

Fossil Collecting Expeditions Led By the Division of Vertebrate Paleontology during the 1950's

By Mark Lay

The 1950s marked a time of renewal for the United States National Museum's (USNM) Division of Vertebrate Paleontology. In 1948 the Museum articulated an ambitious strategy to update many of its exhibit halls, and by the early 1950s plans for one new hall highlighting Tertiary mammals and another highlighting early fishes and amphibians were well underway. Although the Museum had specimens in these topical areas on display previously, new fossil discoveries, new research, and changes in presentation techniques all mandated a change in exhibit approach. The new exhibit halls would not only include new specimens, but also would embody a new philosophy, including a new thematic approach, more public-friendly specimen labeling, and new dioramas and lighting. In addition to their normal collection and research responsibilities, the curatorial staff was expected to "*prepare the original narrative scripts, select the objects, write the captions, and consult with the exhibits designers and preparators on the arrangement of the objects and the use of the drawings, paintings, and other graphical aids required to communicate their ideas to the viewers.*"[1] It fell to the curators to not only ensure the scientific accuracy of information in each hall, but also to obtain whatever specimens were necessary to tell the story.

At the time there were two vertebrate curators in the USNM Division of Vertebrate Paleontology. Curator C. Lewis Gazin, an expert in Tertiary mammals, particularly those of Wyoming, Colorado, and Utah, curated the new mammals hall (eventually called the Hall of the Age of Mammals in North America). Associate Curator David H. Dunkle had wide-ranging interests, but focused primarily on primitive Paleozoic vertebrates, particularly Devonian fishes, and thus he curated the Hall of Fossil Fishes, Amphibians, and Primitive Reptiles. Although many fossils for these new halls were already in hand, Gazin and Dunkle's field expeditions during the 1950s remained on the lookout for exhibition quality specimens in addition to their usual prospecting for research and study material.

In January 1950, Dr. Gazin, accompanied by Dr. Theodore E. White (from the Smithsonian River Basin Survey), left for Panama's Herrera Province at the invitation of the Museo Nacional de Panamá and with the cooperation of the Government of Panama, to explore an area southwest of the Panama Canal where Pleistocene fossils had been reported. During February and March, with the assistance of a local support crew, Drs. Gazin and White excavated a large quantity of the giant ground sloth *Eremotherium rusconi* Schaub, and some fragmentary skeletal remains of *Toxodon* (a large, heavy-bodied hoofed mammal), a glyptodont, horses, deer, rodents, and turtles near the towns of Ocú and Pesé. Dr. Gazin decided the bonebed would reward further work and was also likely to yield exhibition-quality material. Although many of the fossils were slated to either stay in or return to Panama, a significant quantity were shipped to the USNM. Planning to come back to Panama the next year, the Smithsonian party returned to Washington at the beginning of April.

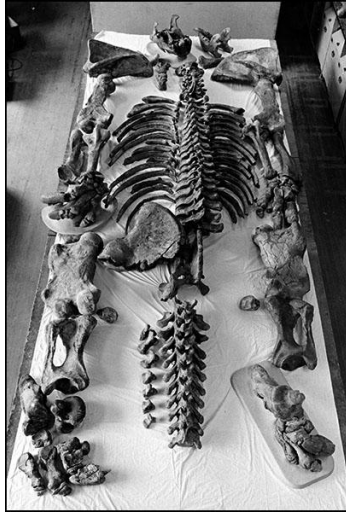


The collecting locality at El Hatillo near Pesé, Panama, 1951. From Gazin, 1957.[2]

Meanwhile, with the cooperation of the Government of Cuba, Dr. Dunkle traveled to the province of Pinar del Río in western Cuba during February and March 1950. Assisted by a local guide named Juan Gallardo, he obtained an excellent series of fossil fish from the Jurassic shales of the Jagua Formation. In particular, their collections included representatives of three orders of bony fishes (*Amiiformes*, *Pycnodontiformes*, and *Semionotiformes*) and of the family *Leptolepidae* (a fish resembling a modern herring). Dr. Dunkle noted that many of the specimens were "*skeletons in perfect association and practically undistorted by crushing*".[3] More than 100 specimens collected during this expedition are currently listed in the USNM collection catalog.

