

Dinosaurs of the District of Columbia

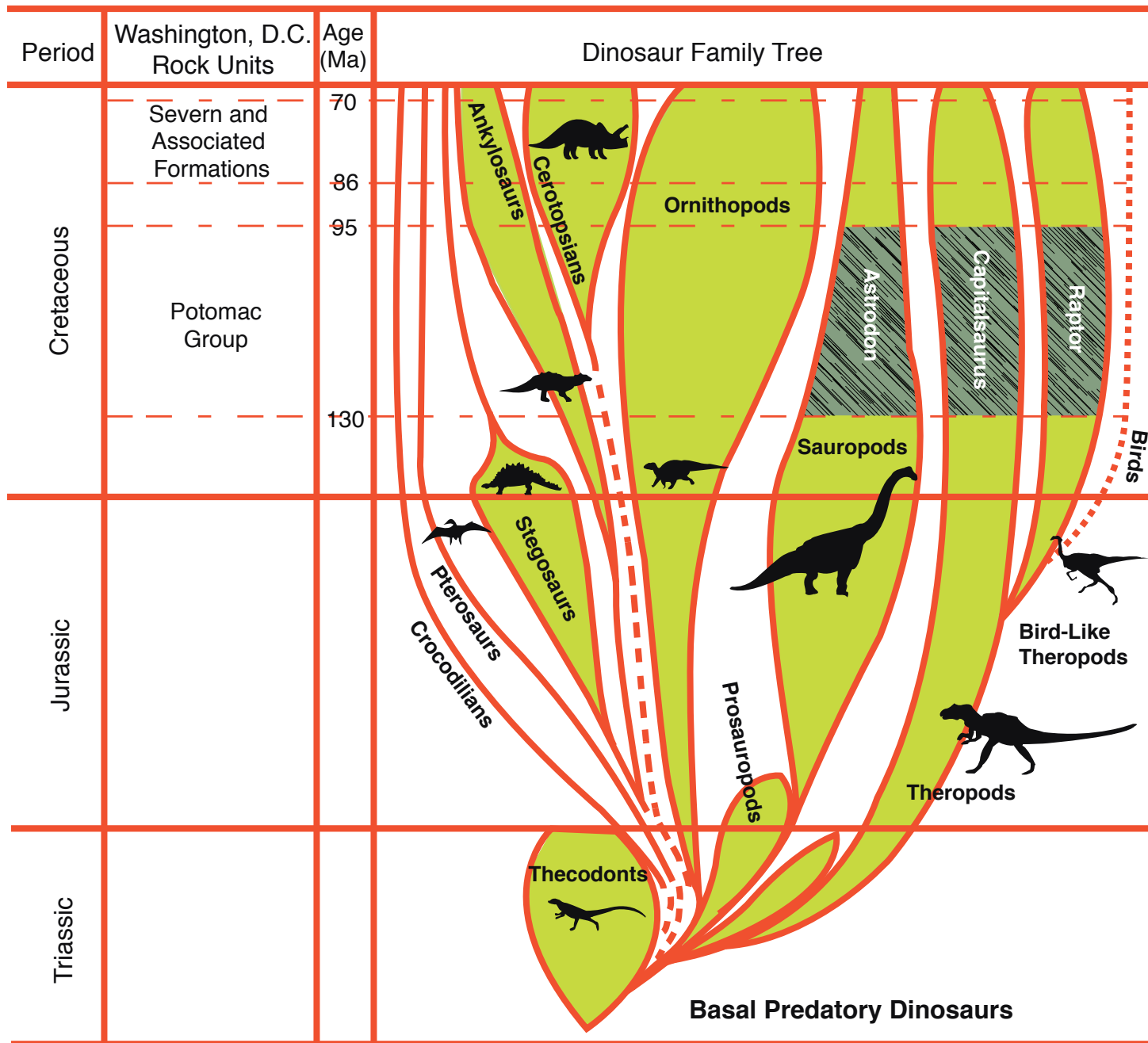
by
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Washington, D.C.

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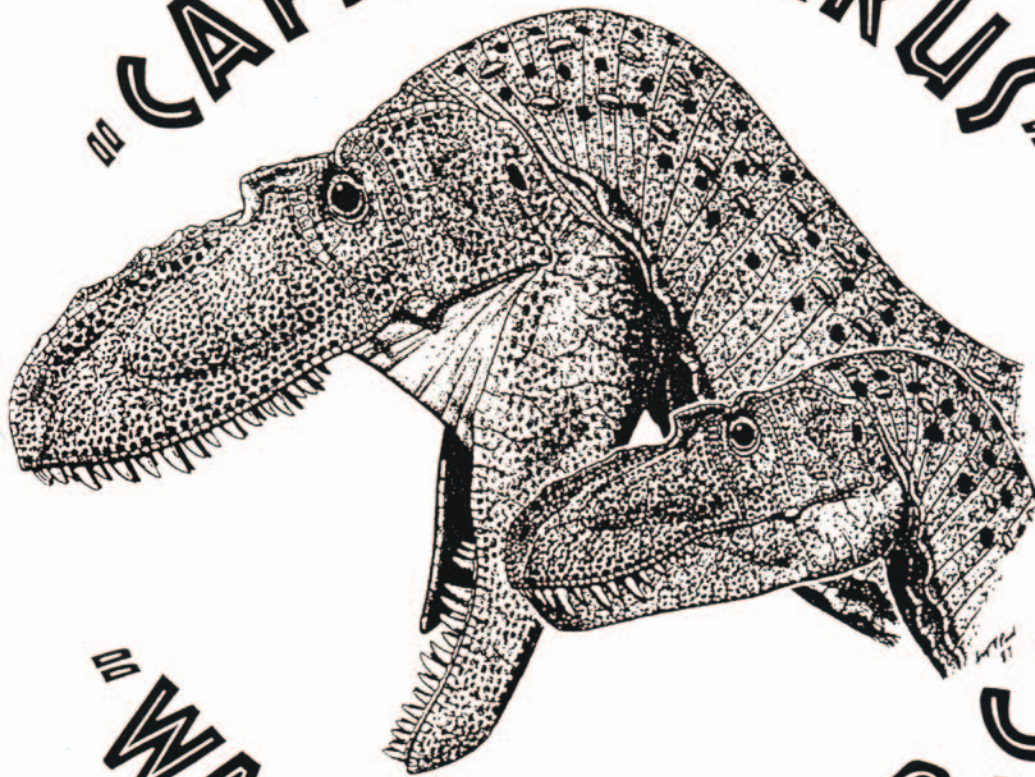
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Fossil bones indicate presence of members of this group in Washington D.C.

