

Major Collecting Expeditions

Conducted by the Division of Vertebrate Paleontology during the 1970s and 1980s

By Mark Lay

This article deals with the major collecting activities conducted by the Division of Vertebrate Paleontology (VP) of the National Museum of Natural History (NMNH) during the 1970s and 1980s. It discusses the expeditions, generally of a month or more in duration, conducted by the curatorial staff. With the exception of one curator's trips to what was to become one of the most studied paleontological sites on the Eastern Seaboard, it generally does not deal with the numerous short or relatively local trips by either the professional VP staff or the many contributions made by other NMNH staff, museum volunteers, or amateur fossil collectors. Although many valuable contributions resulted from these activities, they simply are too numerous to record individually in this format.

The Early 1970s

At the beginning of 1970, there were three curators in the Division.

In 1970 Dr. Clayton Ray, Curator of Late Cenozoic Mammals, had been working on the Pleistocene Hall (also known as the Quaternary Hall and later as the Ice Age Hall) first planned in the 1960s for nearly six years. At the time, the NMNH fossil exhibits overall did not have many specimens from Australia, and Dr. Ray thought that such specimens might make an interesting exhibit within the Pleistocene Hall. Accordingly, he and Franklin ("Frank") Pearce (Head of the NMNH Vertebrate Paleontology Lab -- VP Lab) joined Dr. Richard Tedford and Dr. Robert Emry of the American Museum of Natural History (AMNH), and Paul Lawson and Neville Pledge of the South Australian Museum to collect in the interior of Australia. Between the beginning of July and late September 1970, the party explored the area around Moolawatana Station (near Copley, Australia) and revisited previously discovered Pleistocene sites at



Diprotodon skull, USNM 437462, as prepared for display.

Lake Callabonna (a dry inland lake in northeastern South Australia). The expedition was extraordinarily productive, with a large number of fossil birds and marsupials collected, including some fine skulls, nearly complete skeletons of *Diprotodon* (the largest marsupial ever discovered and now extinct) and a semi-articulated *Phascolonus* (a giant wombat). Unfortunately, the concept of an Australian exhibit never gained traction within the Museum and only one of the *Diprotodon* skulls collected (USNM 437462) during the trip was used in the eventual Ice Age Hall.


Dr. Nicholas Hotton III, Curator of Vertebrate Paleontology, was perhaps best known as an expert in Permian/Triassic non-mammalian synapsids, but he also was interested in dinosaurs. He had done significant fieldwork in the Permian/Triassic Beaufort Group of South Africa during the early 1960s, collecting fossils and researching both the geology and biostratigraphy of the Group. South Africa was geographically part of the supercontinent Gondwana during the Permian and Triassic (roughly 200-300

mya), and Hotton returned to South Africa during the summer of 1970 to attend the “Second Symposium on Gondwana Stratigraphy and Paleontology”. This major international conference spanned almost two months and sessions were held in both Cape Town and Johannesburg. Dr. Hotton arrived in South Africa in early July and, although he did no additional collecting on this trip, spent his time further reexamining the geology and stratigraphy of the Beaufort Group and examining specimens collected by the South African Geological Survey and various museums in addition to attending the symposium sessions. He left South Africa and traveled to London in early September, remaining at the British Museum (Natural History) through nearly the end of the month.

Senior Paleobiologist Dr. C. Lewis Gazin retired in July 1970, after an illustrious career spanning 40 years at the NMNH primarily studying the Tertiary and Quaternary land mammals of North America. Although Gazin remained associated with the museum after retirement, first as Paleobiologist Emeritus and later as Curator Emeritus, the museum needed a new staff curator for land mammals. In February 1971, Dr. Robert Emry was hired into the NMNH as Associate Curator of Fossil Mammals. His primary research interest, land mammals of the late Eocene and Oligocene epochs (roughly 40-23 mya) fit the need nicely. He initially focused his attention on Eocene and Oligocene formations in central Wyoming.