In June 1950, Dr. Dunkle, assisted by Franklin Pearce who was now chief preparator in the USNM Vertebrate Paleontology (VP) Preparation Lab (otherwise known as the VP Lab), left Washington with the Smithsonian carryall (a station wagon-type vehicle on a commercial truck frame). Their goal for this trip was to collect fossil plants, invertebrates, fishes, and mammals that would help clarify the stratigraphy of the middle Eocene shales of the Green River Formation of Colorado, Utah, and Wyoming. They collected until August 8. The Green River Basin is one of

the best places in the world to collect Eocene fish and a good set was returned to the Museum, including a number of complete skulls and skeletons of *Amphiplaga brachyptera* (USNM 19883 and 19885) and *Erismatopterus rickseckeri* (USNM 19874, 19876, 19877, 19878, and 19882).

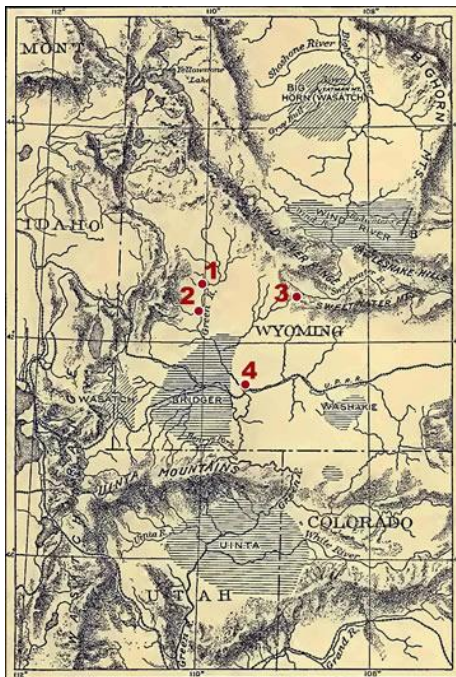


Eremotherium collected by Dr. Gazin in Panama, 1951. From Gazin, 1957.



A restoration of *Eremotherium* by Lawrence B. Isham. The upright sloth is estimated to be about 12 feet tall. From Gazin, 1957.

On January 3, 1951, Dr. Gazin left Washington for his second trip to Panama, accompanied by Mr. Pearce. Following up the work begun in 1950, they planned to continue investigating Pleistocene fauna in western Panama, specifically those localities near the town of Pesé in the province of Herrera. Again, most of the material found was *Eremotherium*, but a good portion of a mastodon was found, along with fragmentary remains of a peccary, a giant armadillo, a turtle, and a bird. The party returned to Washington in late March. When combined with the Panama collections from 1950, there was sufficient material to create two mounts of *Eremotherium rusconii* Schaub (USNM 20867 and USNM 20872). Although the mounts were not finished in time for the formal 1961 opening of the Age of Mammals hall, they were completed and installed in the mid-late 1960s, and became part of the later Ice Age Mammals hall.



Paleocene and Eocene Basins in Wyoming, Colorado, and Utah. Towns: 1) Big Piney, 2) La Barge, 3) South Pass, 4) Green River. Map adapted from Osborn, 1929. [4]

Dr. Gazin again left Washington in late June 1951 to conduct field work in lower Eocene Knight Formation exposures in the vicinity of Big Piney, Wyoming, through July 16, and continued on to a small cluster of exposures in the Paleocene Almy Formation along La Barge Creek between July 17 and 26. This work represented his fourth season at these productive localities, and he collected nearly 270 small mammals and a few birds.

