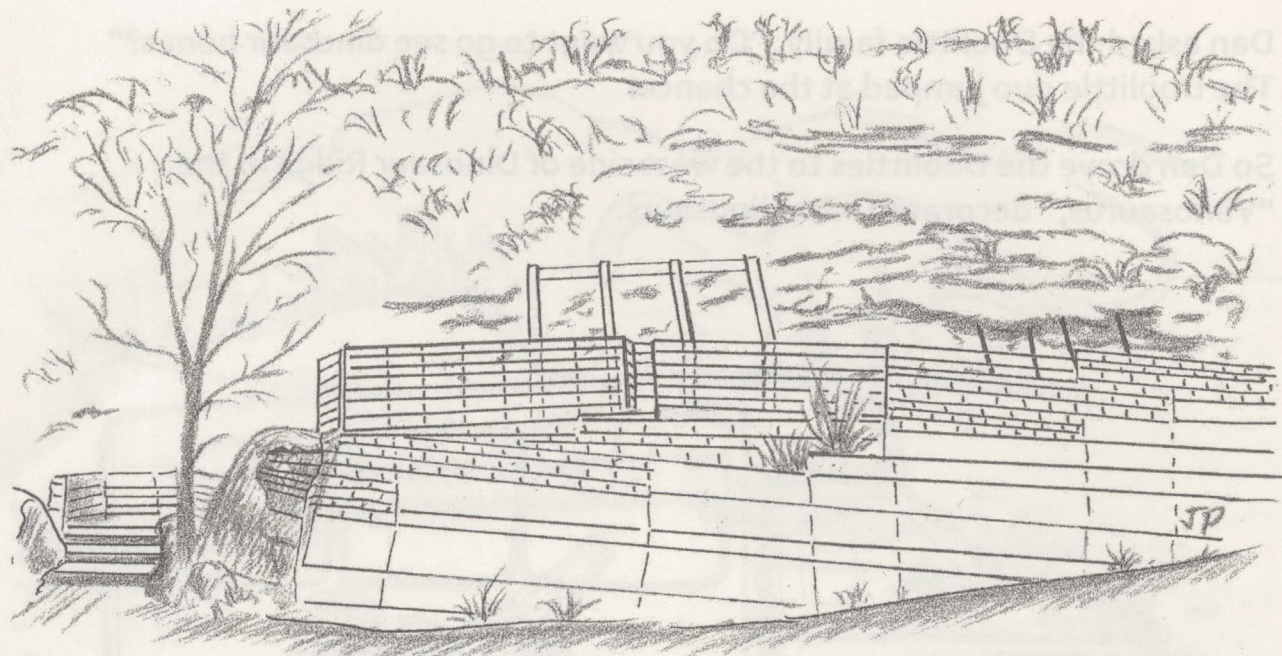
THE "VANOSAURUS" AT DINOSAUR RIDGE

There, in the sandstone, Darin and Denise saw dark brown, hard, smooth, odd-shaped pieces of rock. They turned out to be dinosaur bones.

"How could these pieces possibly have been parts of the largest animals ever to roam on Earth?" They asked Dan many questions. "Which bones are which?" "How would these tie together to create the skeletons in the museums?"

Dan told them that complete skeletons are rare. "Most skeletons are flattened— like 'road-kill'," he explained. "Artists rebuild the skeletons in three-dimensions for the museums."



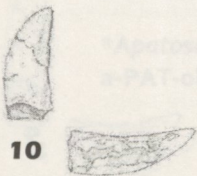


THE BONE SITE AT DINOSAUR RIDGE



What bone do you think this was?
A leg bone? Hip bone? Or maybe a skull?

No one really knows for sure.
Maybe **YOU** can tell us what it was.
Can you find the other half of it?



Dennis, Denise and Darin's Dad, asked, "Who first found these bones?"

"Arthur Lakes, a pastor and school teacher, and his good friend, Henry C. Beckwith, and some other men from Morrison," Dan replied. "They found the first bones of these huge animals when they were hiking along the 'hogback' just north of here, on March 20, 1877. They stumbled upon the big bones."

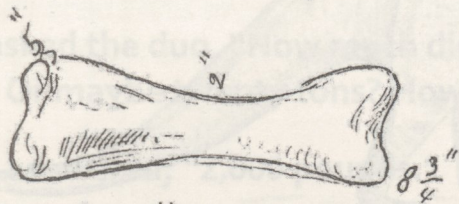
Darin asked, "Was that the same Arthur Lakes who sent the T-rex tooth we saw to Yale?" "Indeed it was," Dan answered.

Denise asked Darin, "What would you have done when you first saw these huge bones?"

"I would have died!" Darin declared.

Titanosaurus Montanus

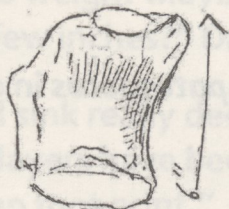
The followig are some of the bones



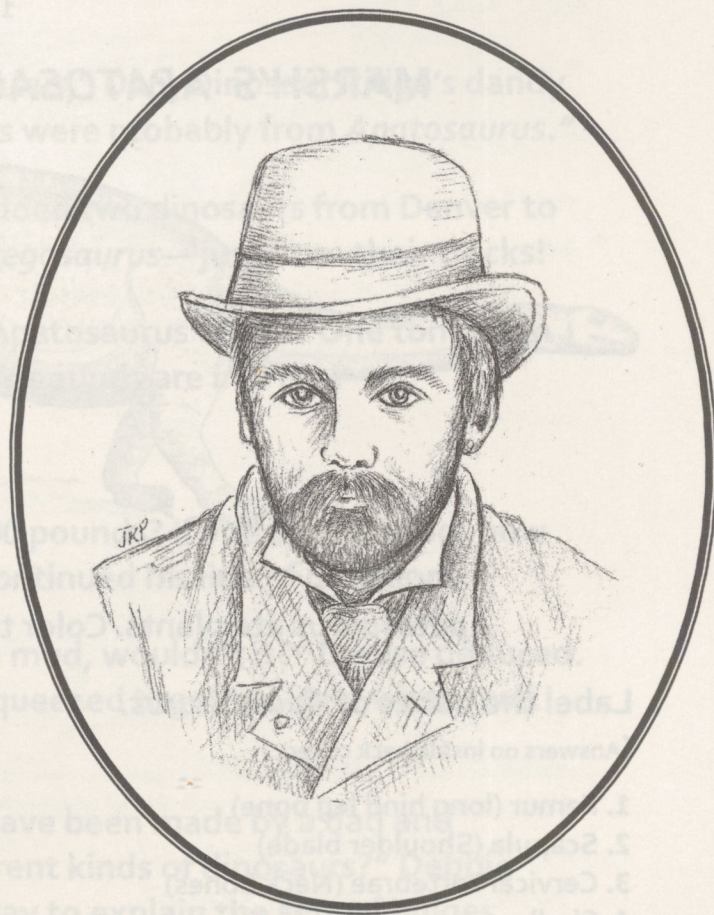
Bone 11



Verteb E. Bone 10

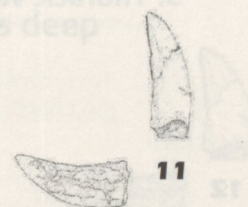


Verteb D. Bone 9



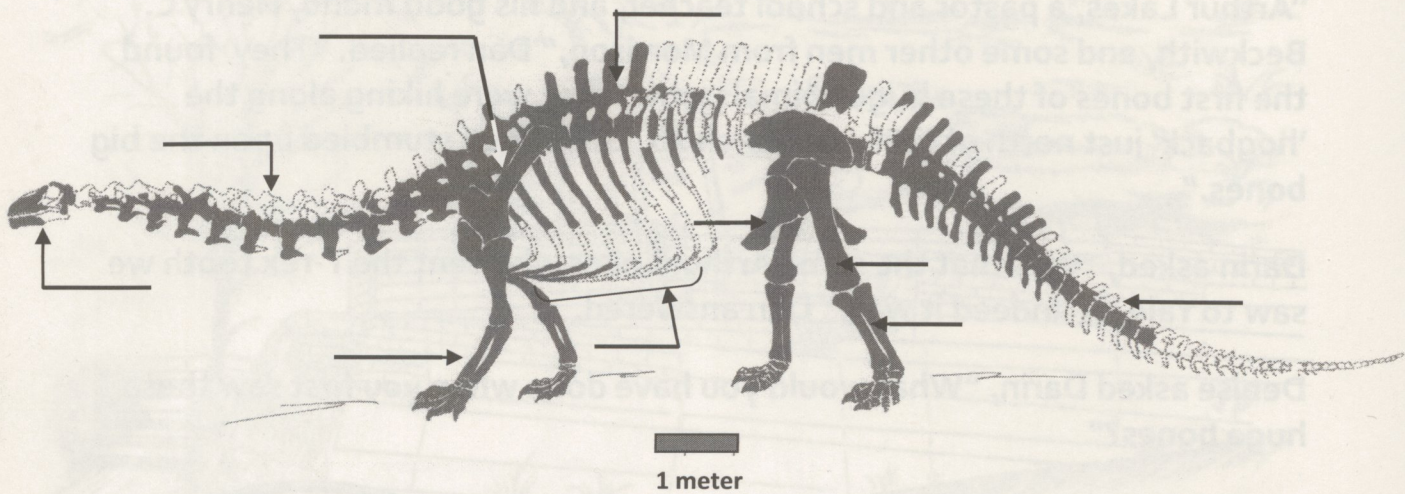
Arthur Lakes drew these sketches of the bones he had collected when he was at Yale in 1878.

Arthur Lakes

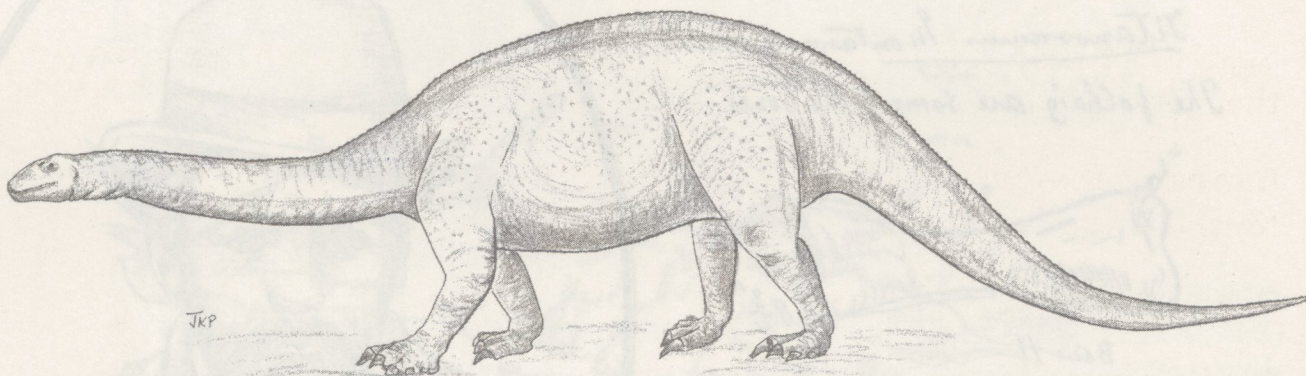


APATOSAURUS SKELETON MARSH CREATED FROM BONES

From Ostrom and McIntosh, 1965



MARSH'S APATOSAURUS "FLESHED OUT"



Apatosaurus ate plants. Color the *Apatosaurus* in camouflage.

Label the bones of *Apatosaurus*.

(Answers on inside back cover)

1. Femur (long hind leg bone)
2. Scapula (Shoulder blade)
3. Cervical vertebrae (Neck bones)
4. Skull
5. Thoracic vertebrae (body vertebrae)
6. Caudal vertebrae (tail bones)
7. Ribs
8. Ulna and Radius (front leg bones)
9. Fibula and Tibia (back leg bones)
10. Pubic bone



Do you think food ever got stuck in their throat?
Why were their nostrils on top of their head?

ROCKY BULGES ON DINOSAUR RIDGE

"What in the world are those?" Darin asked, looking at a number of mysterious rocky bulges hanging down from the overhanging rock.

"Duh! Read!" Denise ordered Darin. She pointed to a sign. "Those are the blobs of sand that slid into the holes where a dinosaur stepped."

Darin asked Dan more questions about these strange bulges. "I see two sizes. Does that mean there were two different dinosaurs? What dinosaurs were they?"

"The sign says *Brontosaurus*, but isn't *Brontosaurus* now called *Apatosaurus*?" Denise asked more questions. "What were the smaller ones?"

"The smaller ones are probably *Stegosaurus*," Dan, Dinosaur Ridge's dandy docent, told the duo. "The larger bulges were probably from *Apatosaurus*."

So, the Dynamic Dinosaur Detectives added two dinosaurs from Denver to their discovery list—*Apatosaurus* and *Stegosaurus*—just from their tracks!

Dan asked the duo, "How much did an *Apatosaurus* weigh? One ton or ten tons? Or maybe twenty tons? How many pounds are in a ton?"

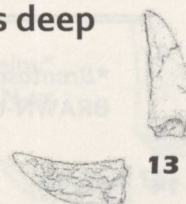
Darin answered, "2,000 pounds."

"So how much do you weigh? Maybe 100 pounds? If you step in mud, how deep do you sink? A few inches?" Dan continued his line of questions.

"So a dinosaur would sink really deep in mud, wouldn't it?" Denise deduced. "I can see where the layers have been squeezed together. And where wet sand slid into the deep foot print."

"Couldn't the different sizes of bulges have been made by a dad and daughter dinosaur, instead of two different kinds of dinosaurs?" Debbie Doolittle doubted there was only one way to explain the sets of bulges.

Dan said, "That's possible, Debbie. Young dinosaurs wouldn't sink as deep as heavy-weight adults did."





“*Brontosaur” Bulges—Dinosaur tracks in Jurassic Sandstone
on Dinosaur Ridge.

- How many dinosaurs walked through the sandy mud along this ancient river?
- How big were their feet?
- How far apart were their footsteps?
- How much did they weigh?
- How fast were they going?
- Did a herd of these dinosaurs passing through make the land shake?



*Brontosaur = “Thunder Lizard”
BRAWN-toe-sore



"But, as Denise said, the dinosaur wasn't always named *Apatosaurus* or *Brontosaurus*," Dan repeated. "O.C. Marsh named the first gigantic bones dug from Morrison **Titanosaurus montanus*. But an animal in India had already been named *Titanosaurus*, so Professor Marsh had to rename this animal *Atlantosaurus*."

"Eventually Marsh named what he thought were four different long-necked dinosaurs from here. He called them **Atlantosaurus montanus*, **Atlantosaurus immanis*, **Apatosaurus ajax*, and *Diplodocus lacustris*." However, before Marsh had named his big bones, bones of another dinosaur from a different place had been called *Apatosaurus*. Nowadays, most paleontologists think that only the scientific names *Apatosaurus* and *Diplodocus* are valid.

After describing *Apatosaurus* from Colorado, Marsh two years later named a very similar long-necked dinosaur from Wyoming **Brontosaurus*. About 30 years later, paleontologist Elmer Riggs showed that the beast from Wyoming and the *Apatosaurus* from Colorado represented two forms of the same kind of dinosaur. So first in naming rights take us back to *Apatosaurus*." Today's scientists aren't sure if the giant bones found on March 20, 1877, belong to *Apatosaurus* or to some other long-necked dinosaur."



One Dinosaur—Many Names

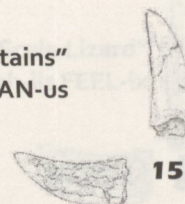
**Apatosaurus ajax* = "Strongest Deceptive Lizard"
ah-PAT-oh-sore-us A-jacks

**Brontosaurus* = "Thunder lizard"
BRAWN-toe-sore-us

**Atlantosaurus immanis* = "Biggest Atlas Lizard"
at-LAN-toe-sore-us im-MAN-is

**Atlantosaurus montanus* = "Atlas Lizard from the mountains"
at-LAN-toe-sore-us Mon-TAN-us

**Titanosaurus montanus* = "Titanic Lizard from the mountains"
Tie-TAN-oh-sore-us mon-TAN-us



Derek Doolittle standing in a pool of a giant and very deep *Apatosaurus* track
Southeastern Colorado



CROCS ON THE ROCKS

Darin had seen a crocodile in the painting of the Jurassic period in Dinosaur Ridge's Trek Through Time exhibit.

"Did we really have crocodiles here in Denver?" Darin asked the docent named Dan.

"Yes, indeed!" Dan replied.

"Do you know that crocodiles like to eat eggs?" Dan asked Darin. "What would be more delicious than a dinosaur egg omelet? So don't you think that crocodiles might have lived where dinosaurs lived?"

Dan went on. "Jurassic crocodiles of many shapes and sizes lived in rivers alongside the dinosaurs. The first specimen ever found in America came from here on Dinosaur Ridge."

Denise wondered, "Why isn't this place called 'Crocodile Ridge'?"

Darin asked, "Were the ancient crocodiles big?"

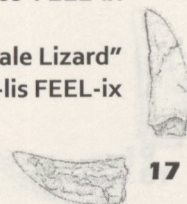
"Arthur Lakes, and Professor Benjamin Mudge from Kansas, and their helpers found a crocodile skull here in the rocks at Quarry #1 on July 18, 1877. It was about 15 inches (~37.5 centimeters) long," Dan told the duo. He showed the twins a model of the skull.

