

Corridor of Time Prehistoric Life of North Dakota Exhibit at the North Dakota Heritage Center Completed

by John W. Hoganson

Introduction

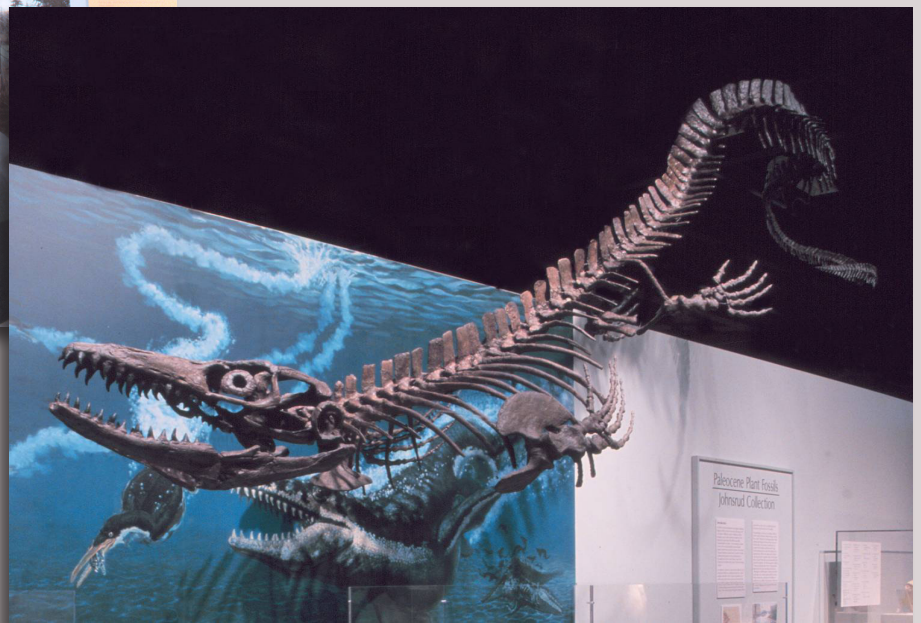
In 1989, legislation was passed that directed the North Dakota Geological Survey to establish a public repository for North Dakota fossils. Shortly thereafter, the Geological Survey signed a Memorandum of Agreement with the State Historical Society of North Dakota which provided space in the North Dakota Heritage Center for development of this North Dakota State Fossil Collection, including offices for the curator of the collection

and a laboratory specialist, a laboratory for preparation of fossils, and a fossil storage area. The NDGS paleontology staff, now housed at the Heritage Center, consists of John Hoganson, State Paleontologist, and paleontologists Jeff Person and Becky Gould. This arrangement has allowed the Geological Survey, in collaboration with the State Historical Society of North Dakota, to create prehistoric life of North Dakota exhibits at the Heritage Center and displays of North Dakota fossils at over 20 other museums and interpretive centers around the state.



Figure 1. Restored skeleton of the Highgate Mastodon, an elephant-like mammal that lived during the Ice Age about 11,000 years ago.

Figure 2. Restored skeleton of *Plioplatecarpus*, a mosasaur that was the main predator in the Pierre Sea that covered North Dakota about 75 million years ago. This specimen was collected near Cooperstown, North Dakota.



The first of the Heritage Center prehistoric life exhibits was the restoration of the Highgate Mastodon skeleton in the First People exhibit area (fig. 1). Mastodons were huge, elephant-like mammals that roamed North America at the end of the last Ice Age about 11,000 years ago. This exhibit was completed in 1992 and was the first restored skeleton of a prehistoric animal ever displayed in North Dakota. The mastodon exhibit was, and still is, a major attraction in the Heritage Center. Because of its popularity, it was decided that additional prehistoric life displays should be included in the Heritage Center exhibit plans. These exhibits would be called the Corridor of Time and be installed in the entrance area of the main gallery. They would trace the history of life in North Dakota through display of fossils from the North Dakota State Fossil Collection. Changes in the state's climate and environments through time would also be addressed in these exhibits. The Corridor of Time would provide an introduction to the rest of the main gallery which interprets the human history of the State.

Phase I and Phase II

The Corridor of Time would be divided into six time periods. The initial plan was to construct all of the Corridor of Time at once. Funding constraints did not allow this to happen so we have had to generate the exhibits in phases. Phase I is about life that existed in the oceans that covered North Dakota during the Late Cretaceous, from about 80 million to 68 million years ago. It is also referred to as the mosasaur exhibit. Fossils of animals that lived in the shallow, warm oceans that covered North Dakota during that time are displayed. The featured fossil is the spectacular 23-foot-long restored skeleton of the Cooperstown mosasaur, *Plioplatecarpus* (fig. 2). Mosasaurs were huge marine lizards and the largest predators in these Late Cretaceous oceans. Also included in this exhibit are fossils of animals that co-existed with the mosasaurs including sharks and other fish, sea birds, giant squids, cephalopods, gastropods, clams, crabs, lobsters, sea urchins, corals, and shrimp.