During October and the early part of November 1951, Dr. Dunkle joined Dr. Manuel Maldonado-Koerdell (at the time head of the Paleontology Department in the Mexican petroleum company Petroleos Mexicanos) to investigate reports of Jurassic and Cretaceous fossils near the town of Tamán in San Luis Potosí, Mexico. A small number of fossils were found, including an almost complete and articulated specimen of the fish *Leptolepis tamanensis*, which represented the only leptolepid to be discovered in Mexico up to that time and only the third variety of Jurassic leptolepid discovered in the Western Hemisphere. The original specimen was left with Dr. Maldonado-Koerdell in Mexico and a cast replica returned to the USNM.

Vertebrate fossil collecting by the Division was somewhat limited in 1952. Both Gazin and Dunkle remained in Washington for the summer collecting season, conducting research on the large amount of material

collected in prior years. Dr. Gazin focused primarily on Eocene and Paleocene mammal specimens from Wyoming and Dr. Dunkle conducted two separate lines of research, one focused on the origins and evolution of bony fish and the other particularly focusing on fish from the Eocene Green River Formation in Wyoming.

However, from the middle of September through mid-December 1952, Dr. Dunkle and Dr. A. R. Loeblich, Jr. (USNM Associate Curator of Invertebrate Paleontology) collected in five different areas of Jurassic and Cretaceous formations in Mexico, in cooperation with Petroleos Mexicanos, the Mexican Instituto de Geologico, and the U. S. Geological Survey (USGS). While not numerous, vertebrate specimens were found in Lower Cretaceous deposits near the city of Tlaxiaco, in the Upper Cretaceous Agua Nueva Formation in Tamaulipas, and an area of Tertiary conglomerate in Guanajuato. It was in this latter location that Dr. Dunkle collected the holotype of a new Tertiary lizard, *Paradipsosaurus mexicanus* (USNM 20667). Of particular importance were Dr. Dunkle's collections of an undescribed Late Cretaceous fish from sites in San Luis Potosí and Tamaulipas, and a series of Early Cretaceous fishes from Oaxaca.

Also in 1952, a field party from the USGS discovered an occurrence of middle and early upper Paleocene mammals in the Bison Basin (Fremont County, Wyoming). This discovery prompted Dr. Gazin and Franklin Pearce to return to the locality in June 1953, focusing on the divide between the Sweetwater drainage and the Red Desert in south-central Wyoming. They were accompanied by Roland Brown (one of the original discoverers of the site), George Pipiringos and James MacLachlen of the USGS, and were met by Paul McGrew (University of Wyoming) and a party of his students, Jean Hough (USGS) and her field assistant, Robert DeMar. The exposures were extensively explored and an outstanding collection of rare Paleocene and Eocene mammals was obtained. Included in this collection were holotypes of 11 new mammalian species, including the new pantodont *Caenolambda pattersoni* Gazin (USNM 21036).



The lower Cretaceous fish *Leptolepis tamanensis*, as found near Tamán, Mexico. From Dunkle and Maldonado-Koerdell, 1953.[5]

After collecting in the Bison Basin, Dr. Gazin and Franklin Pearce proceeded to South Pass, Wyoming, where "a very meager but stratigraphically important collection was obtained." [6] They were more successful in the Green River Basin near Big Piney, Wyoming, and in Fossil Basin near Kemmerer and Evanston, Wyoming, in July and August, collecting a wide variety of mammals. At the close of the field season, Dr. Gazin, accompanied by Mr. Pearce, led a small group from the Society of Vertebrate Paleontology Field Conference to the North Horn and Dragon Paleocene exposures in the Wasatch Plateau country of central Utah.



Skull of *Ectocion ralstonensis*.