Dedicated to
Beryl Kranz,
my patron and mother
and
to the Capital Children's Museum
and all the other
children's museums
that help keep dinosaurs alive.

"CAPITALSAURUS"



"WASHINGTON, B.C."

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How Did The Dinosaurs Get Under Washington, D.C.?

When the subject of dinosaurs in Washington comes up (not a frequent occurrence), most people take the cheap shot, “Oh, you mean those guys up on Capitol Hill.” Or the less witty think you are referring to the mounted skeletons at the Smithsonian. The fact is that for more than 100 years real



dinosaur fossils have been and are still being discovered within D.C.’s 69 square miles.

People sometimes ask, “How did the dinosaurs get under Washington, D.C.?” The question indicates a confusion of time relationships. The city has existed for slightly more than 200 years while the dinosaurs found here are over 100,000,000 years old. The city was simply built above the dinosaur fossils before anyone had any idea that there were such things as dinosaurs. This is not to suggest that had they known that there were dinosaurs here the city might have been placed elsewhere. Contrary to popular supposition, there are no laws in the United States protecting dinosaur fossils in general. The only protected dinosaur fossils are those that are protected by virtue of regulations regarding the land they occupy, such as

national parks or Bureau of Land Management (BLM) properties. Dinosaur fossils occur in cities as well as areas uninhabited by humans.

The earth has had an extremely long history. The planet has but one surface; therefore all events that have occurred in our history or prehistory, including the lives of dinosaurs, must necessarily have occurred on this surface. In a popular sense, where dinosaur fossils are found is largely

random. That is, we place our edifices without regard to the location of dinosaur fossils. As a consequence, chance has placed dinosaur fossils within the geographic boundaries of the District of Columbia. Dinosaur fossils cannot be found in all parts of the District of Columbia; rather they are confined essentially to that portion of the District found east of Rock Creek Park (fig.1). The reasons for this fact are tied to the regional geology of the eastern United States. There are two major provinces in our area, the Atlantic Coastal Plain, a large flat region bounded by the Atlantic Ocean to the east (the coast) and the Piedmont to the west; the other major region is the Piedmont (the foothills of the Appalachian Mountains), which lies between the Atlantic Coastal Plain and the Appalachian Mountains. The boundaries between the regions have a generally northeastern/southwestern orientation.

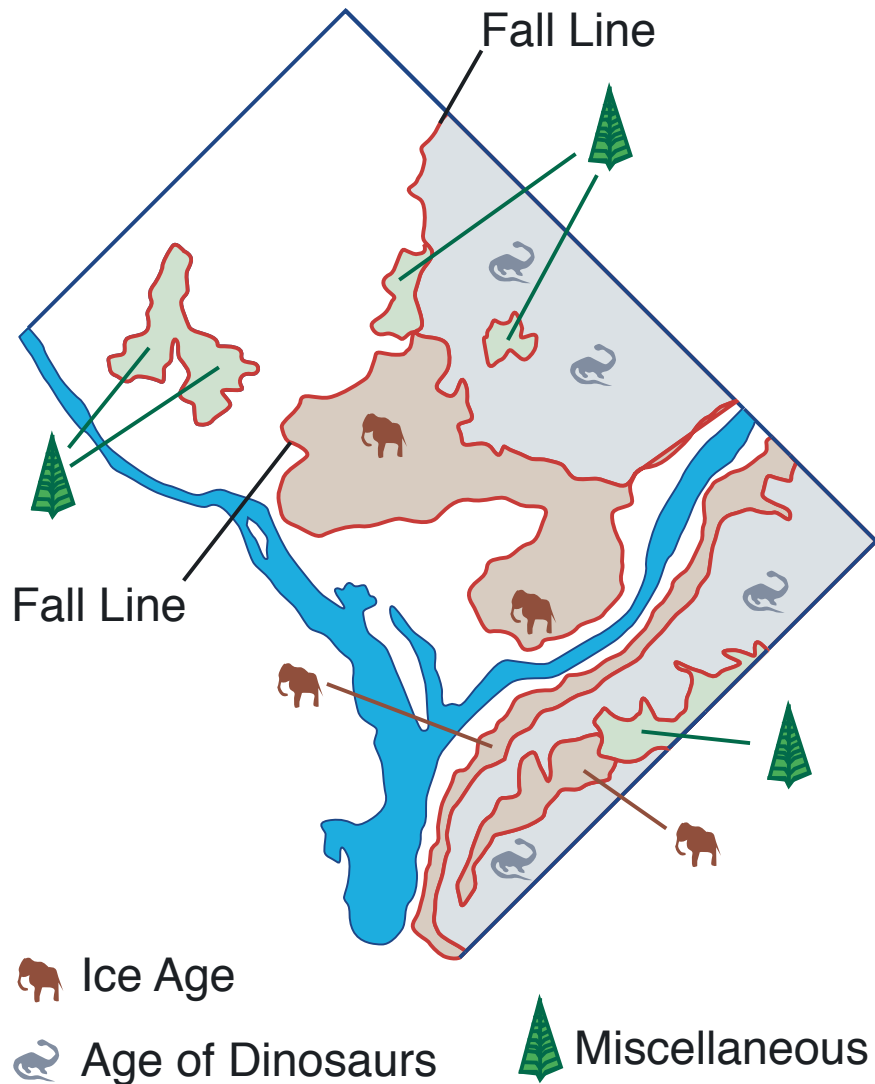


Figure 1. General geological map. Fossils you might find in the District of Columbia.

The Piedmont is made up of crystalline rock some of which may be more than one billion years old; it is far too old to contain dinosaur fossils. The Piedmont rocks occupy the western portion of the District of Columbia at the surface and then dive under the Atlantic Coastal Plain sediments, which cover them in the eastern part of the District.

The Atlantic Coastal Plain province consists largely of sands and clays with an occasional sedimentary rock unit. At its western edge near Rock Creek Park the sediments are up to about 100,000,000 years old, while in the extreme south-eastern parts of the District they are still accumulating today. It is these Coastal Plain sediments that contain Washington, D.C.'s, dinosaur fossils.

