

# Fossil Collecting Expeditions Led By the Division of Vertebrate Paleontology during the 1940's

By Mark Lay

The Division of Vertebrate Paleontology in the National Museum of Natural History (NMNH) Department of Paleobiology has a relatively large vertebrate paleontological collection, with more than 123,000 specimens currently catalogued and many more accessioned but not yet catalogued. All of our specimens come from one of four sources:

- Transfers. In 1846, the legislation that established the Smithsonian Institution also stated that "...all objects of natural history, plants, and geological and mineralogical specimens belonging to or hereafter to belong to the United States" would be held in trust by the Smithsonian for the American people. In 1879, the Sundry Civil Act enlarged this list to specifically include all rocks, minerals, soils, fossils, and objects of natural history collected for the US Government. This means that any fossil specimens collected for the US Government eventually are transferred to the Smithsonian. Transfers from the United States Geological Survey (USGS) in particular have been invaluable in growing our national fossil collections.
- Gifts and Purchases. Many scientifically valuable specimens and collections have come to the NMNH as gifts or outright purchases from individuals, private companies or other museums.
- Trades with other Museums. The NMNH occasionally will trade specimens with other museums. Such trades are undertaken only to round out study material or to acquire specimens for display. All fossil specimens are valuable and care is taken to ensure the trade is mutually beneficial and does no harm to the scientific value of our collections. Generally, any material traded is duplicate to other specimens in the collections.
- Collecting Expeditions. The Smithsonian Institution has had an active vertebrate paleontological collecting program since the 1800s, sending not only Curatorial Staff but a variety of Laboratory, Exhibits and other specialists into the field as well. With few exceptions over the last 100 years (usually due to wars or budget constraints) at least one major collecting expedition has been conducted each year.

In early 1940, there were two curators in the Division of Vertebrate Paleontology. Mr. Charles Gilmore, Curator of Fossil Reptiles, had come to the Division in 1903 as a fossil preparator and advanced through the ranks to his curatorial position in 1923. Mr. Gilmore had been responsible for collection and preparation of many of the mounted dinosaur and reptile displays in the Museum. His interests did not stop there, though, and during much of the 1930's and early 1940's his expeditions also focused on building the Cenozoic reptile, lizard and mammal collections of the Museum. Dr. Charles Lewis Gazin, hired as an Assistant Curator of Fossil Mammals and later promoted to Curator of Vertebrate Paleontology, came to the Division in 1932. His particular interests focused on Paleocene and Eocene mammals.

Fieldwork in 1940 continued explorations that were begun in the 1930's, with Dr. Gazin, Franklin Pearce of the Division's Vertebrate Paleontology Lab and George F. Sternberg all collecting primarily in Eocene and Paleocene localities in central Utah and the Bridger Basin in Wyoming. (While George Sternberg, one of the famous fossil-collecting family of Sternbergs,

was not a staff employee of the museum, he had directly assisted expeditions since at least the 1928 field season.

The trio collected in Utah from early June 1940 through the end of the month, concentrating primarily on collecting Paleocene mammals around Dragon Canyon. In early July they moved to the area around Twin Buttes Wyoming, and between early July and the end of August they focused their attentions on the Bridger Formation (mostly in the D and C horizons, with some additional collection in the B horizon) near Twin Buttes, Grizzly Buttes, Sage Creek Basin and Dead Cow Buttes. This area yielded considerable success. Among other items collected in July were a number of partial skulls and skeletons of *Palaeosyops* (a small brontothere) and *Hyrachyus* (an ancestor of tapirs and rhinoceroses), a nearly perfect skull and jaw of the small predator *Thinocyon velox* Marsh (USNM 361386), and elements of the rare creodont *Machaeroides eothen* Matthew (USNM 17059).

(For an explanation of these geologic features see the last section below: “What are Geologic Formations, Members and Horizons.”)



Dr. Gazin collecting in the Bridger Formation of Wyoming - 1940.

Dr. Gazin's work in the Bridger Formation in Eocene southwestern Wyoming continued to be productive. On Aug 9, he, Pearce and Sternberg found an unusually complete skull and skeleton of *Uintatherium robustum* Marsh, (USNM 16662), missing only the neck, a shoulder blade, the right hind limb, and the lower jaws. The specimen was found weathering out and "*formed a compact heap in the ground with many of the important parts still in articulation*".<sup>[1]</sup> At the time, the exact skeletal arrangement of *U. robustum* was still under discussion, and of particular importance, the dorsal, lumbar and sacral vertebrae of this specimen were found in articulated sequence, clarifying the situation greatly. The specimen was complete enough to mount for exhibition, and can still be seen on display in the “Mammals in the Limelight” Hall of the NMNH.