"Professor Marsh named this crocodile **Diplosaurus felix*. It would have been about 40 inches long from its divided nose to the tip of its tail." Dan held his arms out to show the duo how big 40 inches (~1.5 meters) was.

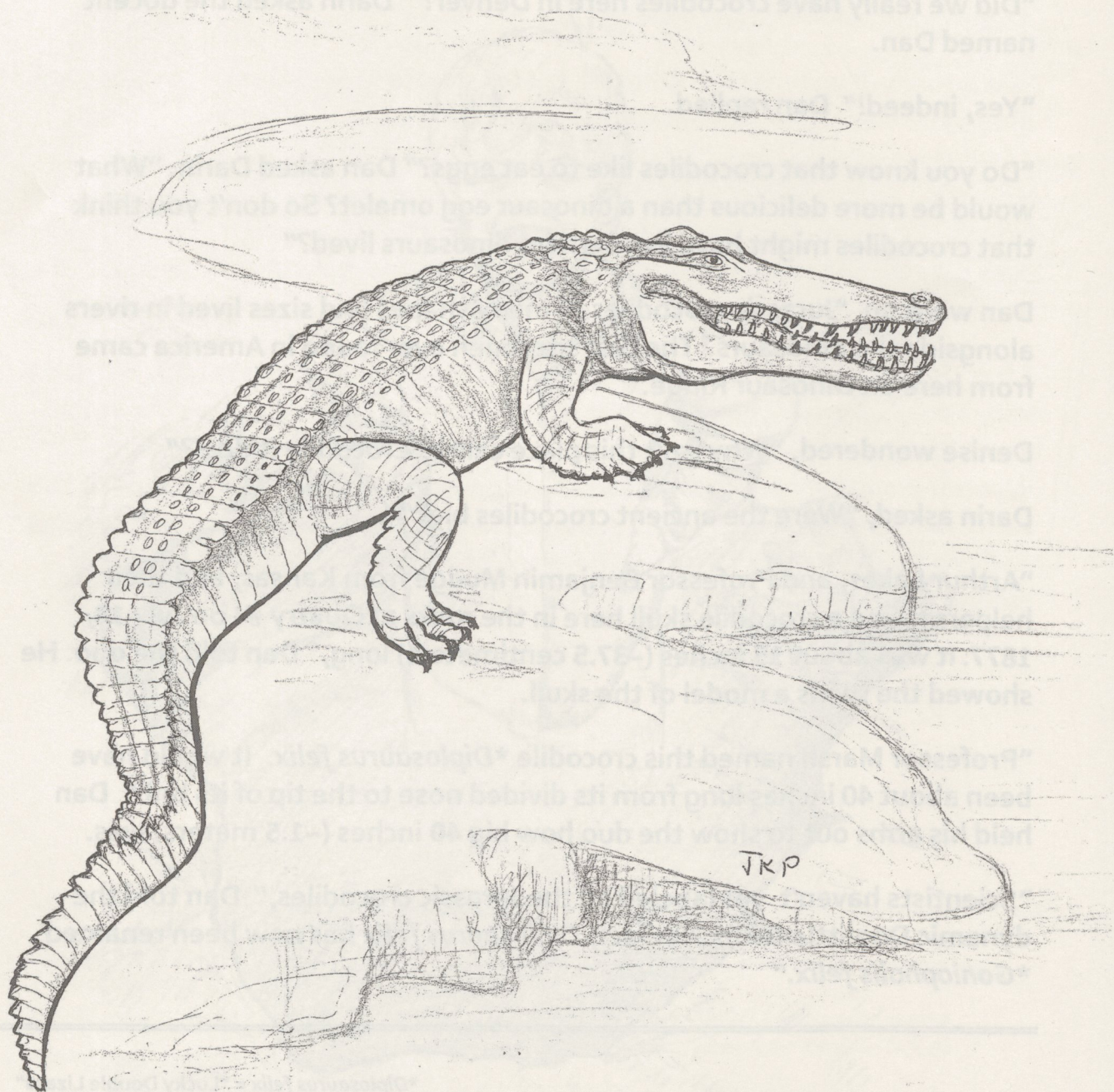
"Scientists haven't yet labeled all the Jurassic crocodiles," Dan told the dynamic Doolittle twins. "In fact, *Diplosaurus felix* has now been renamed **Goniopholis felix*."

**Diplosaurus felix* = "Lucky Double Lizard"
Dip-low-SORE-us FEEL-ix

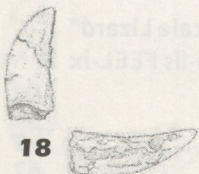
**Goniopholis felix* = "Lucky Angled-Scale Lizard"
Go-knee-OFF-ah-lis FEEL-ix

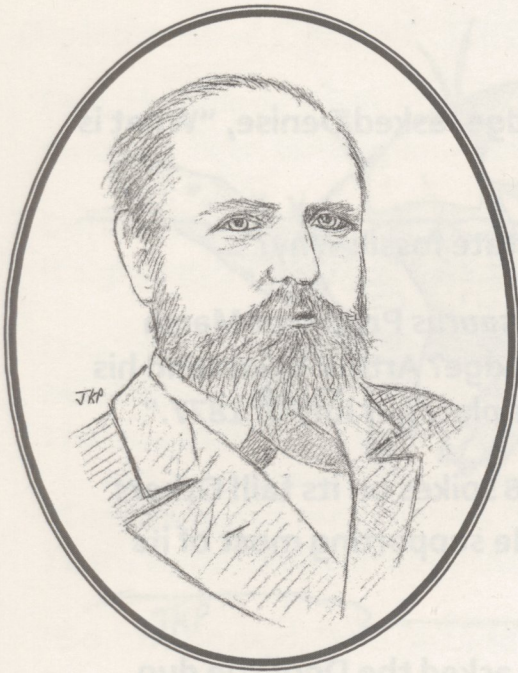


Goniopholis felix
(originally called *Diplosaurus felix*)

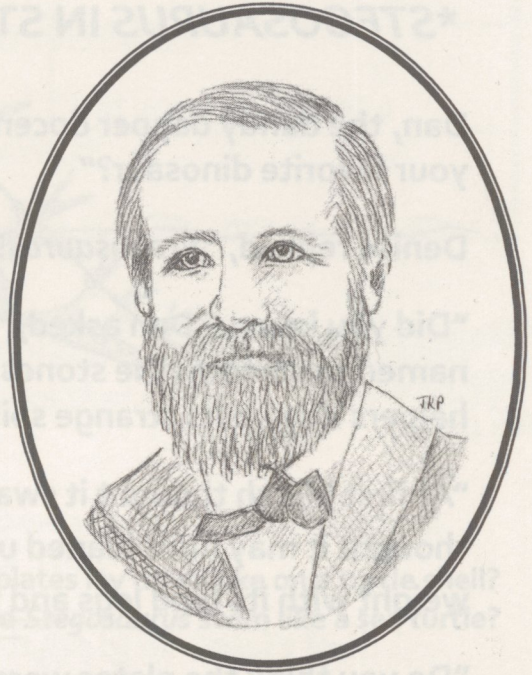


COLOR THE CROCODILE SO IT LOOKS LIKE A LOG ALONG THE RIVER.
DRAW IN SOME SCOURING RUSHES WHERE IT COULD HIDE.

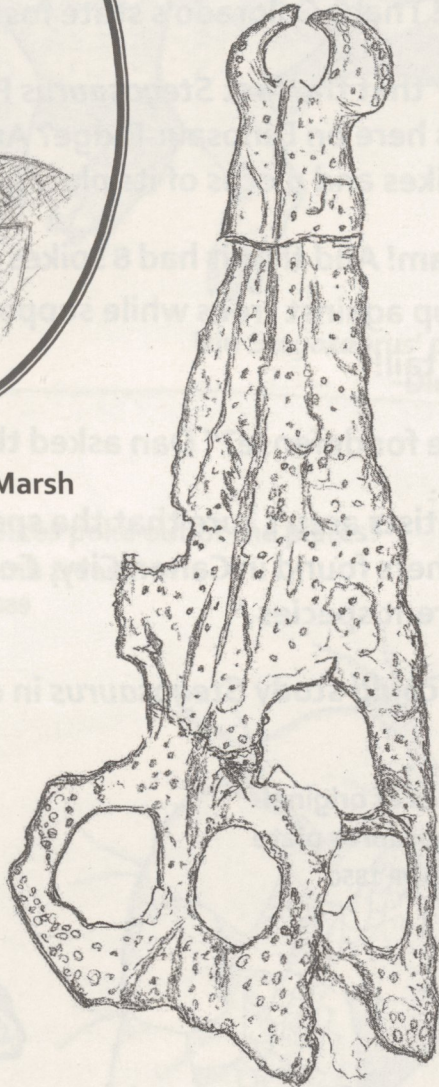




Professor Othniel C. Marsh

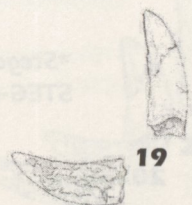


Professor Benjamin Mudge



10 centimeters

The skull of
Goniopholis felix
(originally called *Diplosaurus felix*)
#YPM VP 517



*STEGOSAURUS IN STONE

Dan, the dandy dapper docent from Dinosaur Ridge, asked Denise, "What is your favorite dinosaur?"

Denise replied, "*Stegosaurus*! That's Colorado's state fossil! Why?"

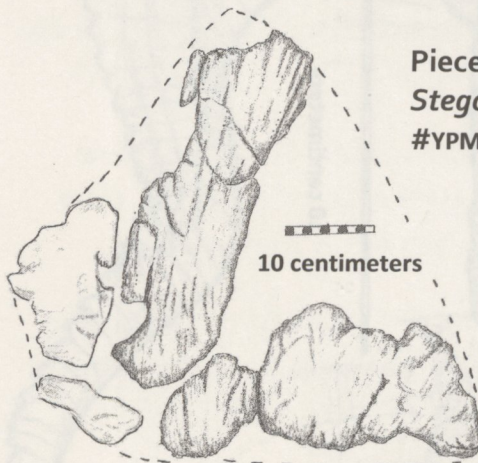
"Did you know," Dan asked, "that the first *Stegosaurus* Professor Marsh named came from the stones here on Dinosaur Ridge? Arthur Lakes and his helpers dug up its strange spikes and pieces of its plates in July of 1877."

"At first Marsh thought it swam! And that it had 8 spikes on its tail! Others thought it may have leaned up against trees while supporting most of its weight with its hind legs and tail!"

"Do you think the plates were for defense?" Dan asked the Doolittle duo.

"You know," Dan said, "scientists aren't sure that the specimens found here are different enough from others found in Canon City, Colorado, or Como, Wyoming to be called a different species."

"Maybe," Denise thought, "I could study *Stegosaurus* in college."



Pieces of original
Stegosaurus plate
#YPM VP 1850

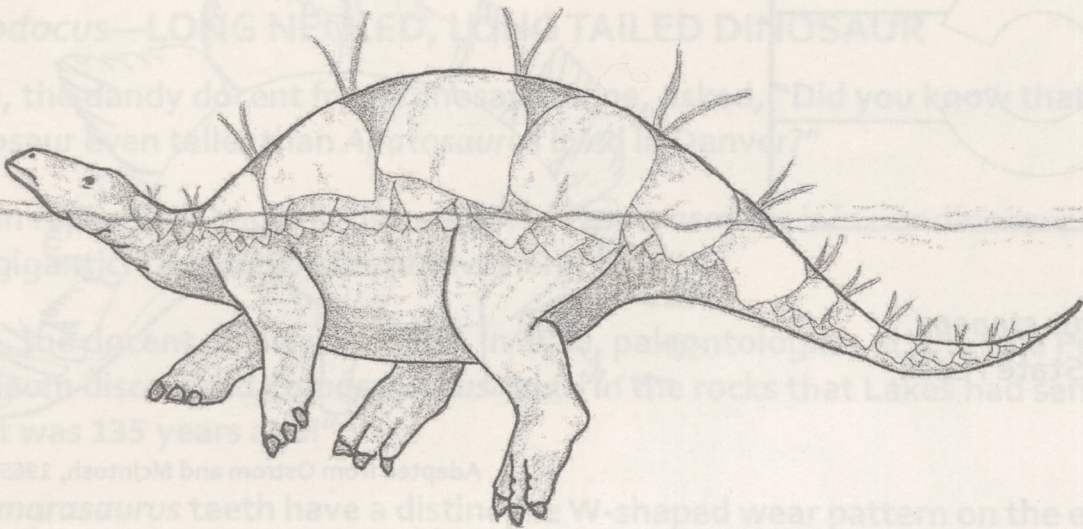
Shade the missing part of the plate

Stegosaurus vertebrae
#YPM VP 1850



20

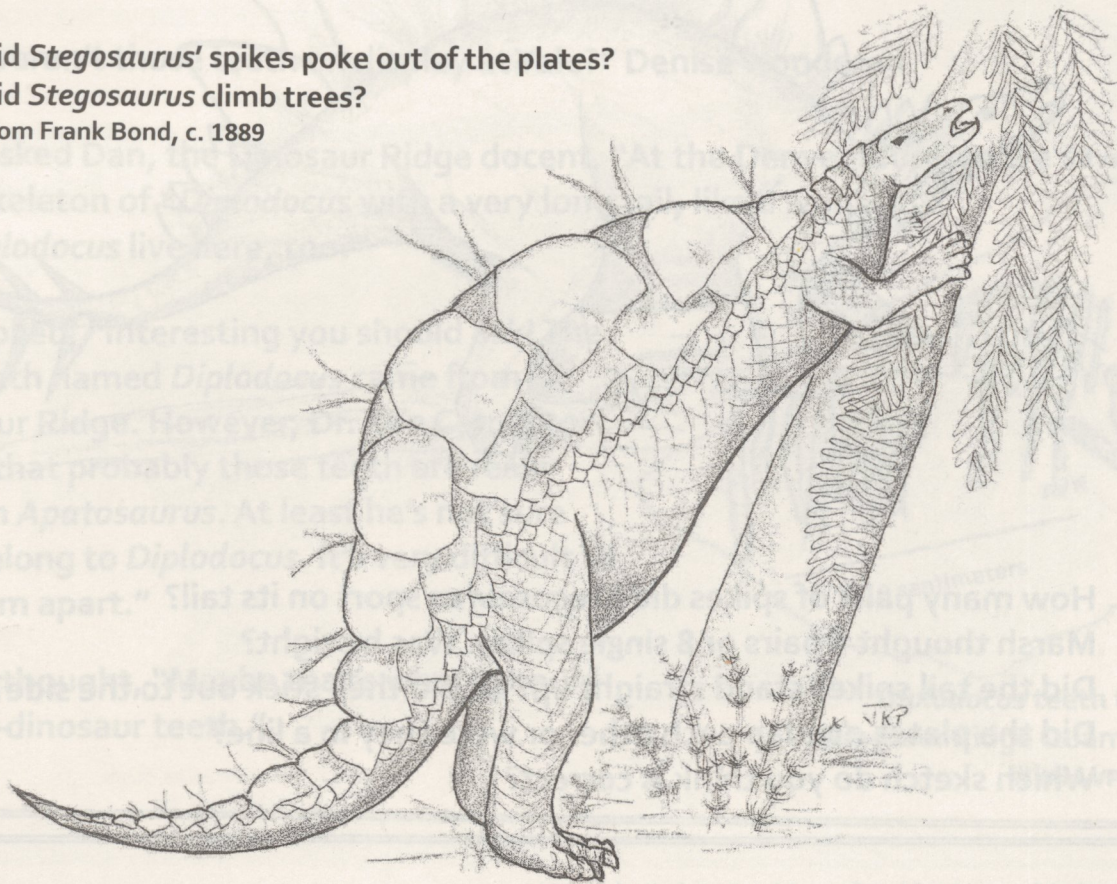
**Stegosaurus armatus* = "Armored Roofed Lizard"
STEG-oh-sore-us ARM-a-tus



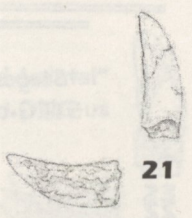
Did *Stegosaurus*' plates lay down like on a turtle shell?
 -Did *Stegosaurus* swim like a sea turtle?