In order to find dinosaur fossils three factors are essential. The sediments or rocks containing the fossils must be at or near the surface. They must be of the correct age, between 235 and 65 million years old. They must be of the correct type of rock (sedimentary) laid down by water, either rivers, streams, and lakes or marine deposits near the ancient coastline.

Some of the deposits in the eastern part of the District of Columbia are covered by sediments too young to contain dinosaur fossils, while erosion has removed dinosaur-aged deposits from the western portions of the city. As a consequence considerably less than half the land area of the District of Columbia is a likely site for dinosaur discoveries (fig.1).

Dinosaurs of the District

All dinosaurs discovered in the District of Columbia to date are approximately 100 million years old. It is possible to find dinosaur fossils from about 70 million years ago but none have been reported. These dinosaurs will be discussed later in the text.

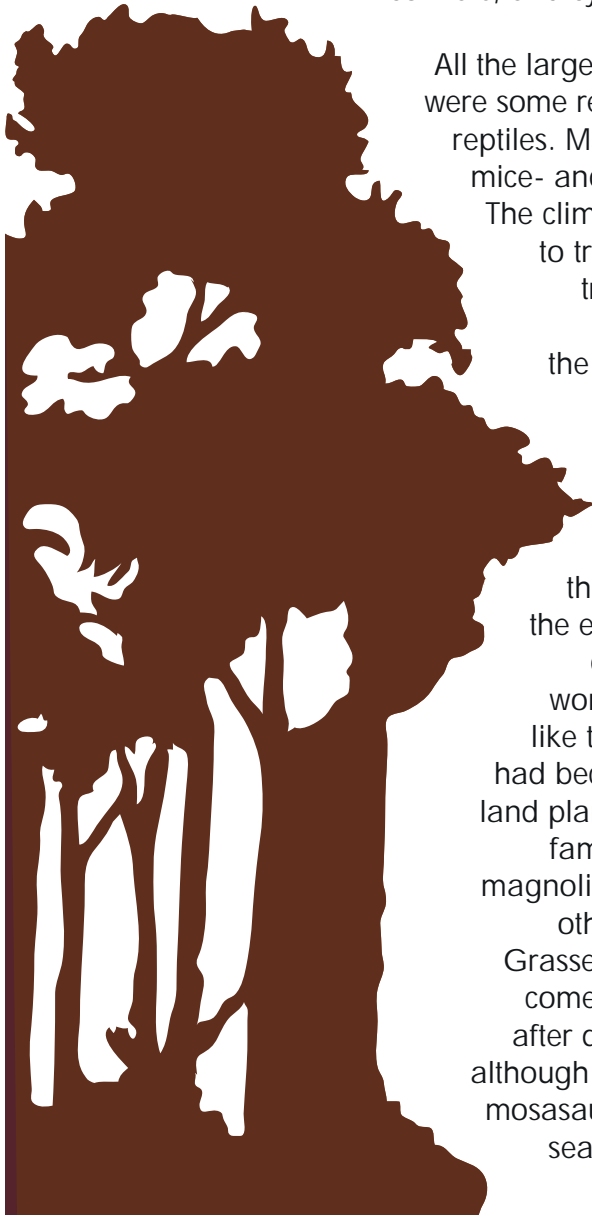
Within 25 miles of downtown Washington, D.C., the potential exists to find dinosaurs of all types and from essentially all dinosaur times. This fact may seem unbelievable to most people because popular notions suggest that dinosaurs are found only in distant and exotic locales. However, the three conditions of rock type, age, and surface exposure mentioned earlier are all met by the National Capitol Region. Within the boundaries of the District of Columbia only sediments of the last dinosaur period, the Cretaceous, are present. These sediments represent the time from the mid-Cretaceous to its end, approximately 100,000,000 to 65,000,000 years ago. The sediments are divided into two large bundles. One, called the Potomac Group, is about 100,000,000 years old. The other, called the Severn Formation, is about 70,000,000 years old. The Potomac Group beds are sands, clays, and gravels laid down on the ancient Atlantic Coastal Plain under environmental conditions similar to the Bayou Country of Southern Louisiana. The Severn Formation formed under conditions similar to the Northern Gulf of Mexico today.

What Kind of World Did the Dinosaurs Inhabit?

D.C.'s earliest dinosaurs lived in a world very different from today's, a world on the brink of change. The key change about to take place was the rise of the angiosperms, flowering plants. Today angiosperms make up 90% of our plant species and cover most of Earth's environments. For more than 200,000,000 years before Washington's dinosaurs lived, no plants with true flowers were found on Earth.



Some scientists have even speculated that the rise of flowering plants may have been caused in part by dinosaur activities. The plants that dominated the land in the time of Washington's earliest dinosaurs were ferns, mosses, lycopods, sphenopsids, conifers, and cycads.



All the large animals (and there were some really big ones) were reptiles. Mammals were small mice- and rat-like creatures.

The climate was subtropical to tropical. Cypress-like trees more than 100 feet tall dominated the forests. Crocodiles, turtles and even sharks filled the lakes and rivers.

By the time of the Severn Formation, the end of Washington's dinosaur times, the world was much more like today. Angiosperms had become the dominant land plants, including many familiar tree types like magnolias, sycamores, and other hardwood trees. Grasses, however, did not come into existence until after dinosaur times. And although marine reptiles like mosasaurs still swam in the seas and flying reptiles, pterosaurs, still

soared overhead, birds were becoming more common. Whales and dolphins did not develop until millions of years after dinosaurs became extinct.

The Discovery of DC's Dinosaurs

Sometime in the cold January of 1898, D.C.'s first dinosaur fossil was unearthed after lying buried for more than 100,000,000 years. It came about in this way. The city was growing and utilities needed to be expanded. Workmen were digging a trench more than forty feet below the surface to lay a sewer pipe. At the corner of First and F streets, S.E., they encountered a layer of clay with some hard ironstone lumps. On removing the ironstone they noticed a tailbone from a large dinosaur and some other bone fragments. These were delivered to the Smithsonian on January 28, 1898, by J. K. Murphy, the project manager. The previously unknown and unnamed dinosaur was duly cataloged as USNM#3049 (fig. 2).



Figure 2. Two views of tailbone fragment. Courtesy of The Smithsonian Institution.