USNM 16662 as it appears on display.

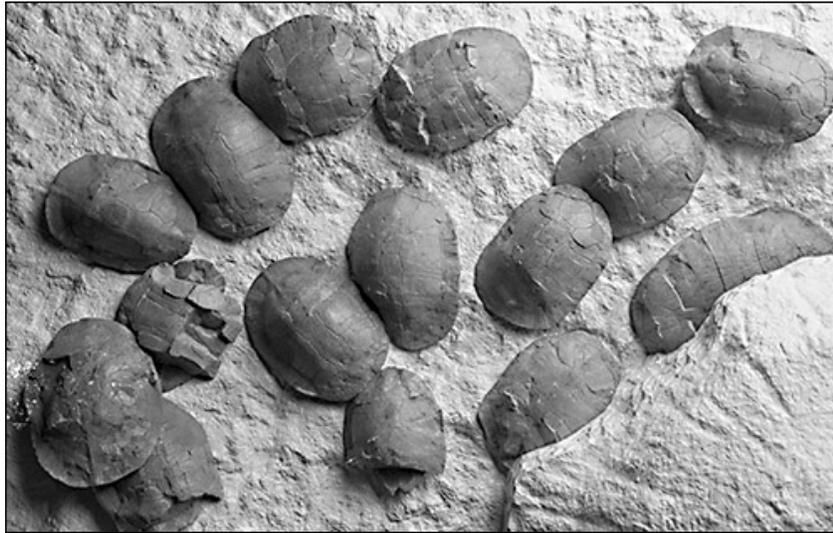
Although Mr. Gilmore did some exploration around Big Bend Texas in April, 1940, he did not make any significant collections during that trip.

Between June 11 and August 27, 1941 Dr. Gazin, Franklin Pearce and George Sternberg revisited Wyoming. The expedition concentrated on areas near Twin Buttes and Cedar Mountain between mid-June and late July, and moved to the Sage Creek Basin in early August. The expedition found some unusually good material of the smaller mammals, particularly the lower jaws and fragmentary skeletal parts of the rare taeniodont mammal *Stylinodon* (USNM 16664, collected in August 1941 in the Bridger Basin), and good specimens of *Hyrachyus* and *Palaeosyops*.



Dr. Gazin jacketing a specimen for transport, 1941.

Of particular note, the 1941 expedition revisited a highly productive locality discovered in the Bridger B formation by the 1930 Smithsonian Paleontological Expedition. This site included a large deposit estimated by Dr. Gazin to contain "several hundred" turtle shells.<sup>[2]</sup> Between August 18 and 26 the party was able to retrieve a slab, 42x66 inches in size and weighing roughly 1,270 pounds, which when prepared showed 15 mostly intact carapaces (one *Echmatemys haydeni* and 14 *E. wyomingensis* - USNM 16761-16775).



A restoration by NMNH preparator Norman Boss of the turtle slab found by Dr. Gazin in 1941.

Collecting in 1942 focused on Oligocene and Eocene exposures in eastern Wyoming and western Nebraska. Between early June and mid August 1942, Mr. Gilmore and Alfonso Segura Paguaga, of the Museo Nacional in San Jose, Costa Rica, assisted by fossil hunters George Sternberg and George B. Pearce, explored the Oligocene Hat Creek Basin area, Niobrara County, Wyoming and western Nebraska. Among the noteworthy specimens found were nearly complete and articulated specimens of *Miniochoerus gracilis* Leidy (USNM 16825), *Leptomeryx evansi* Leidy (USNM 16754 and 16755), *Dinictis felina* Leidy (USNM 18219), and *Hoplophoneus primaevus latidens* Thorpe (USNM 18203). The expedition also collected some good skulls and/or partial skeletons of the small carnivore *Pseudocynodictis gregarius* Cope (USNM 16811), the fossil horse *Mesohippus*, the small camel *Poebrotherium*, the early rhinoceros *Hyracodon*, the squirrel *Ischromys*, the small herbivore *Merycoidodon* and the rabbit *Palaeolagus*.

The impact of World War II brought collecting by the Division of Vertebrate Paleontology essentially to a standstill. Travel was restricted by both gasoline and tire rationing, and Staff attention was focused on selecting, cataloguing and packing those paleontological specimens (particularly the type specimens) deemed appropriate for evacuation if required. Dr. Gazin was furloughed from the Smithsonian for military duty and joined the U.S. Army Air Force in July 1942, leaving Mr. Gilmore as the sole resident curator. Dr. Gazin did not participate in collecting activities again until the field season after his return from active duty at the end of 1945. Little collecting was done by Division staff during the 1943-1945 period, and what was done was mostly during a number of short excursions to the Miocene Calvert Formation on the Chesapeake Bay.