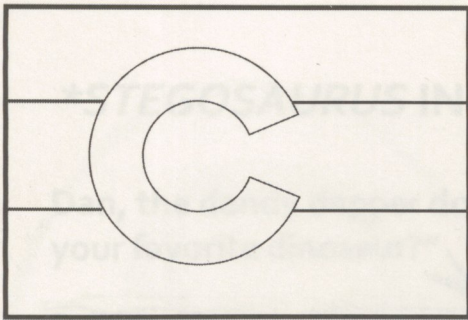
JKP

Did *Stegosaurus*' spikes poke out of the plates?
 Did *Stegosaurus* climb trees?
 From Frank Bond, c. 1889



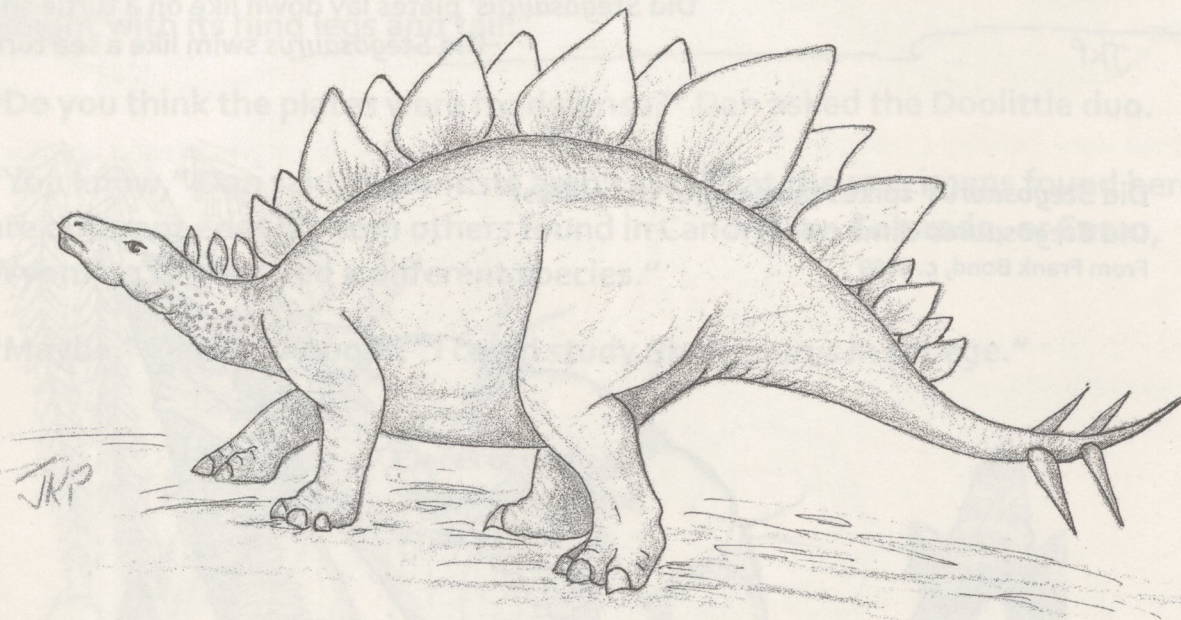
TWO DIFFERENT EARLY IDEAS OF *STEGOSAURUS*





****Stegosaurus stenops*,
Colorado's State Fossil,
ate plants.**

Adapted from Ostrom and McIntosh, 1965



How many pairs of spikes did *Stegosaurus* sport on its tail?
Marsh thought 4 pairs or 8 single spikes. Was he right?
Did the tail spikes stand straight up? Or did they stick out to the side?
Did the plates overlap each other or were they in a line?
Which sketch do you think is correct?



****Stegosaurus stenops*
STEG-oh-sore-us STEN-ops**



Camarasaurus—THE BIGGEST DINOSAUR

Diplodocus—LONG NECKED, LONG TAILED DINOSAUR

Dan, the dandy docent from Dinosaur Ridge, asked, "Did you know that a dinosaur even taller than *Apatosaurus* lived in Denver?"

Darin replied, "A huge dinosaur named *Camarasaurus* is in our dinosaur books. It's gigantic! Did *Camarasaurus* live here, too?"

Dan, the docent, answered. "Yes. In 2010, paleontologists at the Yale Peabody Museum discovered *Camarasaurus* teeth in the rocks that Lakes had sent in 1877. That was 135 years ago!"

"*Camarasaurus* teeth have a distinctive W-shaped wear pattern on the edges. There were small pieces of the jaw bone preserved, too!"

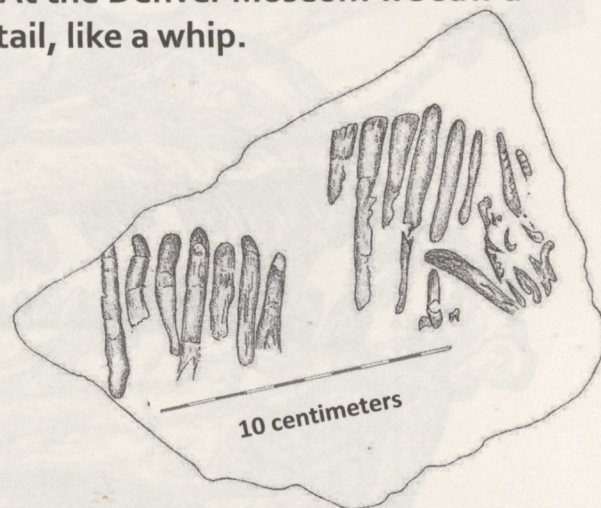
"So," Darin said, "We can add *Camarasaurus* to our list of dinosaurs from Denver!"

"Why weren't those teeth on display at Yale?" Denise wondered.

Darin asked Dan, the Dinosaur Ridge docent, "At the Denver Museum we saw a huge skeleton of **Diplodocus* with a very long tail, like a whip. Did *Diplodocus* live here, too?"

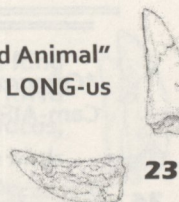
Dan replied, "Interesting you should ask! The first teeth named *Diplodocus* came from Dinosaur Ridge. However, Dr. Ken Carpenter thinks that probably those teeth are really from an *Apatosaurus*. At least he's not sure they belong to *Diplodocus*. It's very difficult to tell them apart."

Denise thought, "Maybe that's what I should study—dinosaur teeth."



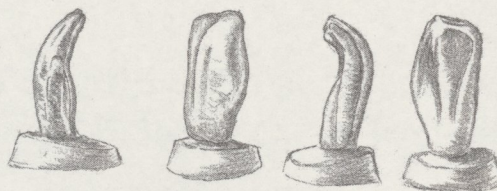
Diplodocus teeth from
Dinosaur Ridge Quarry #5
#YPM VP 1922

**Diplodocus longus* = "Long Double-Beamed Animal"
Die-PLOD-oh-kus LONG-us

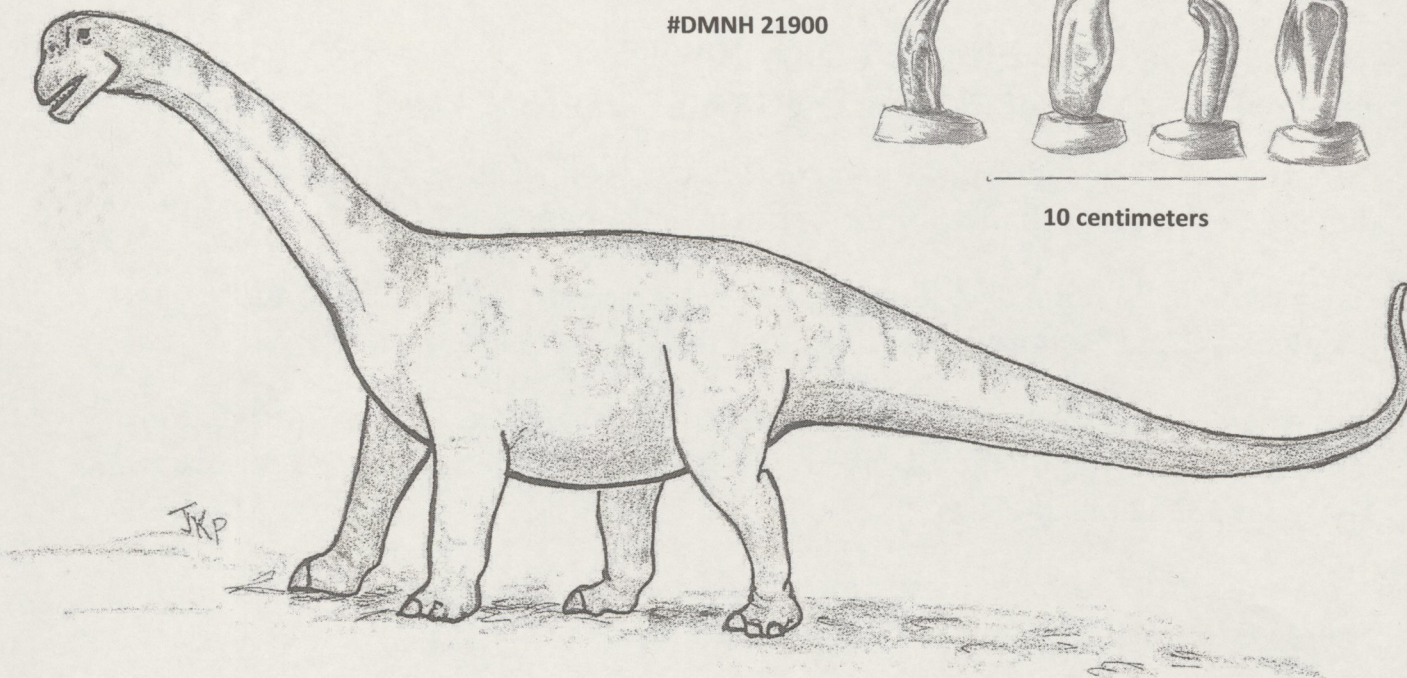


Cast of *Camarasaurus* tooth from different angles

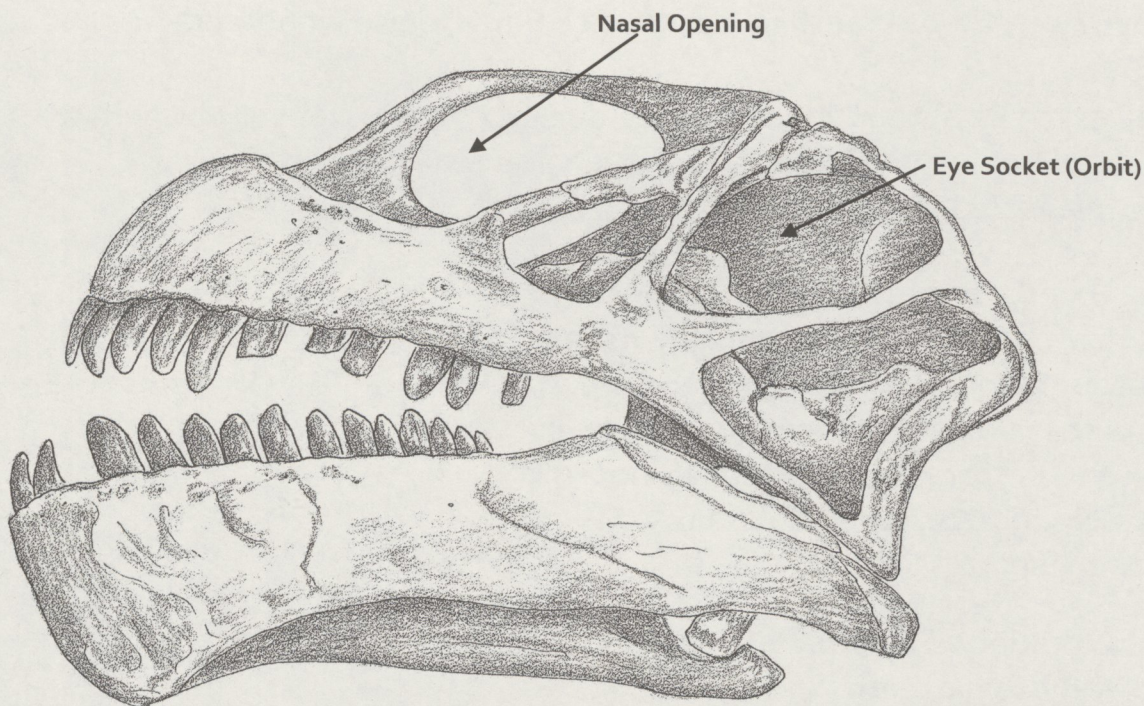
#DMNH 21900



10 centimeters



**Camarasaurus* ate plants. What colors would *Camarasaurus* have been?



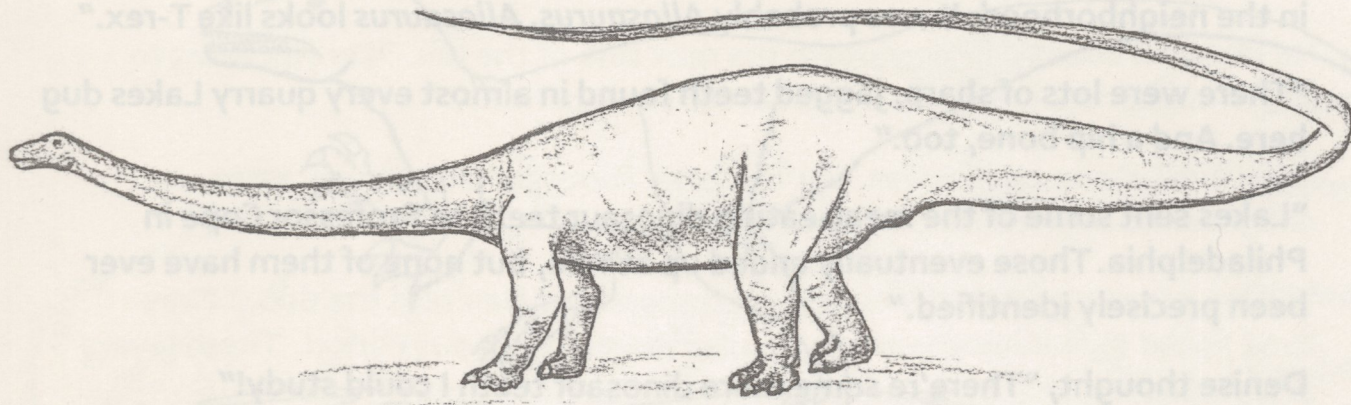
10 centimeters

Camarasaurus skull
#DMNH 29575



**Camarasaurus* = "Lizard with Chambered Vertebrae"
Cam-AIR-a-sore-us





Diplodocus longus

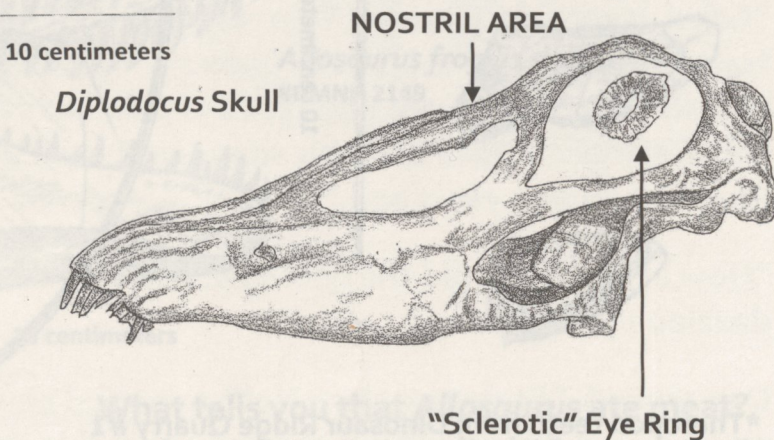
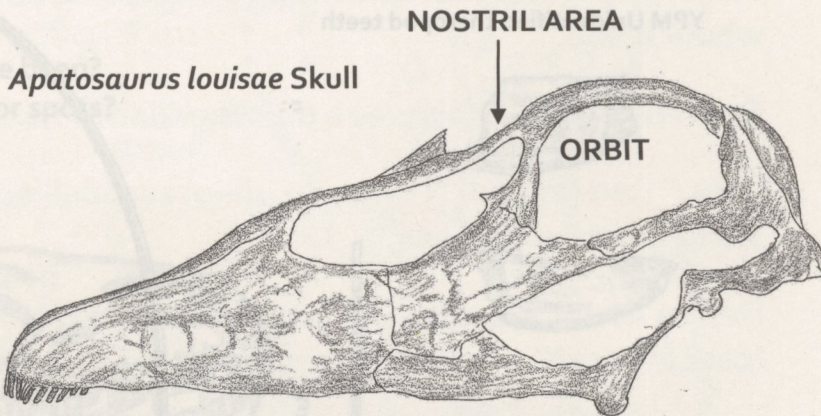
Based on #DMNH 1494

What do you see that is different between the two skulls?

What does the "sclerotic" eye ring do?

What living groups of animals have a "sclerotic" or eye ring?

Do you think *Apatosaurus* had a "sclerotic" eye ring?



**Sclerotic" Eye Ring
Sklare-AH-tic RING

Small bones that deform the eyeball to change the focus;
found in dinosaurs, ichthyosaurs, pterosaurs, and some birds

Darin asked Dan, "These dinosaurs all ate plants. Was a meat eater found here?"