Dr. Gazin and Franklin Pearce returned to Wyoming in June 1954, revisiting some of the more productive Paleocene and Eocene exposures in the south-central and southwestern part of the state. Between late June and late July they focused on areas in the Bison Basin, near Big Piney, La Barge Creek, and Kemmerer, and particularly prospecting in the Ft. Union, Almy and Wasatch Formations. They collected a wide variety of early mammals, including more than 300 currently catalogued skull and skeletal specimens and in particular an excellent skull and lower jaw of the condylarth *Ectocion ralstonensis* Granger (USNM 20736) that was later placed on display. Dr. Gazin noted that their specimens collected this year "add significantly to those obtained earlier and will contribute appreciably to the growing information on the fauna of the Cathedral Bluffs" [7] (The Cathedral Bluffs tongue of the Wasatch Formation contains fossil assemblages similar to some of those collected elsewhere in the Bridger Basin of southwestern Wyoming and the Bison Basin of central Wyoming. Thus, the information gained from Dr. Gazin's collections helps determine the geographic distribution of Paleocene and Eocene species throughout much of the state.) The party left Wyoming for Washington July 25.

Dr. Dunkle picked up the Smithsonian carryall (and Mr. Pearce) from Dr. Gazin on July 24, and collected at a variety of sites in Wyoming, Utah, and Idaho through September 12. He began his efforts in the upper Cretaceous Mowry Shale south of Cody, Wyoming, moved to Logan, Utah, to collect in the Lower Devonian Water Canyon Formation, and then proceeded to the Lower Triassic Woodside Formation in Paris Canyon in southern Idaho where he obtained "an extremely important collection of Lower Triassic fishes." [8] His efforts ended in the Upper Triassic Chinle Formation near Monticello, Utah. Of particular note was his collection of the nearly complete skull and skeleton of the fish *Hemicalypterus weiri* Schaeffer, now designated USNM 23425, the holotype of the species.



Hemicalypterus weiri (USNM 23425) collected by Dr. Dunkle in Utah, 1954.

Limited collecting was done in 1955. Due to illness, Dr. Gazin did not go to the field. Instead, he visited a number of museums to study their collections, including the Yale Peabody Museum, the American Museum of Natural History and the California Institute of Technology with an eye toward loans or specimen copies to augment both research and exhibits materials.

Dr. Dunkle, however, was able to "go West" twice in 1955. His primary intent was to obtain specimens suitable for the planned exhibit hall on fishes and amphibians. He and USNM exhibits preparator Donald Guadagni left Washington on May 18, 1955 for the Cretaceous chalks of western Kansas. They met the famous fossil collector George F. Sternberg in Hays, Kansas, and collected more than 200 fish specimens from the Niobrara Formation in Gove County, Kansas. The Smithsonian Annual Report for 1956 noted: "One of the most unusual recoveries were entire schools of the small acanthopterygian fish *Kansanius*, found preserved on the insides of giant shells of the clam *Inoceranus*." [9] The party returned to Washington around the first of August.

Dr. Dunkle and Franklin Pearce left Washington again on October 27, 1955 for the Permian of Oklahoma to continue the hunt for exhibit-worthy specimens. Although they located five specimens of the pelycosaur *Cotylorhynchus*, only one incomplete young individual merited the work involved in excavation, and only a partial skull fragment is catalogued today. They spent part of November in Texas and returned to Washington.

In contrast to 1955, 1956 was an active year for fieldwork. Dr. Dunkle made trips to both Canada and Scotland. Dr. Gazin traveled to Wyoming and Nebraska.



Eusthenopteron (USNM 271247)

Dr. Dunkle continued to concentrate on the collection of Devonian fishes. He left Washington on May 21, 1956 for Canada and joined long-time local fossil hunter Euclide Plourde to conduct fieldwork first in the Devonian Period Escumiac Formation along the shores of Escumiac Bay in Quebec and later at Upper Devonian and Lower Mississippian sites near Albert Mines and Cambellton in New Brunswick. Collecting was extremely successful. Together, Dr. Dunkle and Mr. Plourde returned more than 400 skeletal and skull elements and dermal bones to the Museum, representing the placoderms (armored fish) *Bothriolepis canadensis* and *Phlyctaenaspis acadia*, the jawless fish *Cephalaspis campbelltonensis*, the lobe-finned fish *Eusthenopteron foordi*, the lungfish *Scaumenacia curta*, and *Homalacanthus affinis*. Dr. Dunkle returned to Washington June 30.