It rested in the collections until January 1908 when it was sent along with other dinosaur bones to Professor Richard Swann Lull at Yale University, who had been engaged by the Maryland Geological Survey to write a manuscript on the dinosaur bones of this region. The results were published in 1911 in the Lower Cretaceous volume of the Maryland Geological Survey. In that volume Lull named the dinosaurian owner of the bone *Creosaurus potens*, which means powerful flesh (-eating) reptile. He gave the measurements of the bone as 6 inches long and 4 inches wide, from which it was possible to estimate the dinosaur's size at over 30 feet and its weight at more than 2 1/2 tons.



Figure 3. "Capitalsaurus Washington, B.C."

Ten years later Professor Gilmore of the Smithsonian renamed the bone's owner *Dryptosaurus?* meaning wounding reptile. He chose to make this change for two reasons. *Creosaurus* had been invalidated as a name and the only fairly complete large meat-eating dinosaur specimen known from the eastern United States was *Dryptosaurus*, found in New Jersey in 1866. Gilmore used the question mark in order to call attention to the weakness and uncertainty of the identification. Like all paleontologists, Gilmore probably hoped further discoveries of more complete specimens would resolve the issue.

While I may well not have been the first, by the late 1980s I began to question the similarity of the Washington, D.C., bone to those of *Dryptosaurus*. On examining the *Dryptosaurus* specimen in Philadelphia, I became convinced that Washington's creature was not *Dryptosaurus*. Therefore, in the April 1990 issue of *Washington Magazine* I suggested it be given the new name *Capitalsaurus*, the dinosaur of the nation's capital (fig. 3).



Figure 4. Detail of street sign "Capitalsaurus Court" corner of First and F streets.

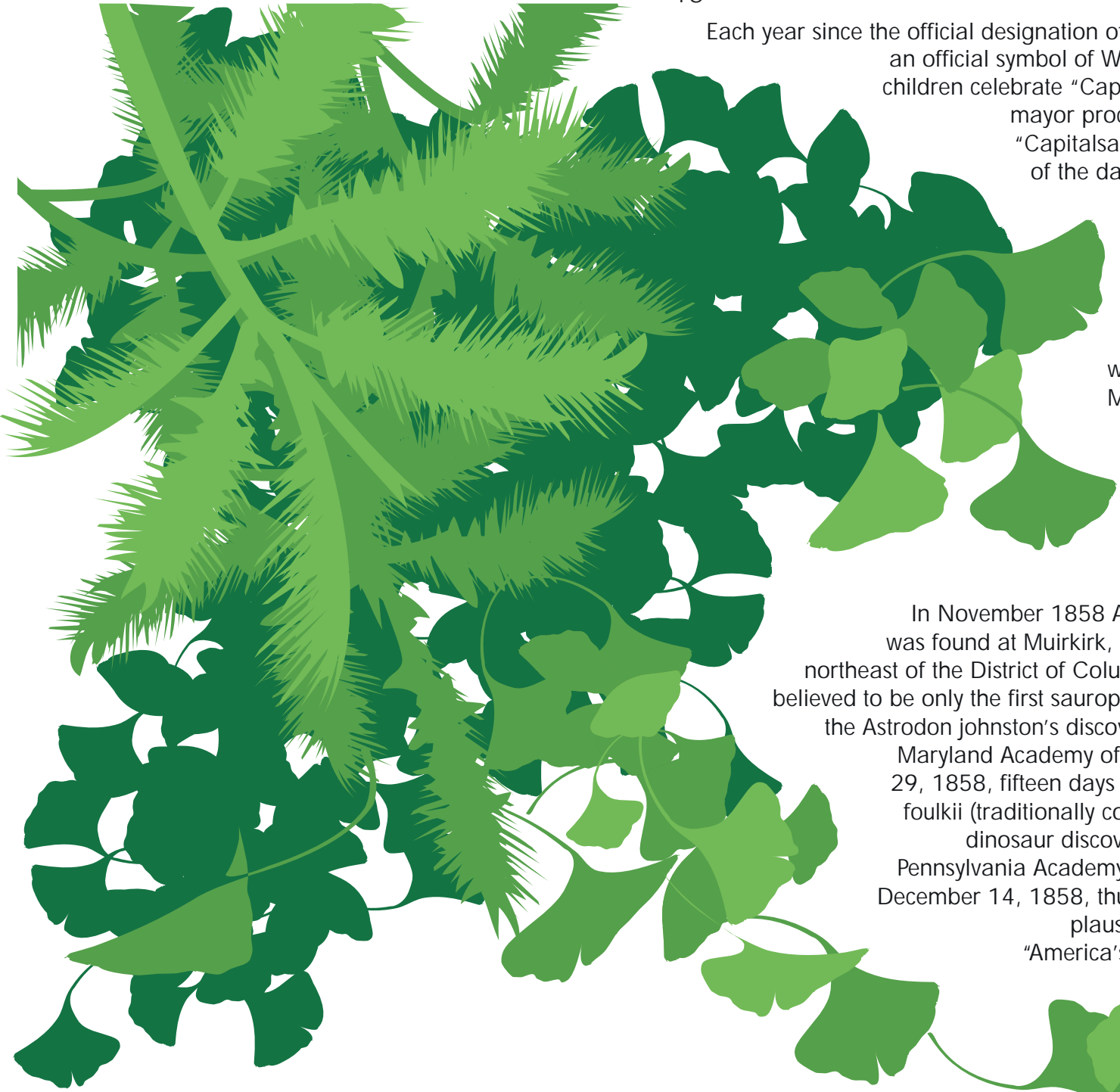


Figure 5. Corner of First and F Streets, "Capitalsaurus Court."

A paleontologist with more anatomical training than I (my background is primarily in geology) wrote a journal article in 1998 showing that the bone was indeed different from all known dinosaurs. In that same volume I once again said it should be called Capitalsaurus.

That same year the students of Watkins and Smothers elementary school in Washington, D.C., had a bill placed

before the City Council and in due course the "Capitalsaurus Act of 1998" became law, making the Capitalsaurus the first official symbol of the District of Columbia adopted under home rule. The following year the discovery site, F Street Southeast between First and Second streets, was renamed "Capitalsaurus Court" (fig. 4 and 5). "Capitalsaurus Court" as a location even appears on some of the city's public safety exams.