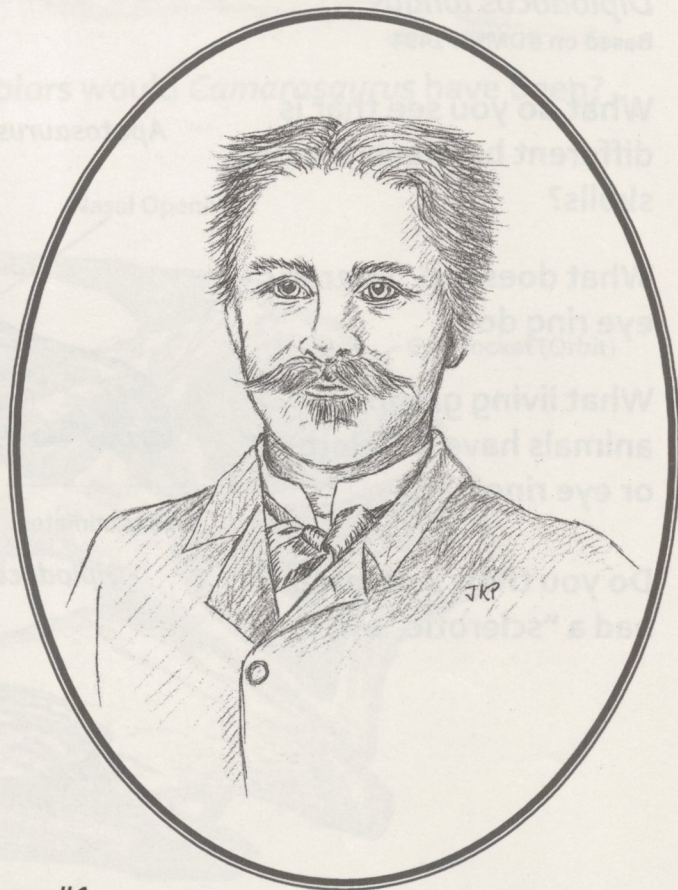
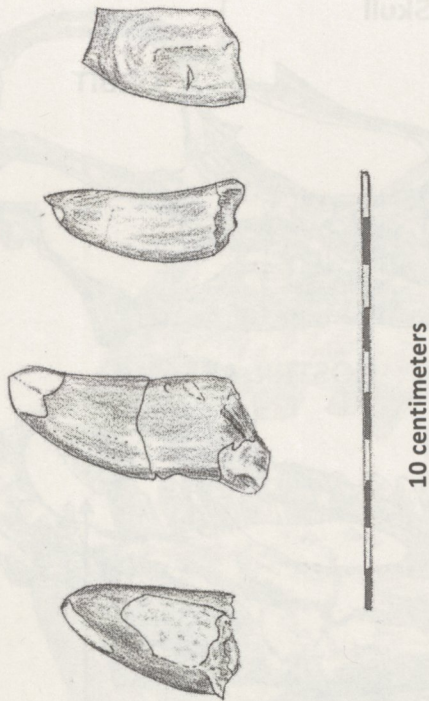
Dan, the docent, replied, "Great question, Darin!" "Yes, there was a meat-eater in the neighborhood. It was probably *Allosaurus*. *Allosaurus* looks like T-rex."

"There were lots of sharp, jagged teeth found in almost every quarry Lakes dug here. And a hip bone, too."

"Lakes sent some of the meat-eating dinosaur teeth to Professor Cope in Philadelphia. Those eventually ended up at Yale, but none of them have ever been precisely identified."

Denise thought, "There're some more dinosaur teeth I could study!"

YPM Unidentified theropod teeth



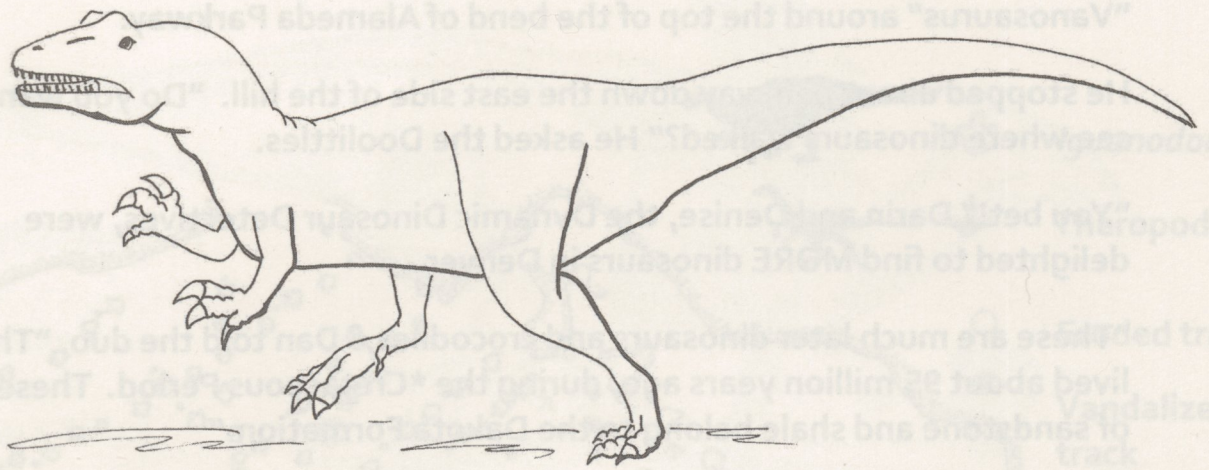
*Theropod teeth from Dinosaur Ridge Quarry #1
Do you think the teeth look like T-rex teeth?

Edward Drinker Cope
Based on photo in Psihoyos, 1994



*Theropod = "beast foot"
THEAR-oh-pod

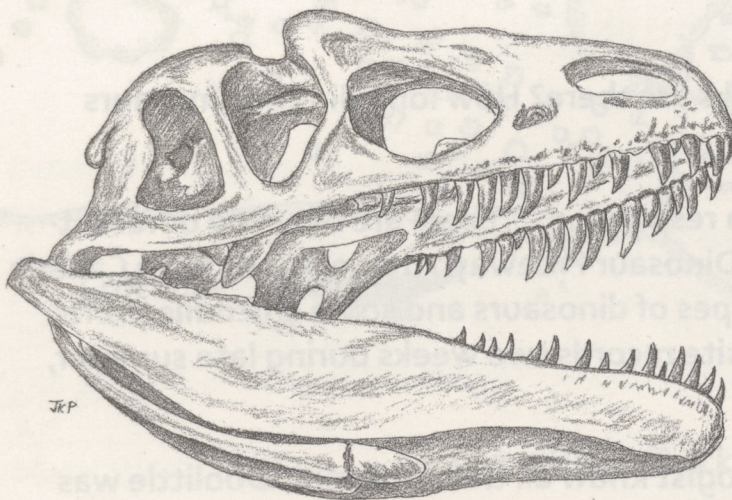




From Lockley & Peterson, 2002

***Allosaurus**

What colors might *Allosaurus* have been?
Might *Allosaurus* have had stripes or spots?



Allosaurus fragilis skull
#DMNH 2149

10 centimeters

What tells you that *Allosaurus* ate meat?
Dinosaurs who ate meat are called "Carnosaurs."

Allosaurus fragilis = "Different Lizard"
AL-lo-sore-us fra-GEL-es
Carnosaurs = Meat-eating Lizards"
CARN-oh-sores



A DINOSAUR DANCE FLOOR

Dan, the dandy driver from Dinosaur Ridge, drove the Doolittle twins, Darin and Denise, Derek, and their parents, Dennis and Debbie Doolittle, in the "Vanosaurus" around the top of the bend of Alameda Parkway.

He stopped about half way down the east side of the hill. "Do you want to see where dinosaurs walked?" He asked the Doolittles.

"You bet!" Darin and Denise, the Dynamic Dinosaur Detectives, were delighted to find MORE dinosaurs in Denver.

"These are much later dinosaurs and crocodiles," Dan told the duo. "They lived about 95 million years ago, during the *Cretaceous Period. These layers of sandstone and shale belong to the Dakota Formation."

The Doolittle duo dashed from the "Vanosaurus" to the track site, up the steps, and under the little metal umbrella. From there they could see the whole scene.

Darin cried out, "This was a dinosaur dance floor!"

"Yes," Dan replied. "Long ago, dinosaurs dallied between the tides along the shore of an ancient sea."

Denise asked, "How many tracks are there? How long did the dinosaurs 'dance' here?"

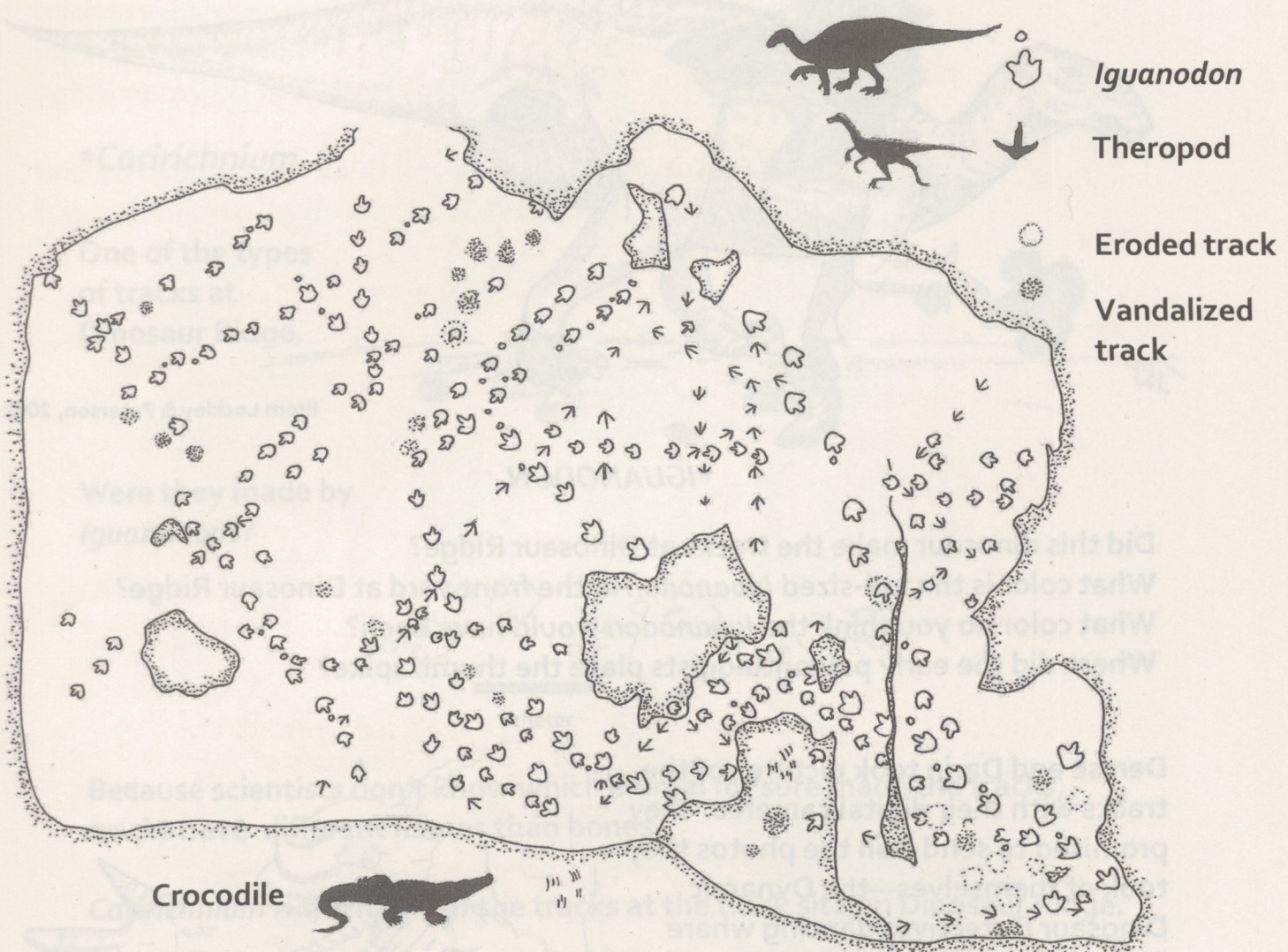
"Good questions, Denise," Dan responded. "There are over 300 different tracks here, part of the great "Dinosaur Freeway" that extends from Canada to Texas. Here there are two types of dinosaurs and some crocodile prints. One geologist thinks that this site records two weeks during late summer, about 95 million years ago."

"How in the world did the geologist know all that?" Dennis Doolittle was dazzled by the data.

Dan replied, "Professor Nora Noffke studied blue-green algal mats that grow along shorelines just above the daily high tide line around the world where the high tides cover the shore maybe only once a month. Modern seashores show the same patterns at summer's end that she sees fossilized in the rocks here at Dinosaur Ridge!"

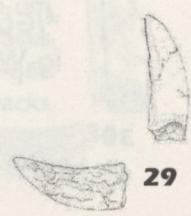
*Cretaceous = Kreh-TAY-shus





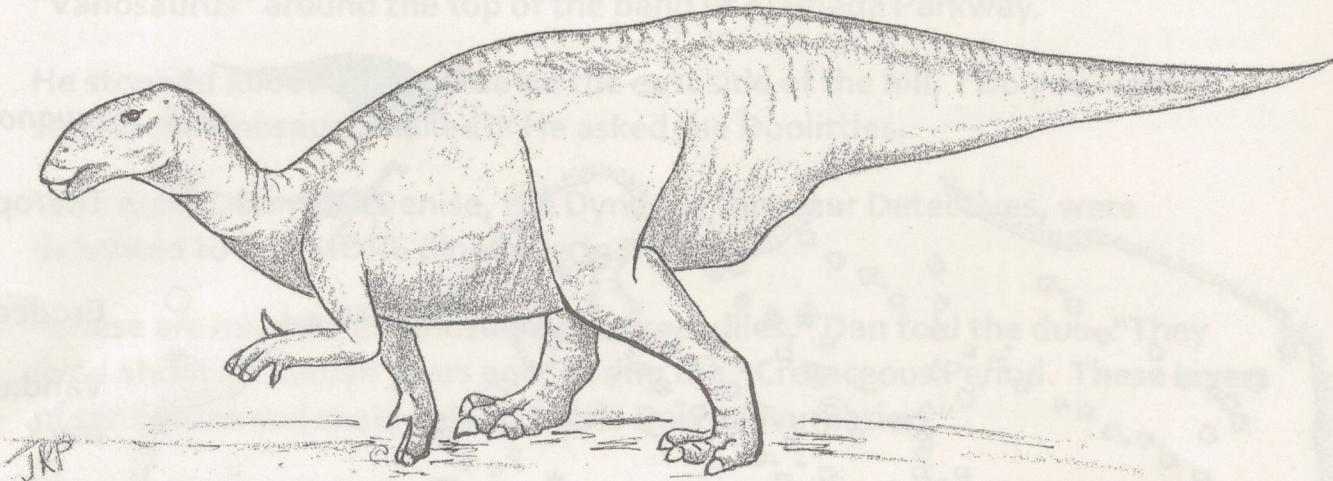
Dinosaur Ridge Track Site

- Circle an *Iguanodon* track.
- Put a square around a theropod track.
- Put a triangle around a baby *Iguanodon* track.
- Color over the crocodile track with green.
- Color the eroded tracks yellow.
- Color the vandalized tracks red.
- Draw a line that connects the tracks in one trackway.
- Which animals in this group would have been the predators?



A DINOSAUR DANCE FLOOR

Dan, the dandy driver from Dinosaur Ridge, drove the Doolittle twins, Darin and Denise, Derek, and their parents, Dennis and Debbie Doolittle, in the "Vanosaurus" around the top of the hill on the Parkway.



From Lockley & Peterson, 2002

*IGUANODON

Did this dinosaur make the tracks at Dinosaur Ridge?

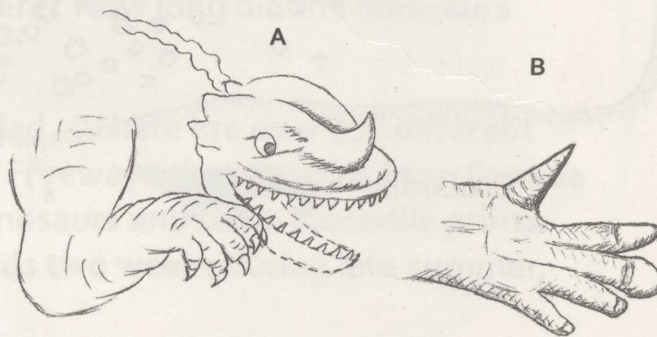
What color is the full-sized *Iguanodon* in the front yard at Dinosaur Ridge?

What color do you think the *Iguanodon* would have been?

Where did the early paleontologists place the thumb spike?

Denise and Darin took pictures of the tracks with their digital cameras. They promised to send Dan the photos they took of themselves—the Dynamic Dinosaur Detectives dancing where dinosaurs dallied 95 million years ago.

The duo's dream—to discover Denver's dinosaurs - now included dancing dinosaurs!



A. *Iguanodon* nose spike, c. 1867

B. True *Iguanodon* thumb spike



*IGUANODON = "Iguana Tooth"
ig-WAN-oh-don

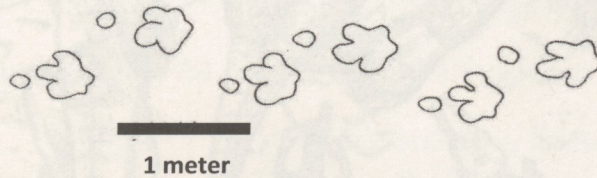


***Caririchnium**

One of the types
of tracks at
Dinosaur Ridge.



Were they made by
Iguanodons?