Phase II includes fossils of the animals and plants that lived in North Dakota during the Late Cretaceous about 65 million years ago when western North Dakota was a vast deltaic coastal plain. The climate at that time was warm-temperate to subtropical. This coastal plain provided habitats for several kinds of exotic plants and animals including dinosaurs. A skull and partial skeleton of the huge three-horned dinosaur *Triceratops* is featured in this exhibit. This partial skeleton is arranged as a “death mount” where the carcass is being

Figure 4. Habitat reconstruction wall painting showing life in North Dakota about 60 million years ago when western North Dakota was a subtropical, forested swampland.



Figure 3. Diorama showing the skeleton of the small meat-eating dromaeosaurid dinosaur that lived in North Dakota during the Cretaceous Period about 65 million years ago.



scavenged by small dromaeosaurs, theropod dinosaurs (fig. 3). Fossils of other animals and plants that lived during this time are also displayed including remains of duckbilled dinosaurs, pachycephalosaurs, *Tyrannosaurus rex*, turtles, fish, pterosaurs, freshwater clams and snails, and leaves from several kinds of plants including palm trees. A wall-size habitat reconstruction mural, showing the appearance of western North Dakota at this time, is a backdrop for the diorama. A recent addition to this exhibit is the display of the arm and tail of the mummified

Figure 5. Ribbon-cutting ceremony at the Corridor of Time Phase III exhibit opening.



Figure 6. Display showing core and oil samples from numerous rock formations in North Dakota and a model of a drilling rig. Inset: Oil well core from the Ordovician Stony Mountain Formation collected in Ramsey County from a depth of 2,456 feet. This core contains brachiopod (clam-like animals) fossils. Crude oil from the Ordovician Red River Formation in Bowman County is in the bottle.

duckbilled dinosaur called Dakota with preserved, fossilized skin. About 65 million years ago one of Earth's greatest biological catastrophes occurred. About three-fourths of all life on Earth, including the last of the dinosaurs became extinct at this time. One theory to explain this extinction suggests that the Earth was struck by a massive asteroid. Meteorites found in North Dakota are displayed to help interpret this event.

The second part of the Phase II exhibit, that we call North Dakota Everglades, is about life that existed in the subtropical, forested swamps that covered much of western North Dakota during the Paleocene about 60 million years ago, about 5 million years after the extinction of the dinosaurs. Fossils of the animals that lived in North Dakota at this time including crocodiles, champsosaurs (crocodile-like animals), turtles, fish, salamanders, mammals, birds, and freshwater snails and clams are displayed (fig. 4). Extensive, lush forests containing Magnolia, bald cypress, ginkgo, palm and many other plants grew in this Paleocene swampland. Their fossils, including petrified wood, leaves, seeds, and even flowers of some plants are on exhibit. The backdrop for this diorama is a huge habitat reconstruction wall mural recreating a forested swampland scene showing what western North Dakota was like 60 million years ago.



Phase III

The last of the Corridor of Time exhibits, Phase III, were completed in January 2009. The exhibits were unveiled during a legislative reception on January 8 and the grand opening was January 10 (fig. 5). Phase III of the Corridor of Time is divided into three displays: Primordial Seas, Cannonball Sea, and North Dakota Scrublands.

Phase III: Primordial Seas

For a vast expanse of time during the Paleozoic Era, from about 500 million to 250 million years ago, North Dakota was often inundated by oceans. Rocks deposited during the Paleozoic do not occur at the Earth's surface in North Dakota and yet, surprisingly, we know quite a bit about life in North Dakota during this time. This is a result of exploration for petroleum. Since the 1950s petroleum companies have been actively exploring for oil and gas in North Dakota. At times during the drilling process, cylinders of rocks called cores, are recovered from the subsurface and analyzed by geologists and paleontologists to help determine if hydrocarbons are present. On occasion, fossils are found in these cores. The oldest fossils that



Figure 7. Fossils from the Paleocene Cannonball Formation and a wall painting depicting animals that lived in the Cannonball Sea.



Figure 8. Diorama showing fossils of mammals and turtles from the Oligocene (about 30 million years old) Brule Formation in North Dakota accompanied by a habitat reconstruction wall painting. The large animal in the foreground is the giant pig-like animal *Archaeotherium*. Inset: skull of the 30 million-year-old saber toothed cat-like animal *Dinictis* displayed in the Oligocene exhibit.

we have in the North Dakota State Fossil Collection are shells of brachiopods (marine animals similar to clams) from an Ordovician Stony Mountain Formation core recovered from a depth of 2,456 feet in Ramsey County. These fossils are about 450 million years old and are featured in this display (fig. 6). Other cores in the display contain fish fossils (Devonian Duperow Formation, depth 4,429 feet, Wells County), sponge-like stromatoporoid (Devonian Duperow Formation, depth 4,402 feet, Wells County), gastropod (snail)(Mississippian Madison Group, depth 9,617 feet, McKenzie County), corals (Mississippian Mission Canyon Formation, depth 9,209 feet, Burke County), brachiopods (Devonian/Mississippian Bakken Formation, depth 7,580 feet, Burke County), sea lilies (Devonian Winnipegosis Formation, depth 5,283 feet, McHenry County), corals and brachiopods (Devonian Winnipegosis Formation, depth 5,274 feet, McHenry County) and inarticulate brachiopods (Pennsylvanian Tyler Formation, depth 7,895 feet, Golden Valley County and depth 7,949 feet, Billings County). These fossils indicate that North Dakota was covered by shallow, warm, marine waters on several occasions during the Paleozoic.