Each year since the official designation of the Capitalsaurus as an official symbol of Washington, D.C., school children celebrate “Capitalsaurus Day” and the mayor proclaims January 28 to be “Capitalsaurus Day” in recognition of the date in 1898 when D.C.’s first dinosaur bone was given to the Smithsonian. In 2002 a bone fragment, possibly from the same type of dinosaur, was presented to the City Museum of the District of Columbia.

D.C.’s Giant Sauropod

In November 1858 America’s first sauropod was found at Muirkirk, Maryland, several miles northeast of the District of Columbia (fig. 9). Originally believed to be only the first sauropod from North America, the *Astrodon johnstoni* discovery was reported to the Maryland Academy of Sciences on November 29, 1858, fifteen days before the *Hadrosaurus foulkii* (traditionally considered America’s first dinosaur discovery) was reported to the Pennsylvania Academy of Natural Sciences on December 14, 1858, thus giving the *Astrodon* a plausible claim on the title of “America’s First Dinosaur” (fig. 6).

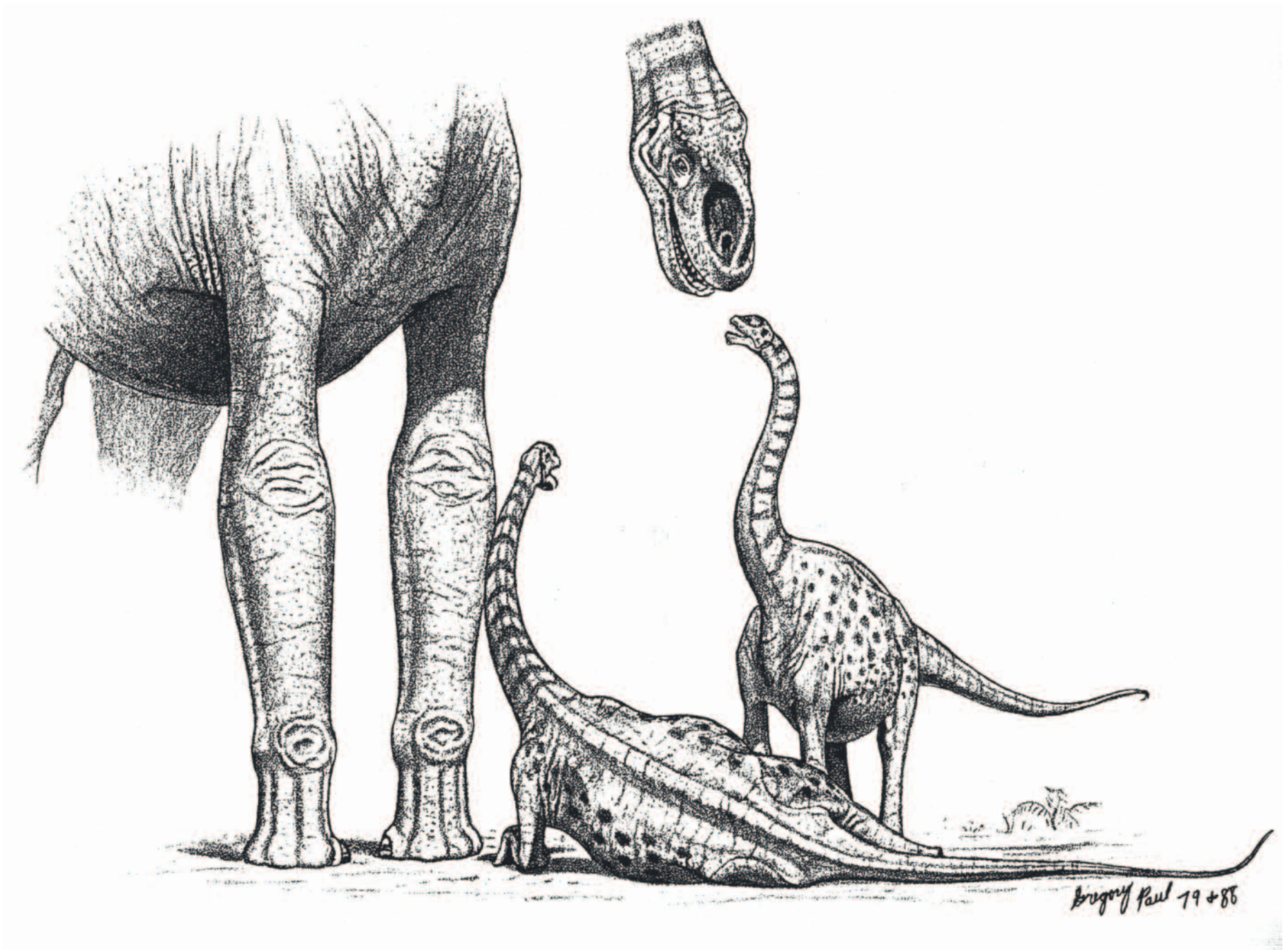


Figure 6. *Astrodon*, "America's First Dinosaur."



Figure 8. Example of a Sauropod (thigh bone). Courtesy of The Smithsonian Institution.

Figure 7. Lower half of a femur 11 inches tall. Found 20 feet below surface level at the west side of First Street NW south of Channing Street.



Figure 9. Largest known dinosaur bone from eastern U.S. Astrodon femur being cast in plaster for removal from Muirkirk clay pit by Dan Chaney (left) and Peter Kroehler (right) of the National Museum of Natural History in May, 1991.