Because scientists don't know which animal for sure made the tracks,
tracks have different names than bones.

Caririchnium is the name of the tracks at the track site on Dinosaur Ridge.

The science of tracking is called *"ichnology."

BE AN *ICHOLOGIST!

Label the hind foot impression with an H.

Label the front foot impressions with an F.

Circle the tracks that were probably made by a young dinosaur.

**Caririchnium* = "Track of Three-toed Dinosaur"

Car-ee-RIK-knee-um

**Ichnology* = Study of fossil tracks

Ick-NAWL-oh-gee

**Ichnologist* = person who studies fossil tracks



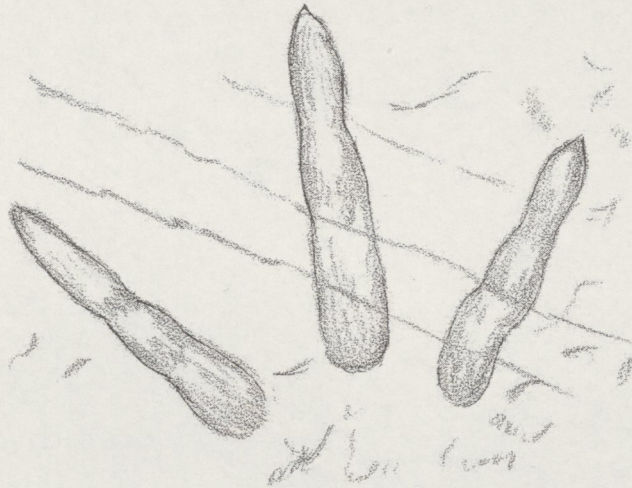
ANOTHER TRACK AT DINOSAUR RIDGE

**Magnoavipes caneeri*

Named for T. Caneer

Long-time Docent at Dinosaur Ridge

What kind of animal do you think made these tracks?
Would you like a track to be named for you?



#UC-D 200.42

10 centimeters



**Magnoavipes caneeri* = "Caneer's Big Bird with Large Feet"
MAG-no-A-vi-pes Can-EAR-i



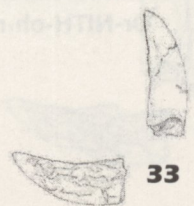


What was the speed limit on the "Dinosaur Freeway"?

What colors could the dinosaurs have been?

Circle a baby *Iguanodon*.

Put an O on the ornithopod; Put a C on the crocodile.



***Ornithomimus velox—SWIFT BIRD MIMIC**

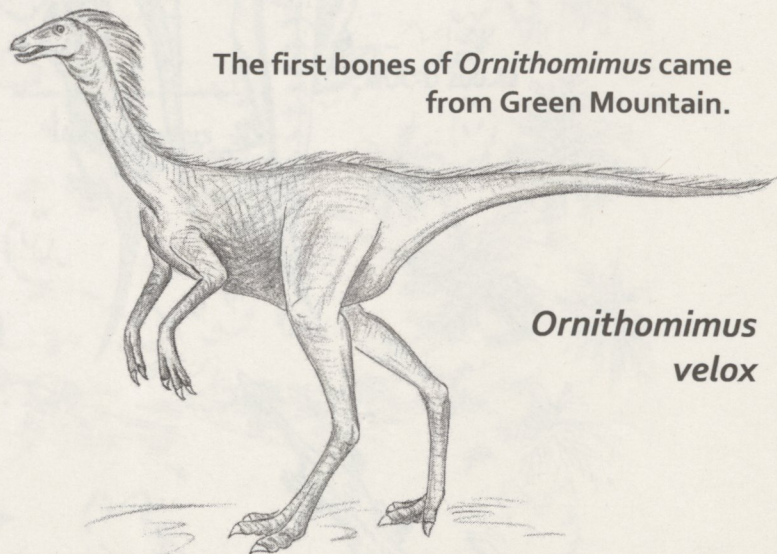
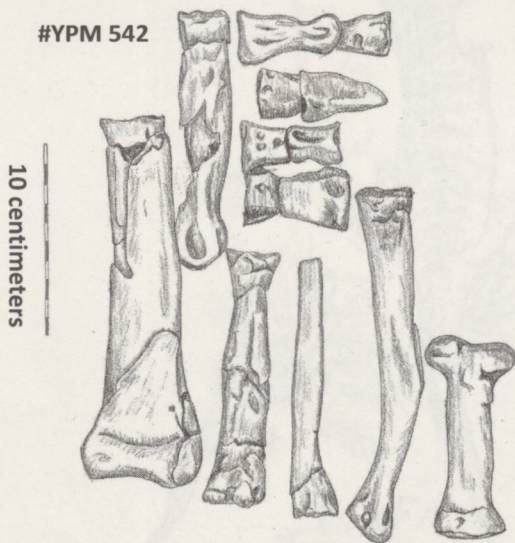
Dan, the dandy dapper docent, asked the Doolittle duo, "Do you know about *Ornithomimus*?" "No," they answered in duet.

"Well," Dan told them, "on June 30, 1889, George Cannon, Arthur Lakes' student—he had helped at the digs in 1877—discovered some ancient bones, part of a small skeleton. He dug them out over on the northwest side of Green Mountain." Dan pointed to the hill across the highway. "George sent them to O.C. Marsh. Marsh named the creature *Ornithomimus velox*."

"We can add another dinosaur, *Ornithomimus*, to our Denver's Dinosaurs list!" Darin exclaimed.

Dan said, "*Ornithomimus* came from sandstones in the Denver Formation, much younger—late Cretaceous—than the rocks on the Ridge and those white rocks, the Laramie Formation, across C-470." Dan pointed across the highway. "In fact, *Ornithomimus* may have been one of the last dinosaurs alive before most met their doom."

"When the deadly meteorite struck about 66 million years ago," Denise declared.



**Ornithomimus velox* = "Swift Bird Mimic"
Or-NITH-oh-my-mus VEL-ox



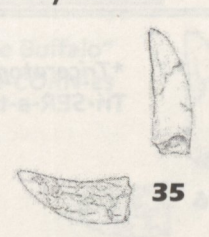


One day in Denver about 66 million years ago

Do you think *Ornithomimus* had feathers?
What color do you think the feathers were?

Scientists have detected that the feathers of one dinosaur were black, like a crow's.

Professor George Cannon taught science at Denver High School for over twenty years at the turn of the 20th century.



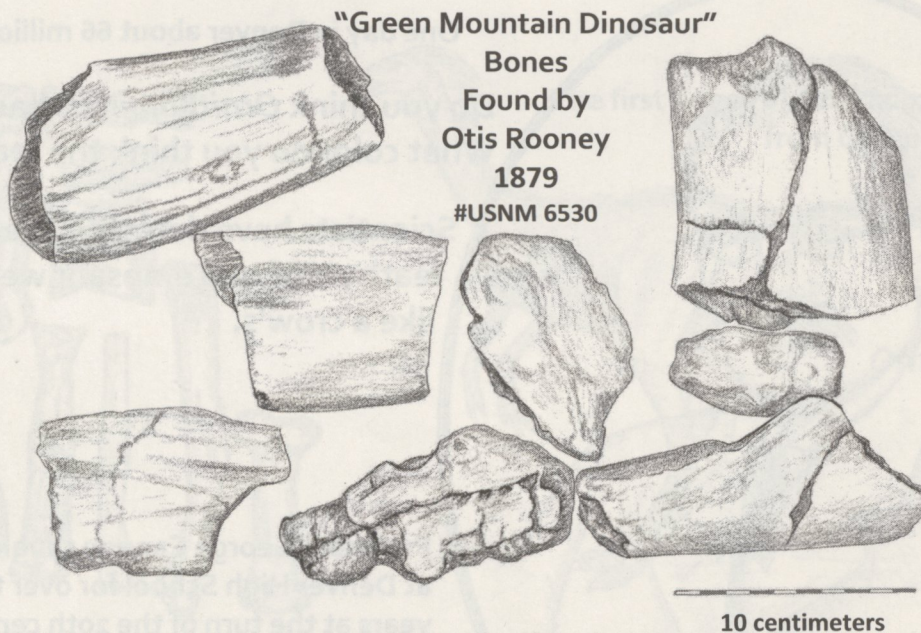
*TRICERATOPS—"THREE-HORN" - THE GREEN MOUNTAIN DINOSAUR

The Dynamic Dinosaur Detectives were not done with their dinosaur discoveries. Dan asked, "Did you know you are very close to where the first horned dinosaurs, like 'Three-Horn,' were discovered?"

Darin replied, "I love 'Three-Horn'. Tell us more."

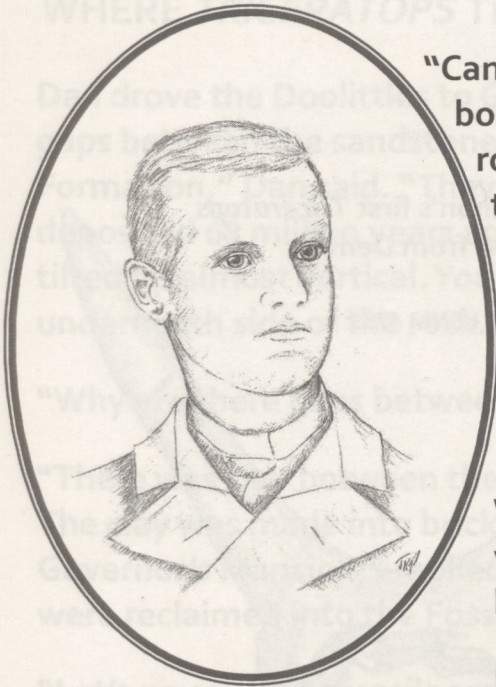
Dan told the duo about another young dinosaur discoverer. "In 1879, a 16-year-old lad, Otis Rooney, lived at the ranch at the bottom of Dinosaur Ridge. One day, Otis went on his own dinosaur discovery dig on the southeast slope of Green Mountain." Dan pointed towards Denver. "There, in a gully where Bear Creek Parkway is today, Otis found some big bones and what looked like a part of a horn."

"Eight years later, Otis showed the bones to George Cannon. George thought they looked similar to the horns that he had just found under the "F" (Federal) Street bridge in Denver. Not knowing what they were, Cannon labeled the bones 'The Green Mountain Dinosaur'."



**Triceratops* = "Three-horned Head"
Tri-SER-a-tops





Otis Rooney, 16-years old

"Cannon," Dan told Darin and Denise, "sent the bones to O.C. Marsh. Marsh didn't know which rock layers had produced the bones. He declared them to be **Bison alticornis*, a large buffalo from a much later geological period."

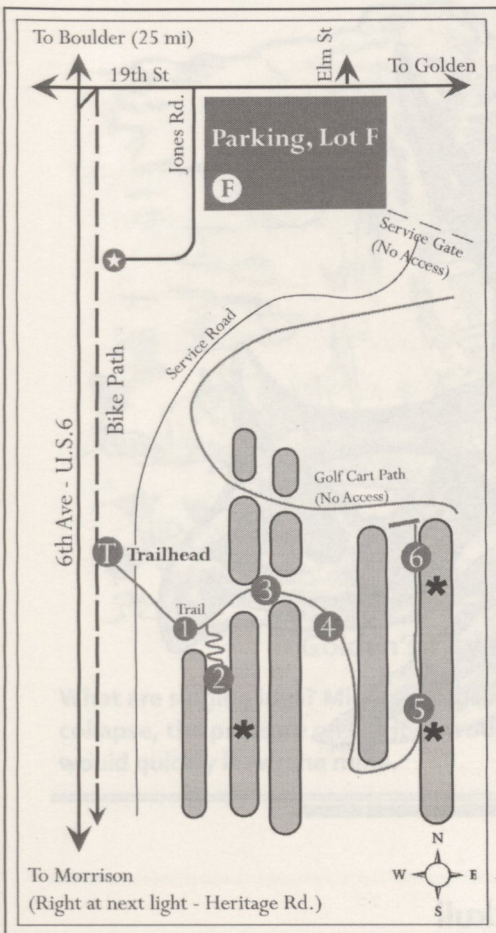
"Cannon argued and wrote an article telling how the bones couldn't have been from *Bison*, because bisons hadn't come about yet!"

"The next year, a complete skull of a *Triceratops* was dug up in Wyoming, and Marsh saw where he went wrong."

Darin asked, "Have any more *Triceratops* been found in Denver?"

Dan answered, "Yes, indeed! Large skulls, one from near Brighton, and also tracks have been discovered. Do you want to see them?"

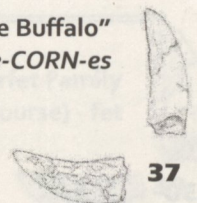
"Definitely!" the Doolittle duo responded. The Doolittles piled into the "Vanosaurus" for the ride to Golden.

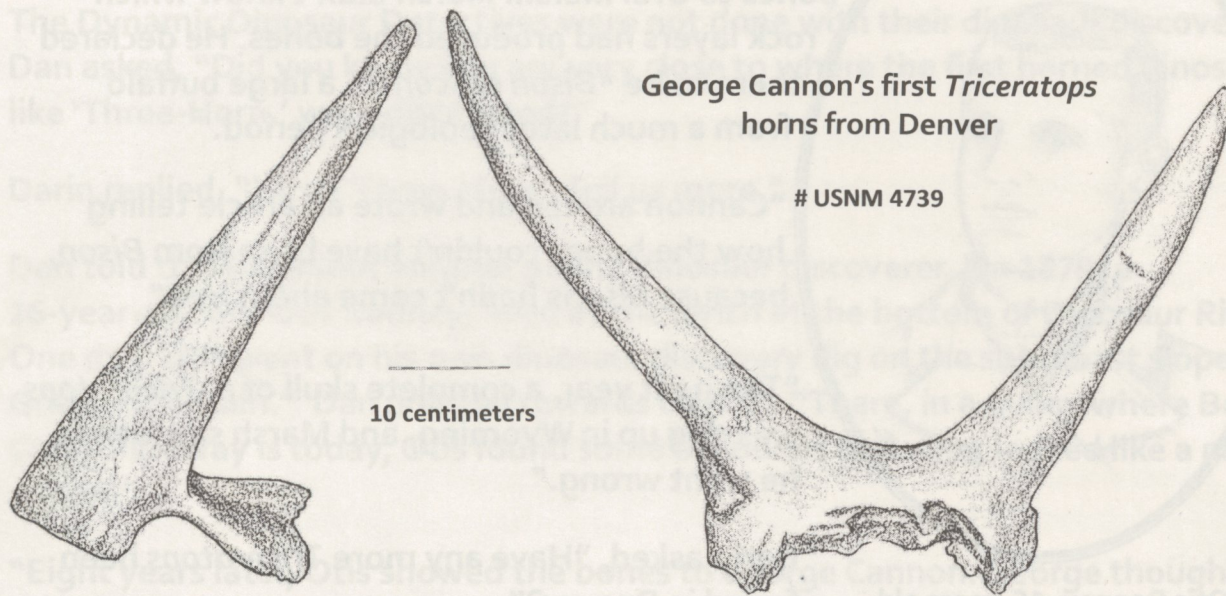


MAP OF TRICERATOPS TRAIL

* = WHERE DAN & THE DOOLITTLES FOUND DINOSAUR TRACKS & TRACES

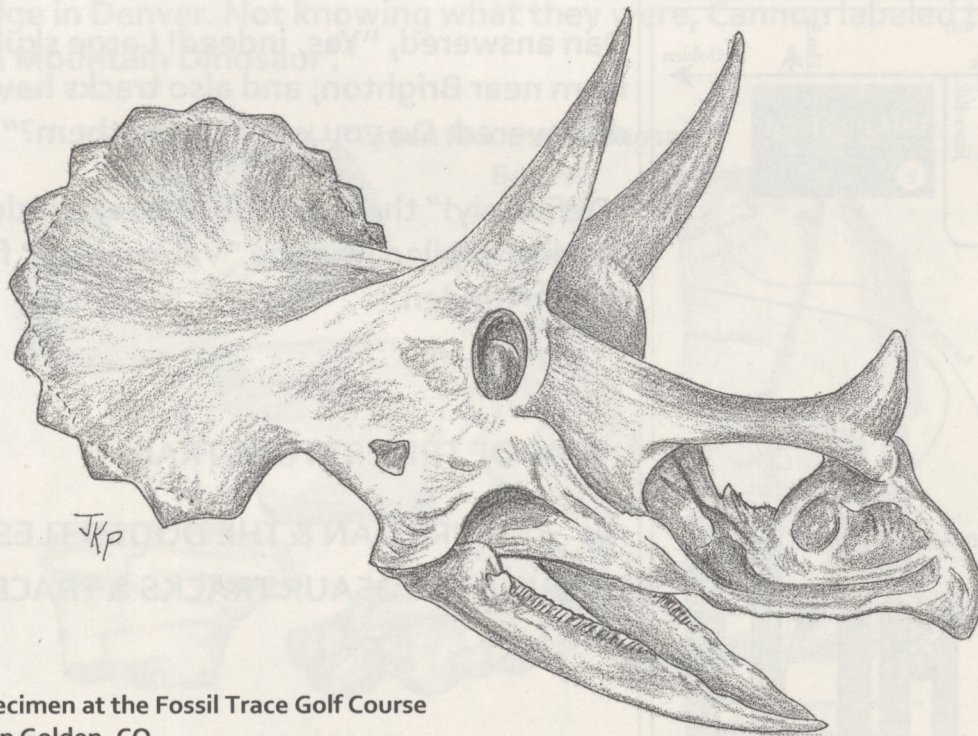
Bison alticornis = "High-horned Large Buffalo"
BY-son ALL-te-CORN-es