Dr. Gazin went to Wyoming and Nebraska during July and August 1956, joined by Franklin Pearce and USNM exhibits worker Theodore Ruhoff. They focused their efforts on upper Eocene and lower Oligocene exposures in the

Wind River Basin and had significant success in finding a variety of mammal specimens, including a skull and skeletal elements of *Coryphodon* (USNM 22748) in the same Wyoming quarry where a *Coryphodon* was originally uncovered in 1954, an incomplete skull of the primitive horse *Mesohippus*, and two excellent skulls of the "bear dog" *Daphoenus* (USNM 362760 and 362761) in the Chadron Formation near Harrison, Nebraska. The party moved to prospect the Eocene exposures in Fossil Basin near Kemmerer, Wyoming, on 30 July. They also collected near Big Piney where they found "several excellent specimens including a partially articulated skeleton of *Meniscotherium*." [10] They returned to Washington August 17, with more than 100 mammal specimens.

Dr. Dunkle left Washington August 17 for Scotland, collecting there with Professor T. Stanley Westoll of the University of Durham. They collected more than 200 specimens of early and middle Devonian fishes from the Old Red Sandstone. Dr. Dunkle returned to Washington on November 9, 1956.

In 1957, the Division of Vertebrate Paleontology gained a new Associate Curator. Dr. Peter P. Vaughn, who studied Permian reptiles and amphibians, joined the Smithsonian in July. He, Dr. Dunkle and Dr. Gazin all conducted fieldwork that year.

Between May 6 and 20 1957, Dr. Dunkle joined Dr. G. E. Lewis of the USGS to explore the Jurassic Period Kayenta Formation on the Navaho Indian Reservation in Arizona, particularly looking for additional specimens suitable for exhibit display. Although they did not find anything suitable during this expedition, they found partial skeletons of four tritylodonts (mammal-like reptiles), part of a protosuchian crocodile, and one essentially complete tritylodont skull and skeleton (USNM 21836). Dr. Dunkle spent the rest of the collecting season in Washington, supervising preparation and reconstruction of specimens already in hand for the planned Hall of Fossil Fishes, Amphibians, and Primitive Reptiles.



Orohippus collected by Dr. Gazin and Franklin Pearce in Wyoming, 1957.

The summer season collecting was more successful. Dr. Gazin and Franklin Pearce concentrated their collecting efforts in the Bridger Basin of Wyoming, particularly focusing on some of the better previously identified middle Eocene localities around the towns of Green River and Lyman between July 12 and August 9. Unfortunately, the trip began inauspiciously. Dr. Gazin noted on July 12 that they had rented a housekeeping cabin in Green River and that the proprietor: "...refused to make us a weekly rate so had to pay daily \$7, which was highway robbery." [11] Even worse, they prospected both sides of nearby Twin Buttes with limited success. "Found layer which

produced bird bones in 1946, but it seemed barren now... Time in Twin Buttes area very poor so moved to Lyman. (7/18) Much better accommodations and for more reasonable rate, \$20/week. Saw much more bone south of Church Buttes." [12] The move rapidly paid off -- in addition to enjoying better (and cheaper) accommodations, the party eventually collected more than 300 fossil specimens, including partial skeletons of the perissodactyl mammal *Hyrachyus*, the primitive tapir *Helaletes*, a skull and partial skeleton of the primate *Notharctus tenebrosus* (USNM 21864), a variety of small mammals, a complete turtle carapace (USNM 22572), and "Particularly important to our exhibition program was the discovery by Franklin Pearce of a skeleton of *Orohippus*" [13] (USNM 26305). At the end of the collecting effort, Franklin Pearce returned to Washington in the Smithsonian carryall and Dr. Gazin proceeded by plane to Los Angeles to visit the Los Angeles County Museum and the California Institute of Technology collection of Eocene mammals.