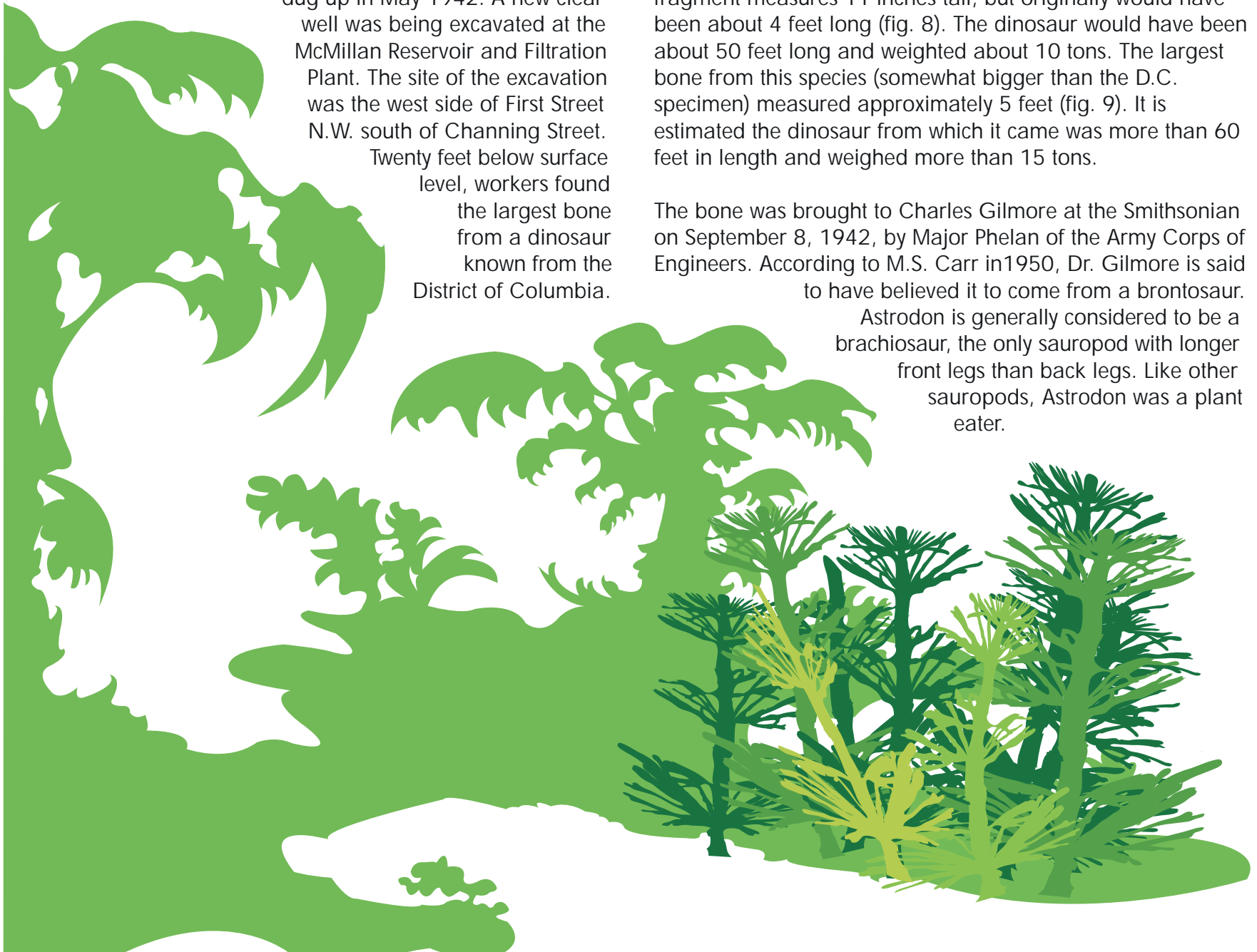
The specimen of this animal found inside the city limits was dug up in May 1942. A new clear well was being excavated at the McMillan Reservoir and Filtration Plant. The site of the excavation was the west side of First Street N.W. south of Channing Street.

Twenty feet below surface level, workers found the largest bone from a dinosaur known from the District of Columbia.

It was the lower half of a femur (thigh bone; fig. 7). The bone fragment measures 11 inches tall, but originally would have been about 4 feet long (fig. 8). The dinosaur would have been about 50 feet long and weighted about 10 tons. The largest bone from this species (somewhat bigger than the D.C. specimen) measured approximately 5 feet (fig. 9). It is estimated the dinosaur from which it came was more than 60 feet in length and weighed more than 15 tons.

The bone was brought to Charles Gilmore at the Smithsonian on September 8, 1942, by Major Phelan of the Army Corps of Engineers. According to M.S. Carr in 1950, Dr. Gilmore is said to have believed it to come from a brontosaurus.

Astrodon is generally considered to be a brachiosaur, the only sauropod with longer front legs than back legs. Like other sauropods, Astrodon was a plant eater.



The World's Largest Raptor

While constructing a sewer line between Texas and Burns Avenues 70 feet beneath East Capitol Street, the diggers found a tailbone from a dinosaur. It was 3 inches long and 2 inches wide. Shown to Dr. David Dunkle of the Smithsonian by Howard D. Thornett of the D.C. Department of Public Works, it was pronounced a dinosaur bone from a coelurosaur. The bone was photographed being held by a pretty secretary with long red-polished fingernails. The picture appeared in the Washington Post on May 2, 1959, along with a story (fig. 10).



Figure 10. A tailbone being held by a secretary. Washington Post, May 2, 1959.

The story suggested it would be given to the Smithsonian. It never was. The bone remained as a paperweight and curiosity on the desk of Mr. Thornett until 1966 when his office was moved. After that time its whereabouts became uncertain.

In 1999 I encountered the story in the course of library research and tracked Mr. Thornett to North Carolina. An old man believed dead by most of his former colleagues, he was unable to recall what had become of the bone. Most likely someone else from the office still has it.

The picture was shown to several specialists on meat-eating dinosaurs. They said it came from a raptor-type dinosaur, a term not widely used in 1959. One estimate of the size of the raptor places it at more than 20 feet, which would make it the largest raptor yet recorded in the world (fig. 11). Perhaps someone may yet find the bone. For now all that remains is the photograph.

Dinosaurs of the Potomac Group from Nearby Maryland

Most of the local dinosaur finds in the National Capital Region come from Maryland. In fact, all the finds in the District of Columbia come from the portion of the city that originally belonged to Maryland. Possessed of a much greater area, Maryland has produced far more specimens and species than Washington, D.C. In addition to those already described from Washington, D.C., virtually every other group of dinosaur is represented in Maryland.

The Capitalsaurus, a large meat-eating dinosaur, may be present in the form of dozens of large teeth and occasional bones. Some paleontologists believe there may be several different large meat eaters present. Most paleontologists think, however, that teeth, the most abundant evidence, are not

a reliable way of distinguishing species of large meat eaters. Like Dr. Gilmore, we must wait for better evidence.

Astrodon, the fossil sauropod found at the McMillan Reservoir, became Maryland's official state dinosaur in 1998, the same year Capitalsaurus became D.C.'s official dinosaur. As in Washington, schoolchildren had a bill placed before the Maryland legislature. It passed both houses by a ten-to-one margin. The bill was introduced once before in 1992 but was defeated at that time by two votes on the last day of the session.