George Cannon's first *Triceratops*
horns from Denver

USNM 4739

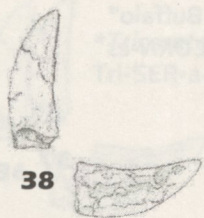


See this specimen at the Fossil Trace Golf Course
clubhouse in Golden, CO



1 meter

Triceratops skull



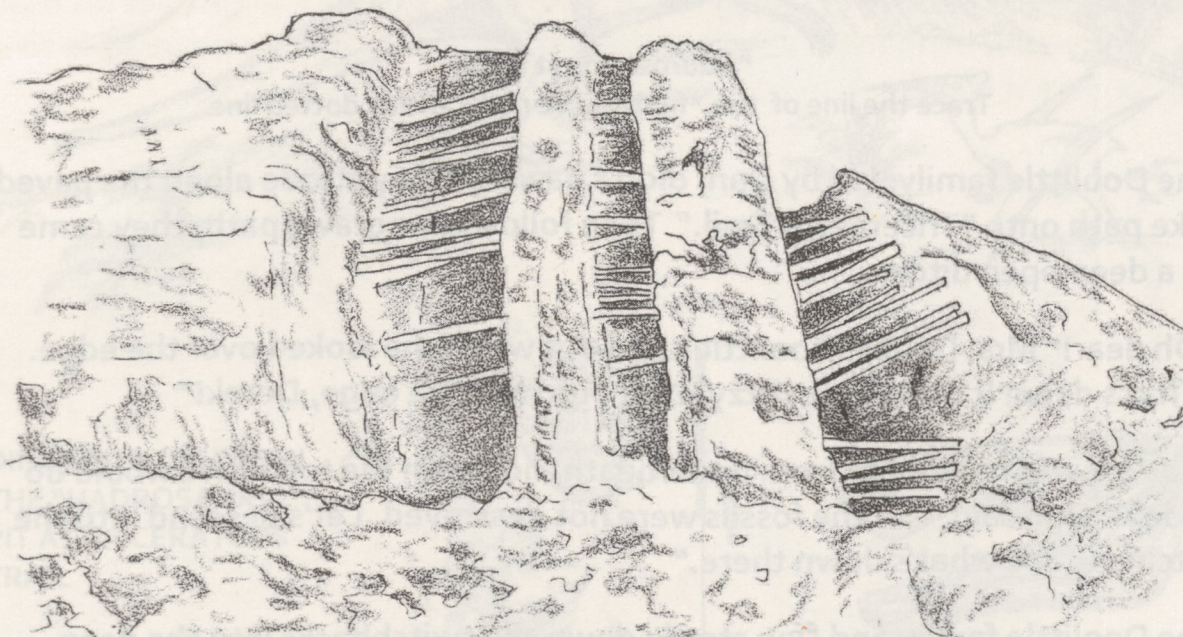
WHERE *TRICERATOPS* TROD

Dan drove the Doolittles to Golden. There the rocks stand on edge with wide gaps between the sandstone beds. "These layers are called the Laramie Formation," Dan said. "They were flat-lying when the sand and mud was deposited 68 million years ago. Then there were earthquakes. The rocks were tilted up almost vertical. You are looking like a worm would, from the underneath side of the rock."

"Why are there gaps between the rock layers?" Darin asked.

"There was clay between the sandstone layers. The *Parfet family mined it. The clay was made into bricks and tiles for Denver's houses, including the Governor's Mansion," replied Dan. "In the past ten years, part of the clay pits were reclaimed into the Fossil Trace Golf Course."

"Let's go see what fossils are in those layers!"

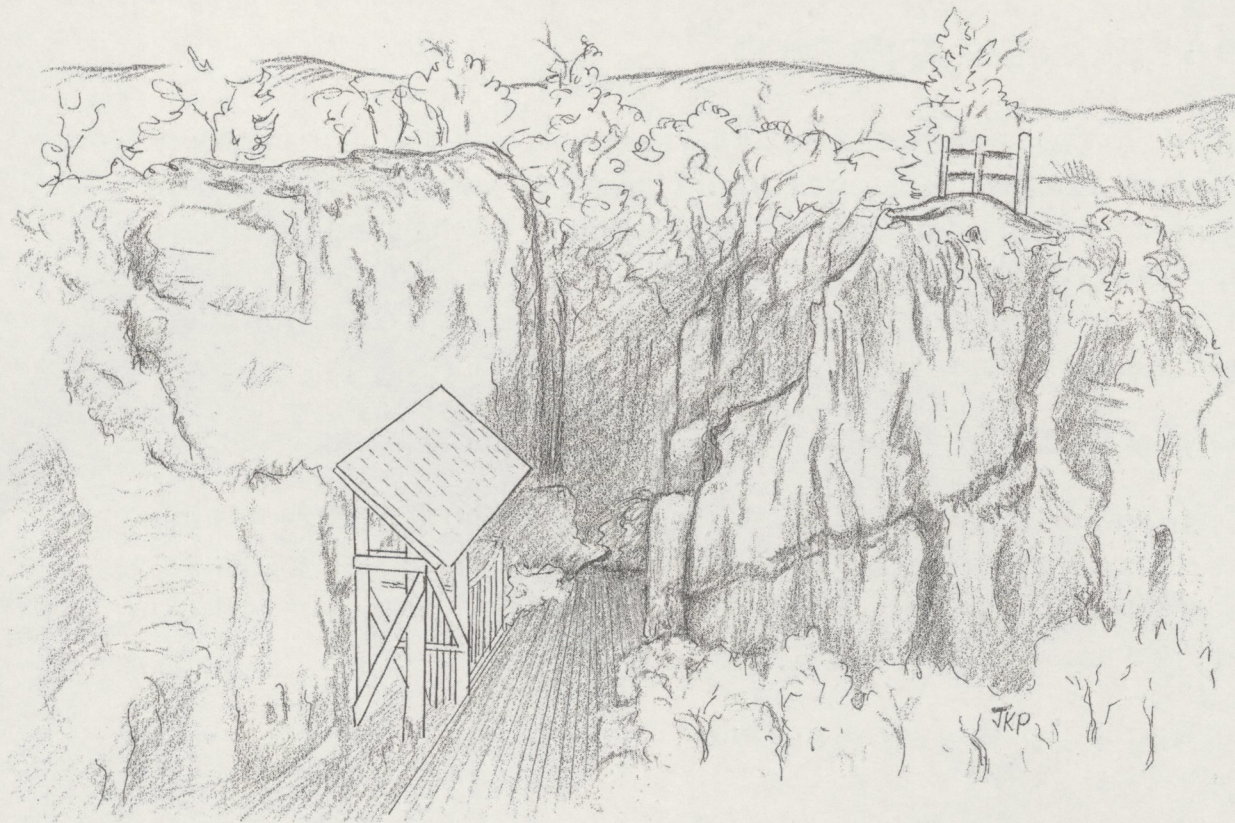


Golden's clay pits with the "Singing Logs" during mining

What are singing logs? Miners wedged freshly cut logs like props during mining. If the walls started to collapse, the pressure on the logs would cause them to hum or "sing." If the miners heard the humming, they would quickly leave the mine.

*Parfet Family
PAR (like on the golf course) - fet





"Hadrosaur" pit today

Trace the line of the *fault in the rocks with a dotted line

The Doolittle family, led by Dan, didn't dawdle. They strode along the paved bike path onto "Triceratops Trail." Then following a gravel path, they came to a deep open ditch.

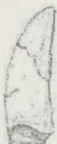
"Oh dear!" Mrs. Debbie Doolittle cried out when she looked over the edge. "That's deep! It makes me dizzy! Don't go near the edge, Derek!"

"The pit was mined out from underneath, not from the top as we would do today." Dan said. "So the fossils were not destroyed. Let's descend into the ditch and see what's down there."

The Doolittle family and Dan strode down the switchbacks into the deep ditch. There they saw HUGE footprints! They were bulges, like the Jurassic footprints at Dinosaur Ridge.

"They're almost as big as the *Apatosaurus* track!" Denise held out her arms. "I can hardly reach across them!"

*Fault = where blocks of rock have been dragged, disturbed, and displaced



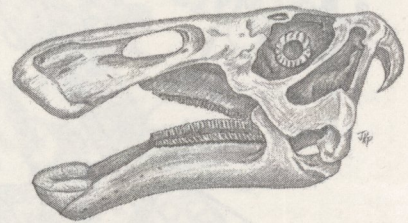
***Hadrosaur and *Pterosaurs in a Late Cretaceous Landscape**



DINOSAUR TRACKS IN THE "HADROSAUR" PIT AT TRICERATOPS TRAIL



2 meters



1 meter

Hadrosaur Skull

DMNH 1493

Circle the *Saurexalopus* track.
Color the Hadrosaur tracks light tan.

- *Hadrosaur = "Bulky Lizard"
HAD-row-sore
- *Pterosaurs = "Winged Lizard"
TEAR-oh-sore

Dan pointed to a number of the huge tracks. "Those are probably from duckbills like hadrosaurs," he said. "The smaller ones are possibly theropods. Those tracks are called **Saurexallopus.*"

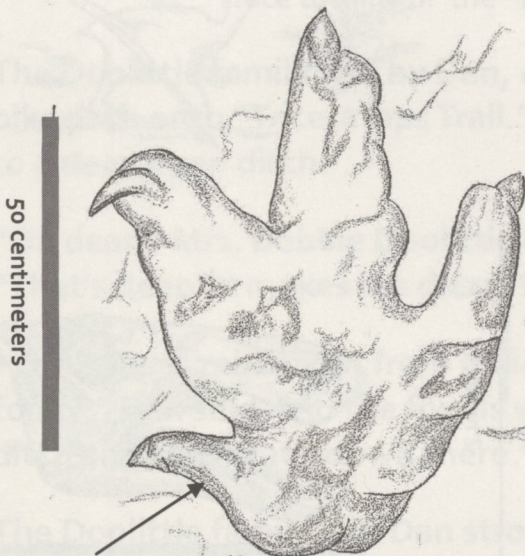
Darin walked a little ways off the deck. "There's another dinosaur dance floor!" Darin pointed to dozens of bulges, one on top of another, going all the way to the top of the sandstone wall.

"Yes," said Dan. "Many dinosaurs left their tracks in the mud here. And so did beetles!" He pointed to some tiny specks in the sandstone.

"A huge dinosaur track and a delicate beetle track preserved right next to each other!" Mrs. Debbie Doolittle marveled how that could be.

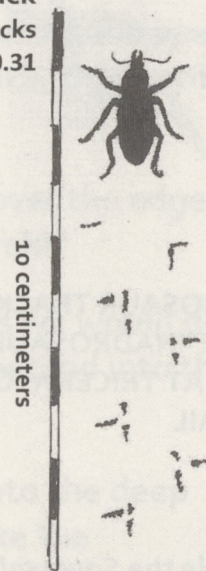
Darin asked, "Was there a T-rex track here?"

Dan replied, "Dr. Martin Lockley, the world's expert dinosaur track detective from University of Colorado at Denver, found some tracks in another pit that could have been made by a huge theropod like T-rex. But it's impossible to say for sure it was from *Tyrannosaurus.* And it's buried now."



*HALLUX track = big toe print (Digit I)
The dinosaur sank deeply into the mud to make this print.

Beetle Track
Found near the hadrosaur tracks
#UC-D 220.31

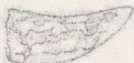


**Tyrannosauripus*
Track
Now buried under the
Fossil Trace Golf Course
#UC-D 225.1



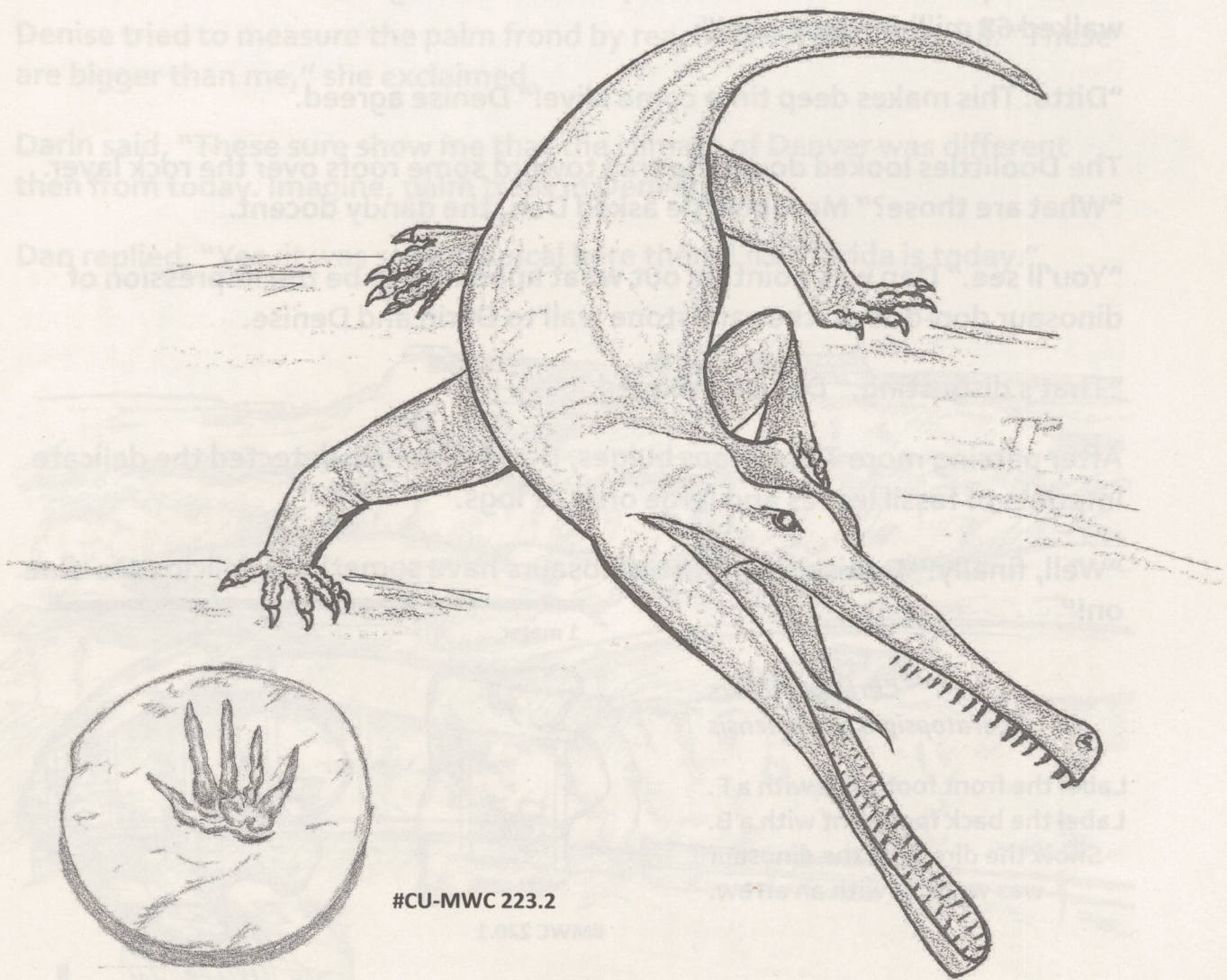
**Saurexallopus* = "Track of Different Foot"
Sore-ex-AL-oh-pus

**Tyrannosauripus* = Track of tyrannosaurid
Tie-RAN-oh-sore-E-pus



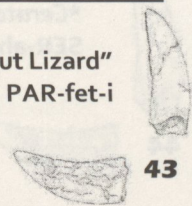
"Another type of track in the clay pit walls is from **Champsosaurichnus parfeti*, a crocodile-like relative of lizards!" Dan reminded the Doolittles, "Remember, where there are dinosaurs there will be crocodiles!"

The Doolittles climbed out of the pit. They followed Dan around a bend in the trail. From the high spot, Dan pointed to South Table Mountain. "See the G? That stands for Golden High School. Just near it was where P.T. Dotson found the first T-rex tooth," Dan told the duo.



Adapted from Rocky Mountain Dinosaur Resource Center

**Champsosaurichnus parfeti* = "Parfet's Track of Snout Lizard"
CHAMP-so-sore-ICK-nus PAR-fet-i



The Doolittle twins came to the edge of an upturned sandstone block with lots of bulges.

Dan told them, "These tracks are called **Ceratopsipes goldenensis*. They prove that a *Triceratops* probably stomped here once. Remember, tracks have different names than the dinosaurs because no one knows for sure which animal made the tracks."

"This is dynamite!" Darin declared, "to be standing where a 'Three-Horn' walked 68 million years ago!"

"Ditto. This makes deep time come alive!" Denise agreed.

The Doolittles looked down the trail toward some roofs over the rock layer. "What are those?" Mr. Doolittle asked Dan, the dandy docent.