It also was a time of personnel changes. Mr. Gilmore retired in 1945, bringing to an end a career of more than 40 years with the Smithsonian. Dr. Gazin was promoted to Curator of Vertebrate Paleontology in early 1946, and later that year Dr. David H. Dunkle was hired into the Division as an Associate Curator of Vertebrate Paleontology. Dr. Dunkle's interests focused on primitive Paleozoic vertebrates, particularly Devonian fishes. Collecting once again resumed in earnest, with the period 1947-1949 showing a dramatic increase in significant specimens returned to the Museum.

The 1946 summer field expedition, composed of Dr. Gazin and assistants Franklin Pearce and Arlton Murray of the Division's Vertebrate Paleontology Lab, left Washington on May 23, 1946 and initially went to Dragon Canyon in central Utah, focusing on collecting Dragon Paleocene mammals and Cretaceous lizards. Although Mr. Murray returned to Washington after a week due to health problems, Dr. Gazin and Mr. Pearce completed two weeks of collecting in the area. Dr. Gazin reported: "*We are doing very well here but are finding it necessary to get into some of the more nearly inaccessible places in order to see new ground, so the going is just a little tougher than before the war, but the material is just as good. Because of these conditions we are finding it necessary to trim our blocks closer to the bone. They grow heavy just the same after being carried a few miles.*"<sup>[3]</sup> Dr. Gazin also reported finding portions of a skull and lower jaw of a titanotherium (USNM 26118 and 26121) in July.



Dr. Gazin's base camp in the Bridger Basin of Wyoming, 1946.

The party then moved to the Middle Eocene Bridger beds in southwestern Wyoming, continuing a research program begun before the war. Dr. Gazin had high expectations: "*These formations have been untouched by collecting parties during the war years and it is expected that weathering will have exposed many additional fossils.*"<sup>[4]</sup> The greater part of the field season was spent collecting fossil mammals in the Bridger Formation, with significant success. Of particular note was the collection of skulls and portions of the skeletons of two unusually large rodents (*Paramys delicatus* Leidy). Other significant discoveries included jaws and skeletal parts of the artiodactyl *Helohyus plicodon* Marsh, the small insectivore *Nyctitherium velox* Marsh, portions of the skull and jaws of *Peratherium innominatum* Simpson and the holotype specimen of *Ischyrotomus oweni* Wood (USNM 17160 and 17161). The expedition also collected skulls of

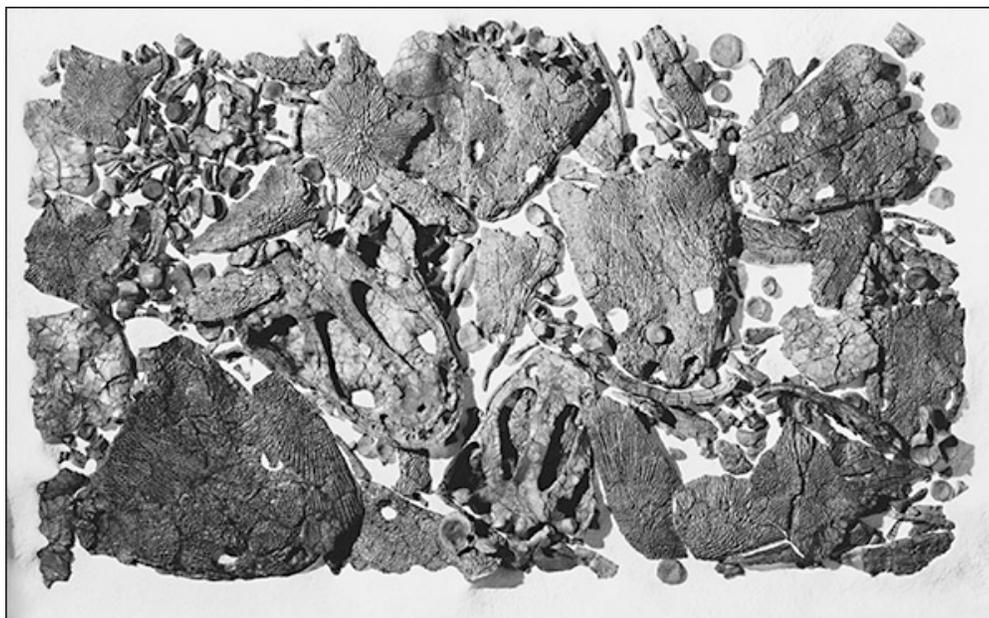
the large six-horned mammal *Uintatherium*, the titanothere *Palaeosyops*, and the rhinoceros *Hyrachyus*. The Smithsonian Institution Annual Report to Congress for 1947 stated: "As a result of these expeditions, the National Museum is building up one of the best research collections of Middle Eocene mammals in the country and has succeeded in obtaining some striking exhibition material representing this very primitive stage of mammalian evolution." <sup>[5]</sup>