Examples of crude oil from several formations including the Red River (Ordovician), Interlake (Silurian), Winnipegosis (Devonian), Duperow (Devonian), Bakken (Devonian/Mississippian), Mission Canyon (Mississippian), Lodgepole (Mississippian), and Tyler (Pennsylvanian) are also displayed to show visitors the variation in color and viscosity of crude oil recovered in North Dakota.

We were very fortunate to have an incredibly detailed model of an operating oil well drilling scene that includes a derrick, associated

buildings, vehicles, and equipment to compliment the Paleozoic rock, fossil, and crude oil exhibit (fig. 6). Master model maker, Mitch Griese, donated this 1/48-scale model to the State Historical Society of North Dakota. A large photograph of the western North Dakota badlands provides an appropriate backdrop for the oil well scene.

Cannonball Sea: The Last North Dakota Sea

The last sea to cover North Dakota is called the Cannonball Sea. It covered much of the state, except for western North Dakota which was a forested swampland, during the Paleocene about 60 million years ago. Shortly after 60 million years ago, the Cannonball Sea receded and oceanic conditions have not returned to North Dakota since. The Cannonball Sea was shallow, warm, and teeming with life. The shoreline sand deposits of the sea yield beautifully preserved fossils of the animals that inhabited this body of water. These fossils include teeth of sharks, sting rays, eagle rays, ratfish, and other fish (fig. 7). Fossils displayed in the Cannonball Sea exhibit also include shells of marine clams, snails, crabs, shrimp, and cephalopods. Featured in the exhibit are several specimens of North Dakota's state fossil, *Teredo*-bored petrified wood. Sixty million years ago driftwood floated near the shore of the Cannonball Sea. Small clams (*Nototeredo*), sometimes called shipworms, bored into the wood forming elongate, tubular living chambers. After millions of years, this wood and the shells of *Nototeredo* and its elongate tubes became fossilized forming *Teredo*-bored petrified wood.

North Dakota Scrubland

By the Oligocene, about 30 million years ago, North Dakota had changed dramatically from the subtropical, forested swampland conditions dominated by crocodiles during the Paleocene to a temperate, nearly treeless scrubland habitat supporting vast herds of exotic mammals. Mammal fossils from the Brule Formation are displayed in the North Dakota scrubland exhibit (fig. 8). Remains of about 60 species of mammals have been recovered from this formation in North Dakota. One of the more spectacular is the giant pig-like animal called *Archaeotherium*. A skull and cast of the skeleton of this animal are featured specimens in this display. Fossils of several other herbivores including the ubiquitous oreodont, *Merycoidodon*, a sheep-like animal are in the exhibit. One of the earliest horses, *Mesohippus*, lived in North Dakota at this time. This three-toed horse was similar to the modern horse in some ways but the adults were only about two feet tall. A skull and lower jaws of *Mesohippus* are displayed. Remains of some of the small mammals, insectivores, rabbits, squirrel-like animals are also in the exhibit.

Fossils of carnivores are not common in the Brule Formation in North Dakota. Skulls of *Dinictis*, a saber-toothed nimravid (cat-like animal), about the size of a small mountain lion, are accompanied by a skeleton (cast) of that animal perched on a cliff. A skull of one of the other carnivores, *Hyaenodon*, is also in the exhibit. Several species of turtles lived in North Dakota at that time including the large tortoise, *Stylomys*. Some of these were the size of the living Galapagos tortoise. Fossils of these animals are also in the exhibit.

A wall-size mural that reconstructs this 30 million-year-old scrubland habitat in North Dakota is a backdrop for the diorama.

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North Dakota History: Readings about the Northern Plains State **receives national award**

A recent book detailing North Dakota's history from dinosaurs to the 21st Century (see June 2008 Newsletter) has been named a national award recipient by the American Association of State and Local History (AASLH). *North Dakota History: Readings about the Northern Plains State*, has been selected as a recipient of the AASLH's Award of Merit. This award is presented to recognize excellence for projects, individual achievement, and organizational general excellence.

North Dakota History is a collaborative publication of the State Historical Society of North Dakota (SHSND) and the North Dakota Center for Distance Education. The book is a collection of articles and images from more than a century of SHSND publications and also features narratives by several North Dakota scholars including survey paleontologist John Hoganson.

Although intended for use as a North Dakota history textbook for high school students, *North Dakota History* will appeal to anyone with an interest in the state's historic and prehistoric past.