"You'll see." Dan was pointing out what appeared to be the impression of dinosaur doo-doo on the sandstone wall to Darin and Denise.

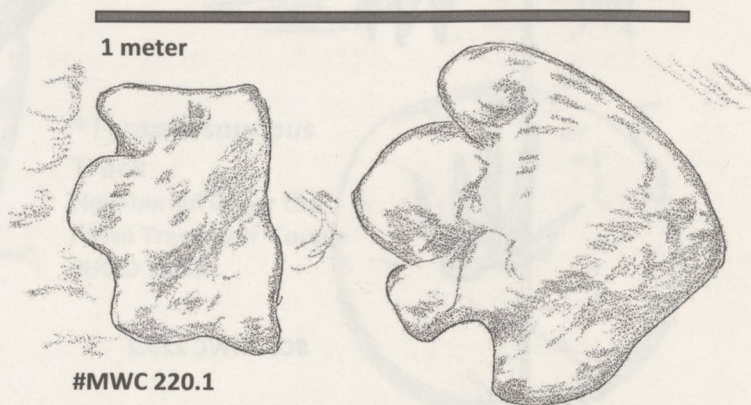
"That's disgusting," Denise declared.

After passing more *Triceratops* bulges, Darin Doolittle detected the delicate imprints of fossil leaves and large ones of logs.

"Well, finally!" Denise said. "The dinosaurs have something delicious to dine on!"

Ceratops tracks
Ceratopsipes goldenensis

Label the front foot print with a F.
Label the back foot print with a B.
Show the direction the dinosaur
was walking with an arrow.



**Ceratopsipes goldenensis* = "Golden's track of a Horned Dinosaur"
SER-ah-TOPS -eye-pes GOLD-en-en-sis

"See if you can find bird tracks on the sandstone walls," Dan dared the duo.

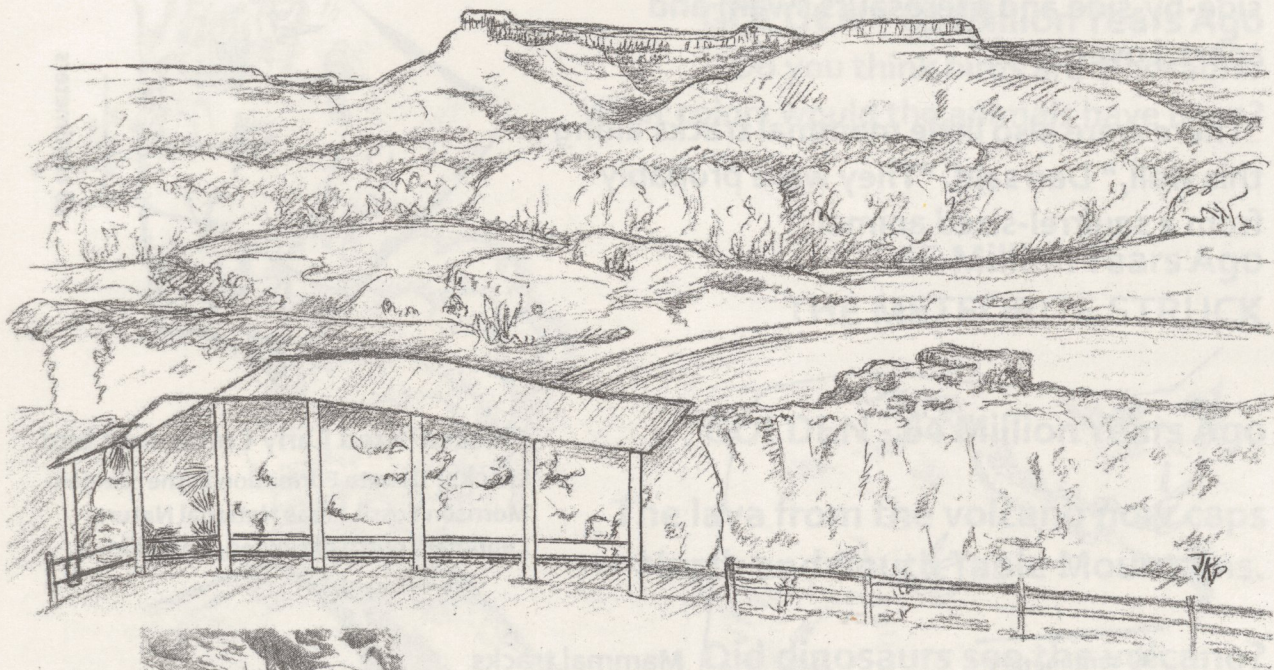
When Mr. Dennis Doolittle got to the end of the walkway, he cried out, "Look! Those are the most beautiful fossils I've ever seen!" The duo's dad had spotted magnificent impressions of huge palm fronds on the sandstone wall. The roof structure protects the delicate fossils from weather damage.

The group dashed down the path to see the fossil palm leaves laid out on the sandstone. Dan pointed out, "See, one was even trampled."

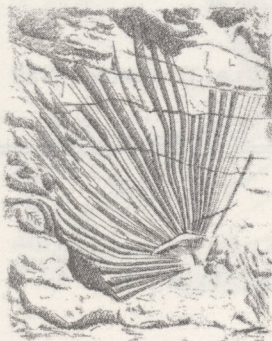
Denise tried to measure the palm frond by reaching across the fossil. "These are bigger than me," she exclaimed.

Darin said, "These sure show me that the climate of Denver was different then from today. Imagine, palm trees in Denver!"

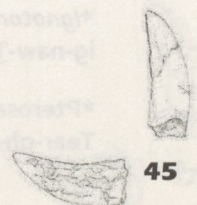
Dan replied, "Yes, it was semi-tropical here then. Like Florida is today."



1 meter



THE PALM FROND WALL AT TRICERATOPS TRAIL



DENIZENS OF THE DEEP-TIME SKY

Finally Darin found a bird track. It was about 3 inches (~7 centimeters) long. Darin asked, "What kind of birds made these tracks at Triceratops Trail?"

"Probably a shore bird, like a crane, made these bird tracks," Dan said. "There are two types of tracks from Golden. The first known Cretaceous bird tracks came from that clay pit in the early Cretaceous Dakota Formation." Dan pointed to a white stripe on a ridge in the distance. "Those tracks are like a duck's feet—webbed. Its name is **Ignotornis mcconnelli*. There are dinosaur bulges and crocodile tracks in that pit too!"

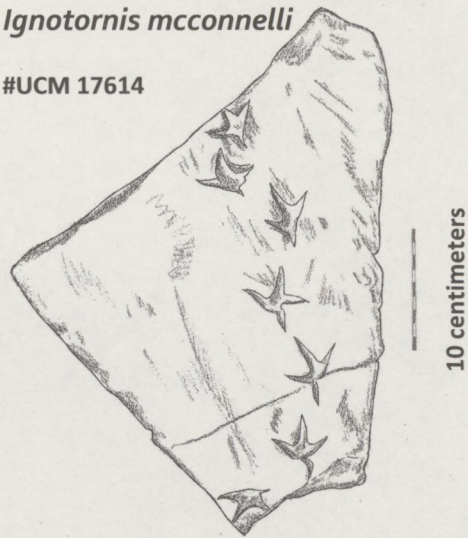
Denise asked Dan, "Were there any animals in the sky here? I saw a model of one over head in the Trek Through Time."

Dan said, "In 1870, O. C. Marsh found *pterosaurs— soaring reptiles— and toothed birds in Kansas. We know that toothed wading birds, dinosaurs, and crocodiles lived side-by-side and pterosaurs swam and soared overhead."

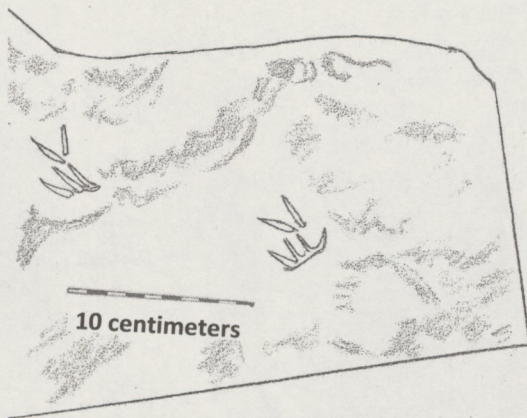
"There were also little mammal tracks along this wall," Dan said. "They were probably from a squirrel-sized animal."

Ignotornis mcconnelli

#UCM 17614



Chicken-sized Early Cretaceous bird tracks: Dakota Formation in the Golden-Morrison Fossil Areas National Natural Landmark north of Golden, Colorado



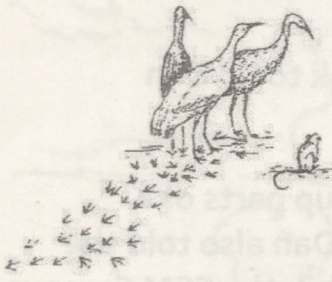
Mammal tracks

Found near the palm fronds at Triceratops Trail
#UC-D 220.33



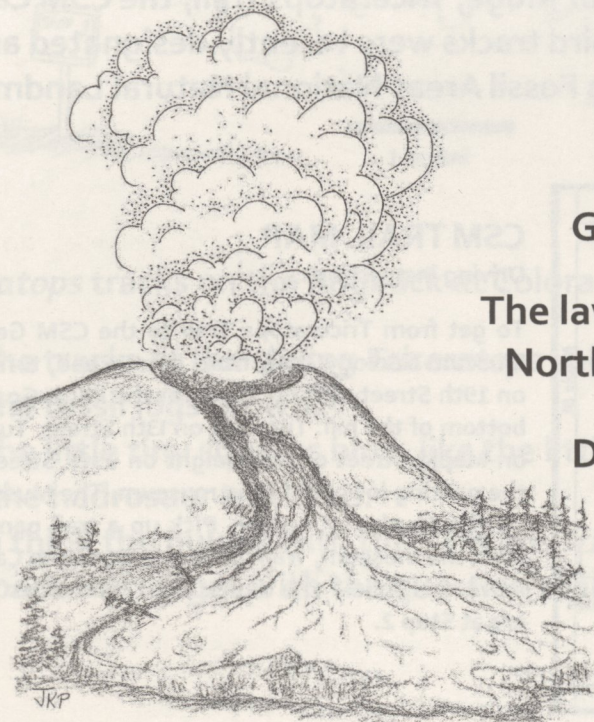
**Ignotornis mcconnelli* = "McConnell's Track of Small Shore Bird"
ig-naw-TORN-es mac-CON-el-lee

*Pterosaurs
Tear-oh-SORES



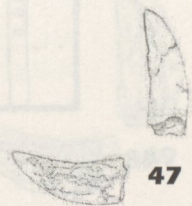
GOLDEN - 68 Million Years Ago
 Do you think birds are dinosaurs?
 What colors would the animals have been?

66 Million Years Ago
THE METEORITE STRUCK



GOLDEN - 64 Million Years Ago
 The lava from the volcano now caps
 North and South Table Mountains.

Did dinosaurs see the volcano?



TRICERATOPS TROMPED THROUGH TOWN

At the end of the trail, Dan asked, "Would you like to see more tracks?" It had been a long day. Dusk was coming on; it was starting to get dark.

Darin and Denise replied, "You bet!" This was the dynamic duo's "Discover Denver's Dinosaurs" dream come true!

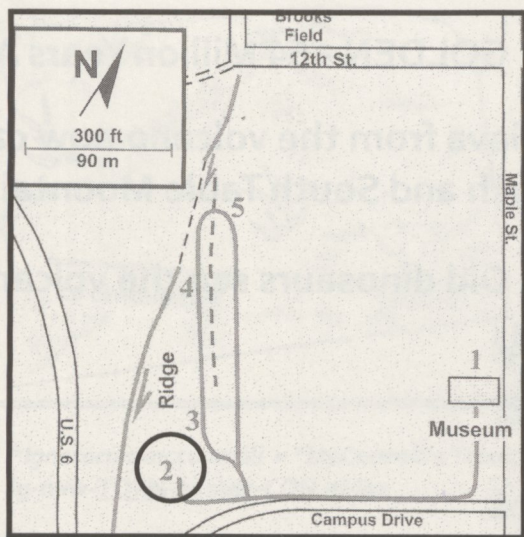
Dan drove the "Vanosaurus" across 19th Street to the trail head for the Colorado School of Mines (CSM) Geology trail. Dan and the Doolittle family hiked around the end of another sandstone layer that stood straight up.

Within minutes, Darin and Denise, the Dynamic Dinosaur Detectives, discovered many *Triceratops* tracks. One was much smaller than the rest.

Denise asked, "Was it a baby *Triceratops*?"

"Good decision, Denise. That's what some scientists think too," Dan answered.

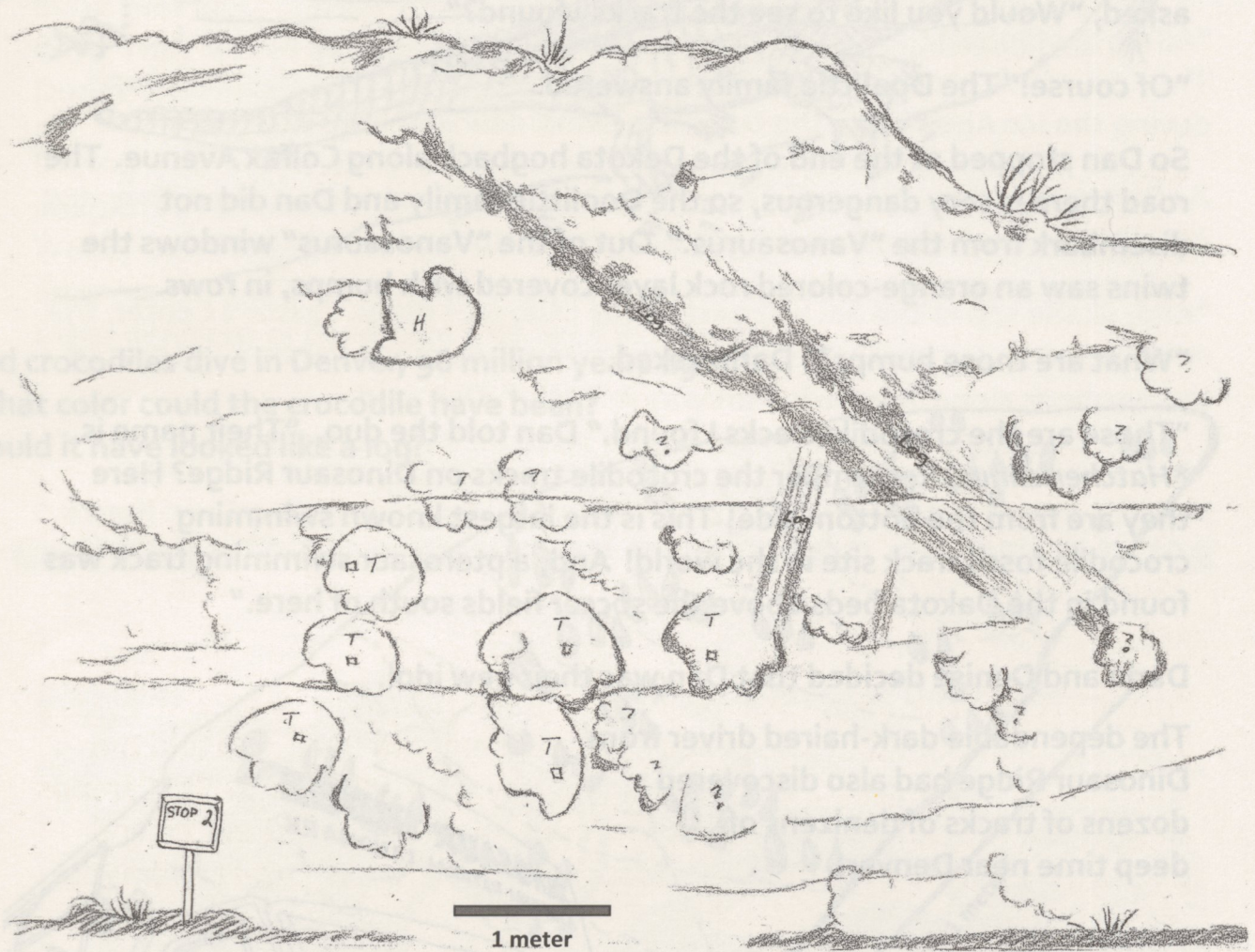
"In the 1970s," Dan said, "School of Mines students dug up parts of a *Triceratops* on the south side of North Table Mountain." Dan also told the Doolittles that along with Dinosaur Ridge, Triceratops Trail, the CSM Campus clay pit and the clay pit with the bird tracks were recently designated and dedicated as the Morrison-Golden Fossil Areas National Natural Landmark.



CSM TRAIL MAP

Driving instructions:

To get from Triceratops Trail to the CSM Geology Museum Geology Trail, from Jones Road, turn right on 19th Street, left on Illinois at the light. Go to the bottom of the hill. Turn left on 13th Street. Turn left on Maple Street or go straight on 13th Street into the parking lot behind the museum. The Museum is on the southwest corner. Pick up a trail pamphlet from the museum, walk up Maple Street to Campus Drive and follow the signs. The *Triceratops* tracks are at Stop 2.