On August 17, 1946, the expedition moved to the Lower Eocene beds in the Wind River Basin of central Wyoming and also collected from Upper Eocene Duchesne River exposures discovered by the USGS in the northern part of the Wind River Basin. Collecting ended around the end of August and the party returned to Washington.

Also in August 1946, Dr. Remington Kellogg and Dr. David H. Johnson, at the time the curator and the associate curator in the Museum's Division of Mammals, and Arlton Murray collected fossil porpoise and whale material from the Calvert Formation Miocene beds at Scientists' Cliffs, Calvert County, Md. Among the finds was a partial skull of the porpoise *Eurhinodelphis longirostris*. (USNM 13567).

Dr. Dunkle, accompanied by Franklin Pearce and assisted by George F. Sternberg, spent the better part of June and July 1947 at a Triassic quarry on the Fullerton-Dobson Ranch south of Lamy, New Mexico. Collecting began on 3 June, and the next 3 weeks were spent prospecting and collecting at a site in the Dockum Formation which has been dubbed the "Gunter Bone-Bed"

The site was originally discovered by a Harvard party (including Dr. Dunkle) in 1936. Dr. Dunkle's party began working adjacent to the original quarry and removed 5 to 8 feet of overburden, exposing roughly 350 square feet additional of the bone bed. Nineteen slabs, with a variety of *Buettneria* (a Triassic amphibian) skull and skeletal elements, were dug out. The largest slab (USNM 18495) measured about 4-1/2 by 9-1/2 feet and contained 7 complete *Buettneria* skulls, 2 incomplete skulls, and "numerous vertebral and other elements" <sup>[6]</sup> and is still on display in the "Conquest of the Land" exhibit. Together, the 19 slabs contained 35 good *Buettneria* skulls, a significant addition to scientific knowledge.



The *Buettneria* slab - USNM 18495.

As the party still had extensive prospecting to do, they reburied the slabs for safekeeping on June 23 and moved their camp to Quay County, New Mexico. They explored upper Jurassic (Oxfordian) Todilto limestone exposures in Santa Fe, Guadalupe, Quay, and San Miguel Counties in East Central New Mexico for roughly three weeks and collected 87 specimens representing the primitive teleosts (ray-finned fish) *Pholidophorus americanus* and *Leptolepis schoewei*. The party then returned to the Fullerton-Dobson Ranch, recovered the *Buettneria* slabs and prepared them for shipment. Lloyd Fullerton, owner of the ranch, kindly hauled the entire collection to the railroad for shipment on July 11, 1947.

Dr. Dunkle returned to Washington that same day. When he left, Franklin Pearce and George Sternberg proceeded to Colorado to assist Dr. Gazin in exploring the middle Eocene beds in the Huerfano basin. However, the exposures they found were both limited and disappointing, so they left after prospecting for roughly a week.

The party then proceeded back to the Bridger Basin in Wyoming, spending the next 6-1/2 weeks exploring the lower Bridger Formation. Dr. Gazin noted: "*The beds examined were principally those in the more or less continuous escarpment extending northward from Grizzly Buttes to Church Buttes and then eastward to the vicinity of Granger and at points thereon for a considerable distance southeastward. Visits were also made to localities in the upper Bridger which were known to be productive of small mammal remains. Several partial skeletons with skull, representing less common forms were secured this season, as well as excellent material of the better known mammals such as the larger perissodactyls. We are especially proud of the skull, jaws, and other parts of an incomplete skeleton of a tillodont found during the first week in the basin. Mention may also be made of a small quarry, near Cedar Mountain, which was opened for rodents and other small mammals. Lastly, several small blocks of matrix, apparently containing bird remains, were removed from a site near Twin Buttes.*"<sup>[7]</sup> The tillodont was initially identified in the field by Dr. Gazin as *Trogosus castoridens* and later after more complete preparation as *Trogosus hyracoides* (USNM 17886). This specimen included only "*the second skull of this rare mammal to be found during intermittent exploration covering 75 years*".<sup>[8]</sup> Other specimens found included two skulls of the Eocene primate *Notharctus*, skeletal parts of the rhino *Hyrachyus* and the tapir *Helaletes*, and skulls of the small rodents *Mysops* and *Sciuravas*.