Dr. Vaughn conducted his first fieldwork for the Museum in October 1957. During this first short expedition, he explored upper Mississippian formations near Greer, West Virginia, and continued on to the Dunkard series of lower Permian formations in northern West Virginia and southwestern Pennsylvania. The Dunkard Group is particularly important for Paleozoic research as it is one of the few examples of exposed Permian rocks east of the Mississippi River. Dr. Vaughn returned partial tetrapod skeletons and skulls of the small lepospondyl amphibian *Diplocerapsis* to the Museum.

The USNM also underwent a reorganizational change in 1957. Although it did not directly impact collecting by the Division of Vertebrate Paleontology, the USNM created two new administrative subdivisions: the Museum of

Natural History (MNH) and the Museum of History and Technology. Collections of American history, the Worch Collection of pianos, and the National Collection of Fine Arts were transferred from the MNH, allowing it to better focus on the natural world. The U.S. National Museum name was eventually eliminated in 1967, and the MNH became a separate stand-alone administrative unit within the Smithsonian Institution. The MNH was renamed the National Museum of Natural History (NMNH) in 1969 and has retained that name to the present. Specimens, however, both those then in hand and those collected later, continued to have "USNM" listed as part of their designator. To avoid confusion, we will refer to the Museum as the National Museum of Natural History (NMNH) from this point forward, but continue to refer to any cataloged fossil specimens by their USNM number.

Collecting was somewhat limited in 1958, and was conducted primarily by Dr. Vaughn at localities in the lower Permian of Texas, Oklahoma, New Mexico, and Colorado between March 15 and May 17. He was assisted by John Ott from the Division's Vertebrate Paleontology Lab and joined by R. Donald Widman of the National Park Service. Collecting was excellent, particularly in Texas, and several hundred pounds of amphibians, reptiles and fish fossils, mostly from the Clyde and Arroyo formations of Baylor and Wilbarger Counties in Texas, were shipped back to the NMNH.



Seymouria collected by Dr. Vaughn's expedition in Texas, 1958

Dr. Vaughn also made a short trip to the Permian Period Cutler formation in San Miguel Canyon in southwestern Colorado between October 6 and 18, 1958 with G. Edward Lewis of the USGS to review the stratigraphy. Current collection records do not show any specimens collected during this trip.

Unfortunately, another change in personnel occurred at the beginning of 1959. Dr. Vaughn resigned in January 1959 to join the the University of California at Los Angeles. His Associate Curator of Vertebrate Paleontology position was filled in June 1959 by a new hire, Dr. Nicholas Hotton III. Although best known as an expert in Permian/Triassic mammal-like reptiles, Dr. Hotton also researched and published extensively on dinosaurs. Like Gazin and Dunkle, Hotton also was tasked with a Hall renovation, in this case the overhaul of the Hall of Dinosaurs.

In May 1959, Dr. Dunkle and Dr. R. E. Eggleton of the USGS visited the site where Dulles International Airport was being constructed in Virginia, collecting vertebrae and rib fragments and several polygonal armor plates of the late Triassic phytosaur, *Rutiodon* (USNM 22381). These are believed to be the first vertebrate bones obtained from the Triassic of Virginia in the national collections.

Dr. Gazin, his wife, Elizabeth, and Franklin Pearce spent much of July and August 1959 exploring Eocene locations in southwestern Wyoming and Utah. Franklin Pearce drove the Smithsonian carryall and Dr. Gazin flew out, arriving in Wyoming on 24 July. The trio began working out of Lyman, Wyoming, focusing on the exposures just west of Sage Creek. While the primary purpose of the trip was to "*get better map data on the aerial distribution of Bridger stratigraphic units*", [14] they also had considerable collecting success. According to the Smithsonian Institution Annual Report for 1960, the trio "*traced the Sage Creek White Layer, which marks the boundary between the upper and lower Bridger Formation from the type section of Cottonwood Creek around the basin to its most easterly point on Twin Buttes. This study has considerable significance in properly correlating many of the collections made from various localities in earlier years and correcting errors on a map prepared by [William] Matthew and [Walter] Granger about 50 years ago.*" [15] Their collecting concentrated on the middle Eocene Bridger "B" levels on both sides of the basin, but, they also visited a lower Eocene locality in the Knight Formation just south of Bitter Creek Station. Approximately 200 fossil mammal specimens were collected over the course of the two months. The party left on August 22, with Frank Pearce returning to Washington with the carryall and Dr. and Mrs. Gazin proceeding on to California.