Astrodon is the most completely known dinosaur from this region. The most bones of any type of dinosaur come from Astrodon. In addition, unlike the scarce and fragmentary character of the other dinosaurs of the National Capital Region, virtually all the types of bones of the Astrodon's body have been found.

Raptor dinosaurs are also well represented in Maryland. Beside sauropod and large carnivorous dinosaur teeth, the most common dinosaur tooth type found here are small curved teeth believed to belong to raptor dinosaurs. Most of these known raptor teeth are not of a gigantic size as to indicate that they may belong

to D.C.'s possible giant raptor. However, their great numbers indicate the obvious presence of raptors in the region (fig. 12).

Very few bones that have been found locally can definitely be assigned to raptor dinosaurs. There is, however, a partial skeleton discovered by me in 1991 and collected by over half a dozen fossil hunters during the past decade that may be raptor-like in nature. Dr. David Weishampel of Johns Hopkins University has suggested that this skeleton belongs to an ornithomimid, an ostrich-like dinosaur. Dr. Gilmore has also identified bones that he believes belong to an ornithomimid. Perhaps future discoveries will clarify the situation.

Another type of dinosaur represented almost exclusively by teeth is Priconodon, an armored dinosaur. Priconodon is believed to be a nodosaur or possibly a stegosaur,



Figure 11. The largest raptor-type dinosaur recorded in the world.

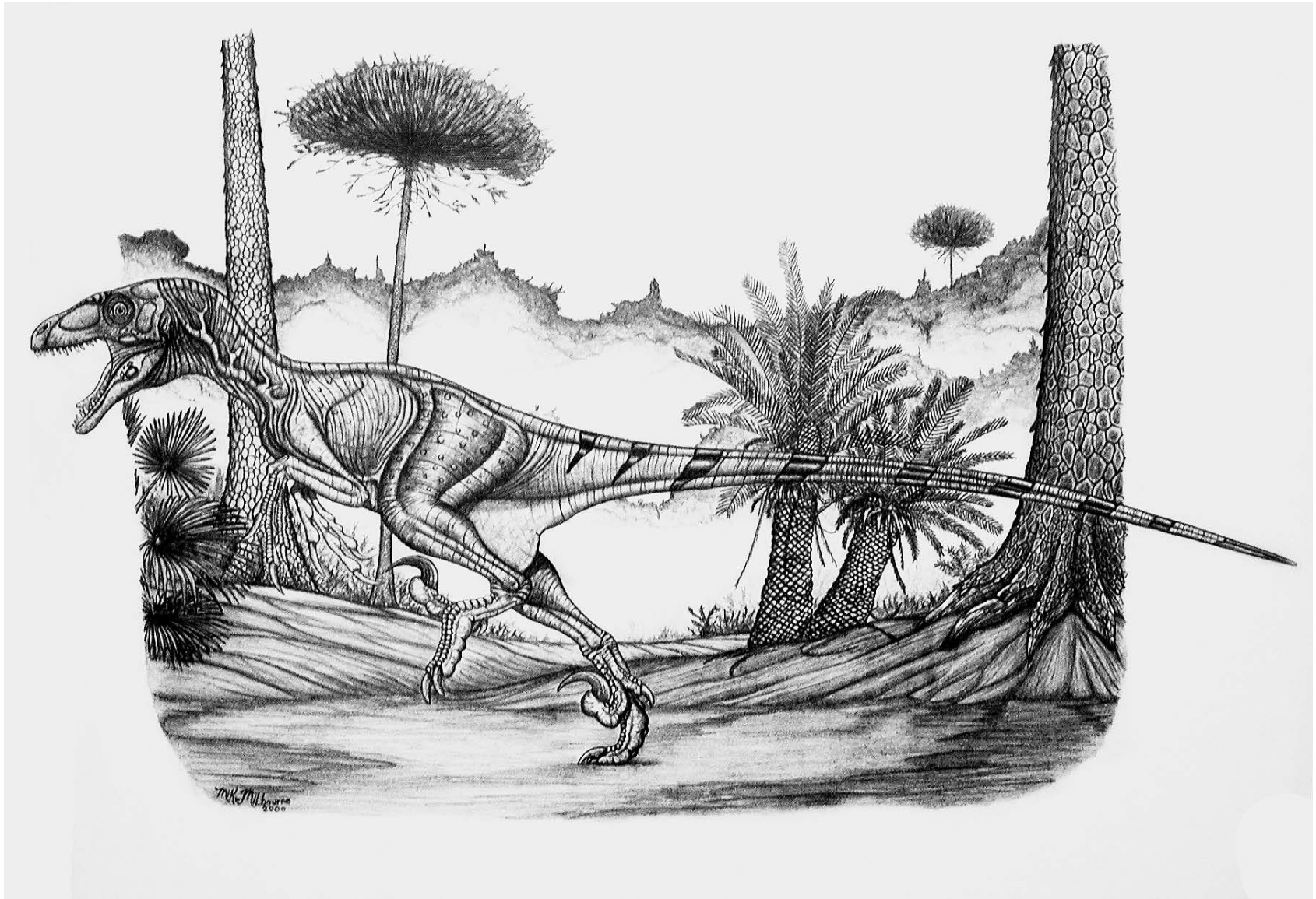


Figure 12. Washington, D.C.'s Giant Raptor.



but a very odd one to be sure. All the local paleontologists are puzzled by the fact that although an abundance of teeth are known from this dinosaur, not a single piece of armor has been found to date. Thus some of us have dubbed it the “naked nodosaur.”

The most recent and astonishing dinosaur discovery is a probable horned dinosaur, *Magulodon*. It is currently known from two teeth. I found the first in 1990 and Tom Lipka found the second in the mid 1990s. Almost all dinosaurs have but a single tooth type in their mouths. Thus a tooth is frequently a distinct indicator of the type of dinosaur. In this instance, what is so amazing is that prior to these discoveries it was believed by all paleontologists that horned dinosaurs were confined to Asia and western North America because they could not cross the large sea separating the two halves of North America. *Magulodon* is not only a horned dinosaur but also one of the earliest. This find suggests a much wider distribution or even possibly an origin of horned dinosaurs in eastern North America.

One other dinosaur is represented from the Potomac Group by a partial tooth. It is an *Iguanodon* type or early duckbill - type dinosaur. This scarcity is surprising because *Iguanodon* is the most common dinosaur in Early Cretaceous beds elsewhere.