1948 was a relatively quiet year for collecting. Dr. Dunkle, assisted by Arlton Murray, collected in the marine Cretaceous Pierre Shale Formation north of Lusk in eastern Wyoming between May 31 and July 9, 1948. Dr. Bobb Schaefer, also an expert on fossil fish with the American Museum of Natural History, joined them for part of this period. Collecting was not particularly productive and Dr. Dunkle noted: "*The period of June 15 to June 25 was essentially lost because of practically constant rain.*"<sup>[9]</sup> They moved to northeastern Utah and collected in the Green River Eocene beds until July 28. Collecting was somewhat more productive, with 326 good specimens (mostly of the fish *Knightia*) found over the course of a week. At the end of July, they proceeded to Laramie Wyoming to meet Dr. Gazin. Mr. Murray left for Washington the next day. Drs. Gazin and Dunkle attended the 1948 Society of Vertebrate Paleontology Field Conference held in Laramie and on August 5, Dr. Dunkle left for Washington and Dr. Gazin headed towards Montana.



Dr. Gazin, his family and Franklin Pearce in Montana, 1948.

Dr. Gazin, joined by his wife Elizabeth, his son Chester and Dr. J. LeRoy Kay of the Carnegie Museum divided their time between localities in the Pipestone Springs Oligocene (Chadronian) in Montana (7-17 August, 1948) and exposures of the Almy Paleocene and Knight Lower Eocene along the Green River in the northern part of the Bridger basin, Wyoming (18-30 August). In Montana the party collected numerous skull and skeletal fragments of *Hesperocyon*, *Hyracodon*, *Leptomeryx*, *Mesohippus*, *Palaeolagus* and *Trigonias*. Dr. Gazin noted later that the collecting effort in Montana was so successful it nearly doubled the Museum's representation of Chadronian microfauna from this area. In Wyoming, they found a variety of mammals and lizards, with the best of the finds including a variety of skulls and articulated skeletal portions of the condylarth *Meniscotherium robustum*.

Collecting in 1949 focused mainly in the Paleocene Puerco and Torrejon localities of the San Juan Basin in New Mexico and the Knight Lower Eocene in the Green River formation, Wyoming.

Dr. Gazin, accompanied again by his son Chester and Franklin Pearce, left for the San Juan Basin in June 1949 in the Paleobiology Department's new carryall. This was a significant improvement in transportation that allowed not only transport to the West, but "non-borrowed" transportation to the various sites. The month of July was spent collecting in localities in the Puerco and Torrejon horizons. According to Dr. Gazin's report: "*The principal collections were made in the vicinity of the type localities of the two members of the Nacimiento Group with most of the material coming from the various branches of the Arroyo Torrejon, along which exposures were examined with considerable persistence and painstaking detail. Something a little less than 400 specimens of Paleocene mammals were secured, counting only individuals whose remains have preserved at least two teeth.*"<sup>[10]</sup>

At the end of July, the party moved to southwestern Wyoming, specifically Big Piney, to revisit previously explored Eocene and Paleocene localities. The party systematically worked the Knight Eocene exposed on both sides of the Green River between LaBarge and several miles to the north of Big Piney. Dr. Gazin noted that the large *Meniscotherium* (*M. robustum* Thorpe) was abundant, with some bones articulated. The party also found significant quantities of the early titanotheres *Lambdotherium popoagicum* Cope, including a rare skull (USNM 19761). The party returned to Washington D.C. around the end of August.

## What are Geologic Formations, Members and Horizons?

A "formation" is the basic geologic unit, consisting of similar rock types that were originally continuous and created by related depositional events and environments. A formation is characterized by its composition, appearance, and exposure over an area large enough to show up on a map having a scale of an inch to a mile. It must be distinctive enough that a geologist can readily discern it from other formations. A "member" is a subdivision of a formation and has distinct lithographic characteristics that distinguish it from other parts of the formation. A "horizon" is a distinctive layer or thin bed within a formation that has characteristic features, composition, or fossil content. If the horizon contains distinctive fossils or volcanic ash falls of a known age, it can be used to help date the rock sequence. For instance, the Bridger Formation (named in 1871 for exposures discovered near Fort Bridger in southwestern Wyoming) is composed of distinct layers of tuffs from volcanic ash falls, sandstones, mudstones and limestones deposited roughly 49.0-45.5 million years ago (MYA) during the Eocene Epoch. The formation is divided into 3 members (Black Forks, Twin Buttes and Turtle Bluff, with Black Forks being the oldest) and 5 distinct horizons (A through E, with A being the oldest). (Murphey and Evanoff 2011)

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