Triceratops tracks on the hogback at Colorado School of Mines Geology Trail

Color the tracks of the sliding *Triceratops* yellow.

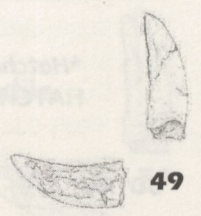
Color the fossil logs brown.

Color the little tiny squares blue, like the little signs at the track site.

Color the hadrosaur track red.

Do you think the bulges with the "T"s are *Triceratops* tracks?

How about the bulges with the question marks?



DAN'S CROCODILE SWIM TRACKS

All this time, Dan, the dandy dapper decent docent from Dinosaur Ridge, had kept a deep dark secret. On the way back toward Dinosaur Ridge, he asked, "Would you like to see the tracks I found?"

"Of course!" The Doolittle family answered.

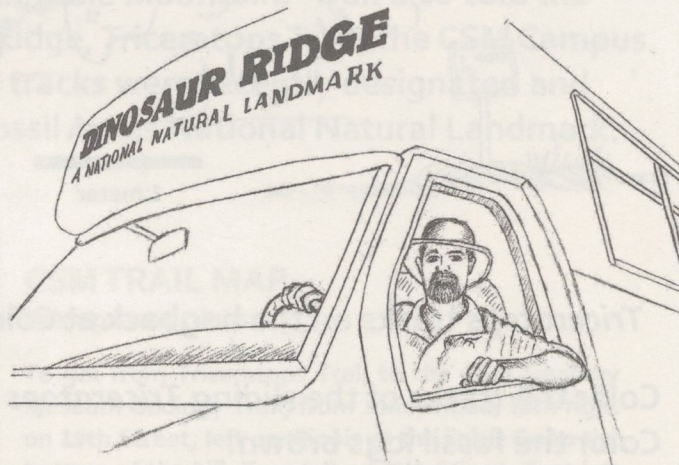
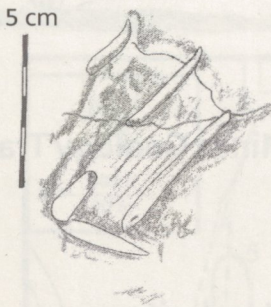
So Dan stopped at the end of the Dakota hogback along Colfax Avenue. The road there is very dangerous, so the Doolittle family and Dan did not disembark from the "Vanosaurus." Out of the "Vanosaurus" windows the twins saw an orange-colored rock layer covered with bumps, in rows.

"What are those bumps?" Darin asked.

"Those are the crocodile tracks I found." Dan told the duo. "Their name is **Hatcherichnus*. Remember the crocodile tracks on Dinosaur Ridge? Here they are from the bottom side! This is the largest known swimming crocodile fossil track site in the world! And, a pterosaur swimming track was found in the Dakota beds above the soccer fields south of here."

Darin and Denise decided that Dan was their new idol.

The dependable dark-haired driver from Dinosaur Ridge had also discovered dozens of tracks of denizens of deep time near Denver!



Pterosaur track from the Dakota sandstone above the soccer fields

#CU 209-160

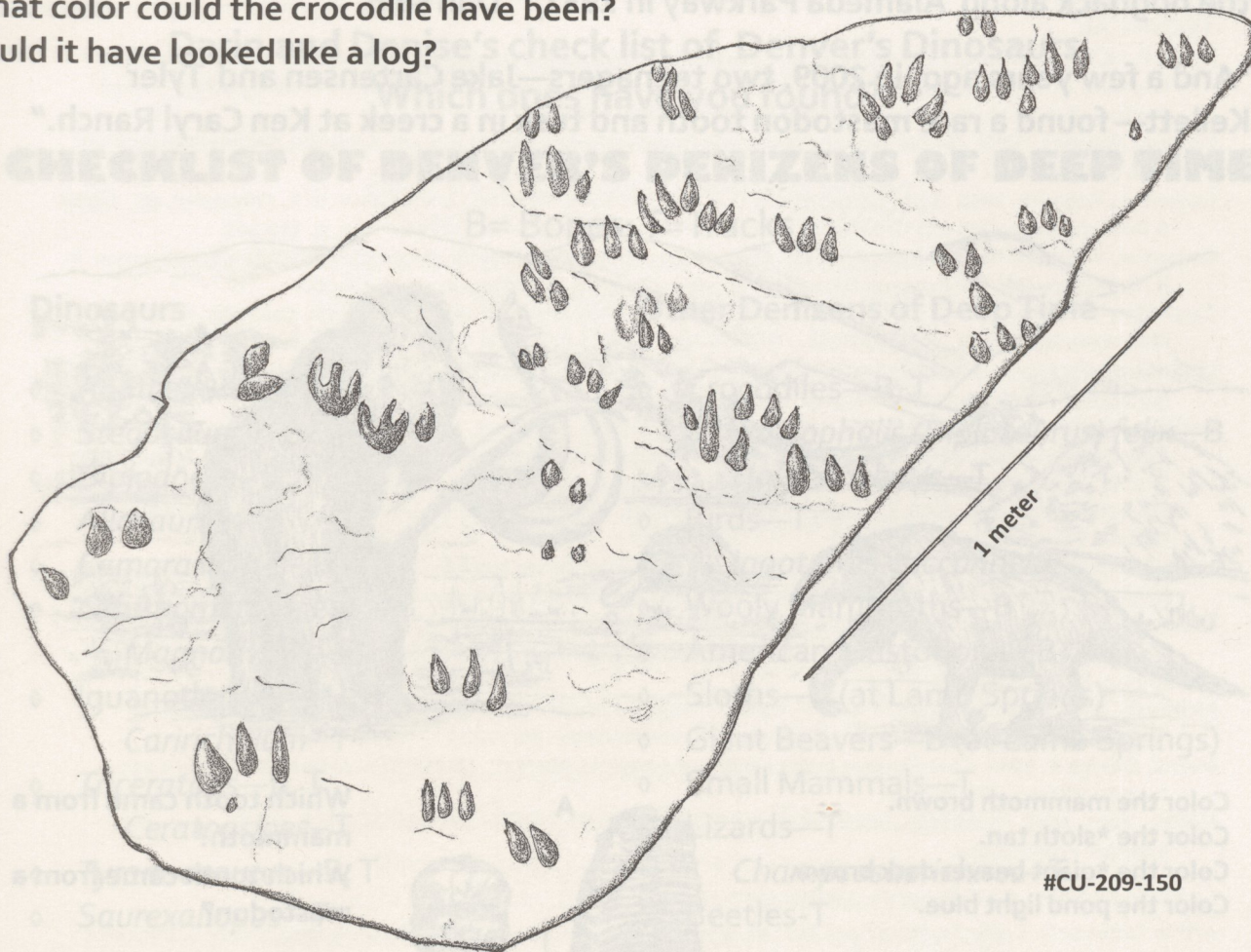


**Hatcherichnus* = "Hatcher's Fossil Track" (John Hatcher was an early dinosaur collector)
HATCH-er-ICK-nus





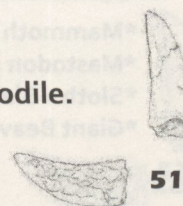
Did crocodiles dive in Denver, 96 million years ago?
 What color could the crocodile have been?
 Could it have looked like a log?



#CU-209-150

Dan the Docent's *Hatcherichnus* (swimming crocodile) tracks

Circle two sets of claw marks that could have been made by one crocodile.
 Judging by the claw marks, how big was Denver's crocodile?



DENIZENS OF DENVER'S ICE AGES - *MAMMOTHS AND *MASTODONS

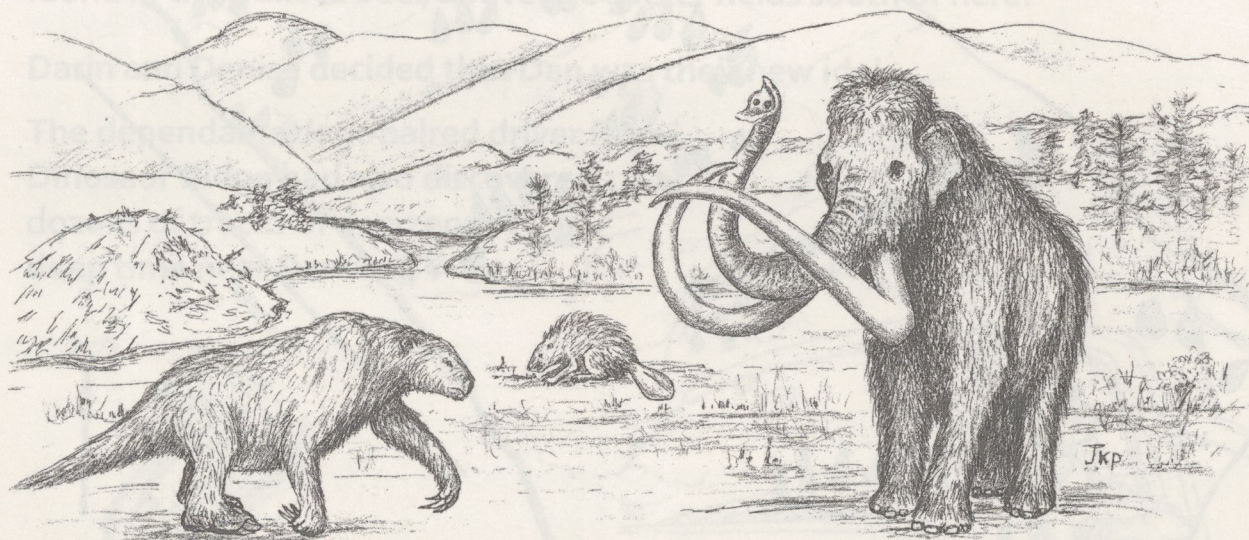
Driving back to Dinosaur Ridge at dusk, Dan told the Doolittle family about other denizens of deep time around Denver.

"All sorts of fossils have been found in the gravel that covers the land surface. They are much younger than the dinosaurs. They were mammals that lived during the Ice Age," Dan, the Doolittle twins' new idol, said.

As Dan drove over I-70 on C-470, he pointed to the highway. "When they dug out this road, workers found parts of a woolly mammoth right here."

"And, at the top of the hill just east of the Dinosaur Ridge Visitor's Center, the road crew dug out two mammoth tusks when they made the first cut east of the hogback along Alameda Parkway in 1937," Dan said.

"And a few years ago, in 2009, two teenagers—Jake Cartensen and Tyler Kellett—found a rare mastodon tooth and tusk in a creek at Ken Caryl Ranch."

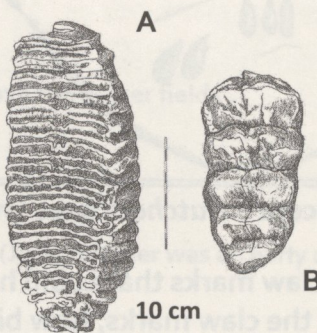


Color the mammoth brown.
Color the *sloth tan.
Color the *giant beaver dark brown.
Color the pond light blue.



- *Mammoth = MAM-moth
- *Mastodon = MAST-oh-don
- *Sloth = Slawth
- *Giant Beaver = GYE-ant BEE-ver

52



Which tooth came from a mammoth?
Which tooth came from a mastodon?

ANSWERS on inside back cover

#DMNH 22070, 22969

Dan turned into Dinosaur Ridge Visitor's Center. The day of discovering Denver's dinosaurs was done. The Doolittle family bid adieu to Dan, the duos' new idol. "Thank you so much for the tour. We'll come back another day!" They waved goodbye, buckled into the back seat of the Doolittle's Dodge Durango, and disappeared around the bend.

During their day of discovering Denver's dinosaurs at Dinosaur Ridge, the delightful, redheaded Doolittle twins realized that some day, like India Wood, Dan Fanelli, Peter T. Dotson, Otis Rooney, George Cannon, Jake Carstensen, and Tyler Kellett, they, too, might discover more dinosaurs and other denizens of deep time that lived in Denver!

Darin and Denise's check list of Denver's Dinosaurs.
Which ones have you found?

CHECKLIST OF DENVER'S DENIZENS OF DEEP TIME

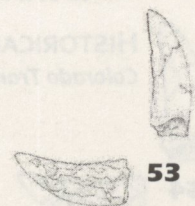
B= Bones: T=Tracks

Dinosaurs

- ◇ *Apatosaurus*—B, T
- ◇ *Stegosaurus*—B, T
- ◇ *Diplodocus*—B, T
- ◇ *Allosaurus*—B
- ◇ *Camarasaurus*—B
- ◇ *Ornithomimus velox*—B
- Magnoavipes*—T
- ◇ Iguanodons—T
- Caririchnium*—T
- ◇ *Triceratops*—B, T
- Ceratopsipes*—T
- ◇ *Tyrannosaurus*—B, T
- ◇ *Saurexalopus*—T

Other Denizens of Deep Time

- ◇ Crocodiles—B, T
- Goniopholis (Diplosaurus) felix*—B
- Hatcherichnus*—T
- ◇ Birds—T
- Ignotornis mcconnelli*
- ◇ Woolly Mammoths—B
- ◇ American Mastodons—B
- ◇ Sloths—B (at Lamb Springs)
- ◇ Giant Beavers—B (at Lamb Springs)
- ◇ Small Mammals—T
- ◇ Lizards—T
- Champsosaurichnus*—T
- ◇ Beetles—T



DELVE DEEPER!
DISCOVER MORE ABOUT DENVER'S DENIZENS OF DEEP TIME!

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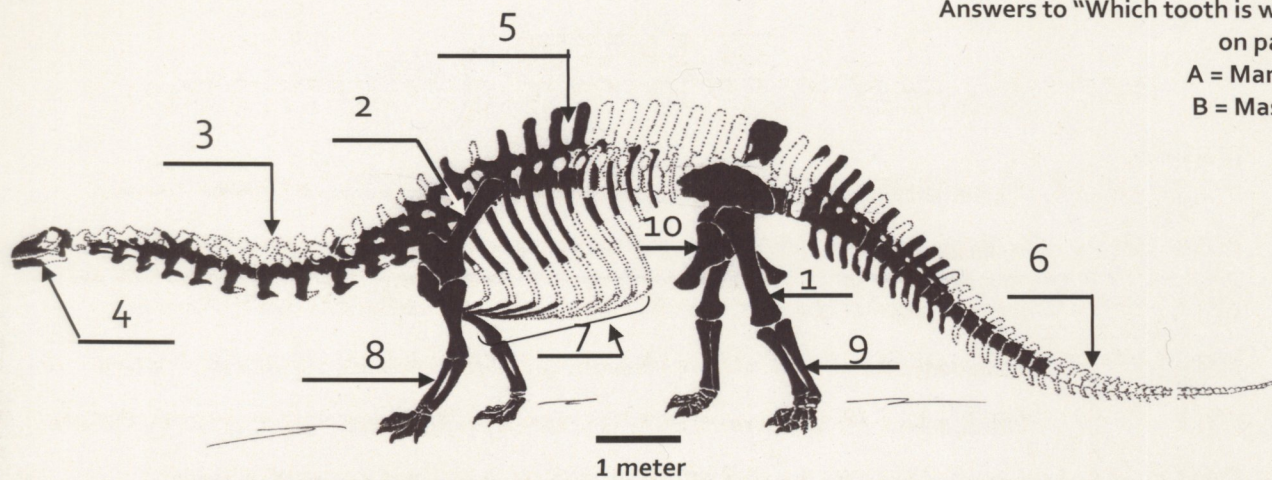
Arthur Lakes to O. C. Marsh, from April 1877 to 1895; E.L. Berthoud to O. C. Marsh, 1874-1877; Henry C. Beckwith to O.C. Marsh, 1875-1878; Benjamin F. Mudge to O. C. Marsh, 1877-1878.

HISTORICAL NEWSPAPERS

Colorado Transcript, Golden, CO: July 8, 1874, p. 3.



Answers to "Which tooth is which?"
on page 52.
A = Mammoth
B = Mastodon



Answers to "Label the bones of *Apatosaurus*" on page 12 .

Discover Denver's Dinosaur Sites

Dinosaur Ridge, Morrison
Triceratops Trail, Golden
Fossil Trace Golf Course clubhouse, Golden
CSM Geology Trail and Museum, Golden
Denver Museum of Nature & Science, Denver
CU-Boulder Natural History Museum (CU), Boulder
Morrison Natural History Museum, Morrison
Annual Greater Denver Gem and Mineral Show, Merchandise Mart, September

Discover Colorado's Other Dinosaur Sites

Dinosaur Depot, Canon City
Museum of Western Colorado, Grand Junction
Mygatt-Moore Quarry
Dinosaur Hill Interpretive Trail (Riggs Hill)
Dinosaur Journey
Rabbit Valley Natural Research Area, Grand Junction
Rocky Mountain Dinosaur Resource Center, Woodland Park
Purgatory River Trackway, Comanche National Grasslands, LaJunta
Dinosaur National Monument, Dinosaur

Discover Dinosaurs Across State Lines

Dinosaur National Monument, Vernal, UT
Prehistoric Museum, College of Eastern Utah, Price, UT
New Mexico Museum of Natural History, Albuquerque, NM
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