All of these dinosaurs and many others yet to be discovered undoubtedly lived in the District of Columbia.

Dinosaurs of the Severn Formation

The Severn Formation outcrops in Southeast and the extreme eastern portion of Northeast D.C. Two dinosaur types are known from Maryland's Severn Formation deposits, though none have yet been found within the District's boundaries. The reason for the infrequent discovery of dinosaur remains in the Severn deposits is that unlike the terrestrial Potomac Group beds these deposits were formed in the coastal Atlantic Ocean waters. Dinosaurs lived on land; therefore, only dead

dinosaurs washed down rivers and streams are found in near-shore marine deposits. Despite this fact, virtually all the famous East Coast and Gulf Coast dinosaur discoveries of the Cretaceous period outside Maryland and the District of Columbia come from the near-shore marine deposits.

A duckbill dinosaur, possibly *Hadrosaurus foulkii* mentioned earlier, is known from the Severn Formation of Maryland as is an ornithomimid, *Ornithomimus antiquus*. These fragmentary remains are found within a few miles of the District's eastern border. Therefore, they undoubtedly lived in the District area as well. Many more species must have also lived here in Late Cretaceous times, but they are still to be discovered.

The Severn Formation contains primarily marine life, including a vast array of shells from clams, oysters, snails, and other shellfish, particularly many varieties of now-extinct ammonites (a relative of the pearly nautilus). In addition, it also produces many vertebrate fossils like shark teeth, crocodiles, and turtles. The most complete skeleton from dinosaur times from the National Capital Region is that of a mosasaur found in 1989 in the Severn Formation of Oxon Hill, Maryland. Mosasaurs, plesiosaurs, and other marine reptiles common in the Severn Formation are often mistaken for dinosaurs but are in fact only distant relatives. Flying reptiles that are much closer relatives of the dinosaurs were probably also present.

In Conclusion: The Future of the Dinosaurs of the District of Columbia

One may be certain that new dinosaur discoveries in D.C. are inevitable. As economics drive both the construction of new and larger buildings and the underground support systems, there will always be excavations going on in the city. In addition, aging buildings and underground systems will require replacement. These events will lead to future encounters with dinosaur fossils.

The best means to insure that these new discoveries find their way to public museums and display is through a "Fossil Alert Law." The city ought to provide an official notice to any person or agency applying to excavate within its limits, stating that important fossils may be encountered during excavation and that no regulations or laws will prevent or slow work progress if fossils are discovered and reported to the appropriate authority or agency. This totally voluntary approach will insure that the new dinosaur discoveries in the District of Columbia will come to light in the foreseeable future.



The Fossil Collectors' Code of Ethics

- I will collect with the landowner's
written or oral permission.
- I will not trespass and I understand
that I am personally liable
if trespassing.
- I will respect the landowners'
rights and wishes.
- I will collect and only take what is
reasonable for my use.
- I will follow any rules or regulations
for collecting on public lands.
- I will observe safety precautions
and use common sense.
- I will report the finds of scientific
value to the property owners
or a museum.

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CREDITS

Cover art by Zyamina Gorelik - dinosaur based on - drawing by Mike Milborne. Design, layout and illustrations on page 1, 3, 4, 7, 9, 10, 14, and 15 by Zyamina Gorelik, with consulting designer Veronica Szalus, 2003.

Map for cover, title page and figure 1 redrawn from Ivar Cooper's original by Heidi Eitel, 2003.

Photograph for inside cover and figures 2, 4, 5, 7 and 8 photographed by Veronica Szalus, 2003.

Drawing for table of content, figures 3 and 6 original graphite on paper by Gregory Paul, 1987, 1988.

Figure 9 from The National Museum of Natural History May, 1991, staff photographer.

Figure 10 Washington Post May 2, 1959, Wally McNamee, staff photographer.

Figure 11 redrawn from Mike Milborne's original by Zyamina Gorelik, 2003, with of sculpted vertebra by Mike Milborne based on existing photographs.

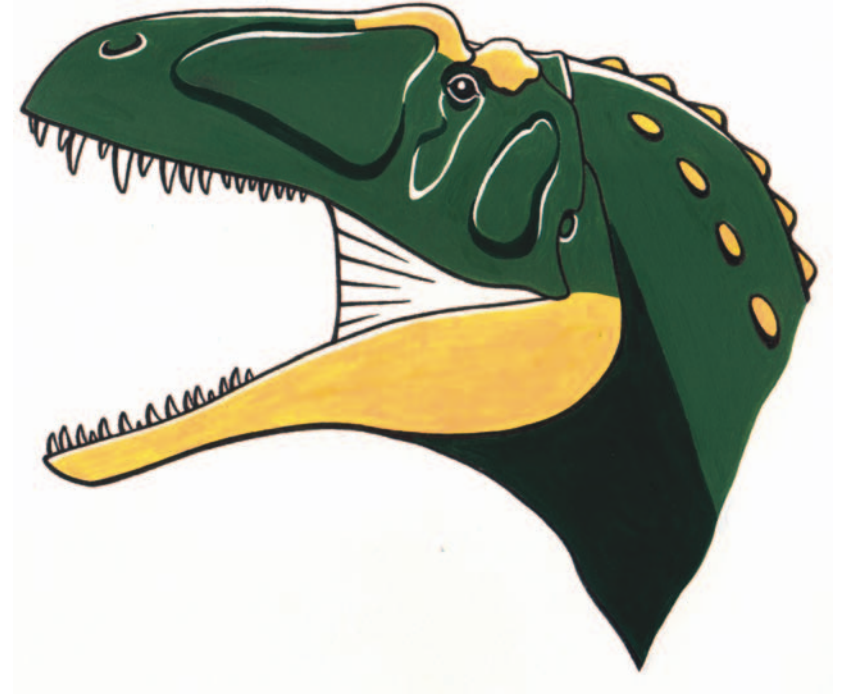
Figure 12 original graphite on paper by Mike Milborne, 2000.



Capitalsaurus Day, January 28th 2002
Mayor Anthony A. Williams and Dr. Kranz with Mrs. Henderson's Montessori
class from Watkins Elementary School, District of Columbia Public Schools.



Capitalsaurus Day, January 28th 2002
Merope Moonstone of Mrs. Henderson's class
presents the mayor Anthony A. Williams
a Capitalsaurus bone.



Capitalsaurus by Greg Paul 2000