Dr. Hotton also spent the last week of October 1959 with Ellis Yochelson of the USGS and H. C. Berryhill examining the Permo-Carboniferous Dunkard Group, primarily in Belmont County Ohio, but including various localities in Ohio, Pennsylvania and West Virginia. The trip was relatively successful in that they collected vertebrates *"from 15 localities from which material had not been previously obtained."*[16] This activity laid the groundwork for future collecting, and these localities were revisited during the 1960s, with additional material obtained.

So, by the end of 1959, the Division of Vertebrate Paleontology was well established on the road to new exhibits. Materials for the Hall of the Age of Mammals and the Hall of Fossil Fishes, Amphibians, and Primitive Reptiles were mostly in hand. And, with the appointment of Dr. Hotton, work began in earnest on the renovation of the Dinosaur Hall. While work on the halls required significant time and attention, the study and research collections had also been greatly augmented. With three vertebrate curators focusing on fishes, dinosaurs, other reptiles, and mammals, the Division was well prepared to move forward.

List of Major Vertebrate Fossil Collection Expeditions Conducted by the United States National Museum During the 1950s			
Year	Curator in Charge	Age/Formation of Primary Interest	Area of Primary Interest
1950	C. L. Gazin	Pleistocene	Herrera Province, Panama
1950	D. H. Dunkle	Late Jurassic/Jagua	Pinar del Rio, Cuba
1950	D. H. Dunkle	Middle Eocene/Green River	Colorado, Utah, and Wyoming
1951	C. L. Gazin	Pleistocene	Herrera Province, Panama
1951	C. L. Gazin	Lower Eocene/Knight, Paleocene/Almy	Wyoming
1951	D. H. Dunkle	Jurassic and Cretaceous/Tamán Beds	San Luis Potosi, Mexico
1952	D. H. Dunkle	Jurassic , Cretaceous, Tertiary	San Luis Potosi and Oxaca, Mexico
1953	C. L. Gazin	Paleocene and Eocene	Bison and Green River Basins, Wyoming
1954	C. L. Gazin	Paleocene and Eocene	Bison and Green River Basins, Wyoming
1954	D. H. Dunkle	Devonian through Middle Cretaceous	Wyoming, Utah and Idaho
1955	D. H. Dunkle	Cretaceous/Niobrara formation	Kansas
1955	D. H. Dunkle	Permian	Oklahoma
1956	D. H. Dunkle	Devonian/Escumiac Formation; Mississippian	Quebec, Canada; New Brunswick, Canada

1956	C. L. Gazin	Eocene	Wind River and Fossil Basins, Wyoming and Nebraska
1956	D. H. Dunkle	Devonian/Old Red Sandstone formation	Scotland
1957	D. H. Dunkle	Jurassic/Kayenta Formation	Arizona
1957	C. L. Gazin	Eocene/Bridger Formation	Bridger Basin, Wyoming
1957	P. P. Vaughn	Mississippian and Permian/Dunkard Group	West Virginia and Pennsylvania
1958	P. P. Vaughn	Permian	Texas, Oklahoma, New Mexico and Colorado
1958	P. P. Vaughn	Permian era Cutler Formation	Colorado
1959	D. H. Dunkle	Triassic	Virginia
1959	C. L. Gazin	Eocene/Bridger Formation	Wyoming and Utah
1959	N. Hotton III	Permian and Carboniferous/Dunkard Group	Ohio, Pennsylvania and West Virginia

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