Dr. Emry is a native of Ainsworth, Nebraska, and maintained a house there. Over the years, this house provided Emry and his collecting parties a valuable base of operations, both as a place to store equipment, and to store and wash the matrix collected from their various field sites. In June 1971, Emry and Albert (“Al”) Myrick, Jr. of the VP Lab stopped at the house to gear up and then went to Wyoming. They remained in Wyoming through late August, mostly collecting in rock corresponding to the Chadronian North American Land Mammal Age in the Bates Hole-Flagstaff Rim area. (The Chadronian NALMA is part of the late Eocene Epoch, approximately 38-34 mya.)

Flagstaff Rim



Flagstaff Rim is an erosion scarp in Natrona County, Wyoming. Extending for more than seven miles in extent, it is comprised primarily of strata of Eocene age and is quite fossiliferous. Sediments to approximately 750 feet of depth are of Chadronian age, with an easily established stratigraphic sequence, a series of precisely dated volcanic ash beds, and a wide variety of fossil fauna.

Chadronian age localities are widespread in the western United States, with prominent outcrops in Montana, Wyoming, Colorado, Nebraska, the Dakotas, Texas, and also in Saskatchewan in Canada. While most have either some fossil species or stratigraphy in common with Flagstaff Rim, all lack one or more of the properties mentioned above. Flagstaff Rim has thus become an area of great importance for both correlating fossils from those widespread areas and in allowing more precise dating of a Chadronian biostratigraphy.

Much of Dr. Emry's research in the 1970s and early 1980s concerned fossils from Flagstaff Rim localities. The panoramic picture above is from his 1973 report on the stratigraphy and biostratigraphy of Flagstaff Rim. See https://repository.si.edu/bitstream/handle/10088/1948/ScTP-0018-Lo_res.pdf?sequence=2&isAllowed=y for more information.

The trip was extremely productive, and Emry later noted that their collection “included mammals of all sizes, including, for example, several skulls of brontotheres (titanotheres - the largest mammals living in North America during Chadronian time), as well as entelodonts, rhinos, camels, horses, and carnivores.

The most important single find was a small but very rich concentration of fossils, collected mostly as a single block, that upon preparation has produced literally hundreds of specimens of at least nine genera of rodents, insectivores (including *Leptictis*, *Apternodus*, two species of *Oligoryctes*, and *Centetodon*), bats, and many specimens of larger mammals such as *Meshippus*, *Poebrotherium*, *Leptomeryx*, *Bathynenys*, carnivores, and much of the skeleton of a large bird. The exposed fossil that led to collecting this block was discovered by Al Myrick, and the site was therefore called Al's Pocket.”¹

Dr. Ray's research focus shifted in 1971. With the initial acquisition of the Emlong Collection of fossil marine mammals in 1967 and Dr. Remington Kellogg's death in 1969, the NMNH had a large and scientifically significant collection of fossil marine mammals, but no curator to care for or study it. Progress on the Ice Age Hall had stalled, and with this wealth of material available, Ray's interest began to shift slightly from a focus on Pleistocene mammals to also include marine mammals from the Oligocene through Pliocene epochs (33.9 – 2.6 mya) . As part of this shift, in early July 1971, Dr. Ray, his daughter Sarah, and Frank Pearce travelled to Oregon to join up with amateur collector Douglas Emlong and familiarize themselves with the geology and localities in which Emlong had been collecting. The party spent roughly two weeks exploring and prospecting primarily in the Astoria (middle Miocene) and Yaquina (Oligocene) formations in northern coastal Oregon. They left Oregon in late July, taking some of Emlong's more recent finds: “Repacked [the] car at Emlong's house, loading as many fossils as we dared haul (weight too great) and left for D.C.”²

The Emlong Collection

Douglas Ralph Emlong was a talented amateur collector living in Oregon who had been collecting fossils along the coastlines of Oregon and Washington states since he was a teenager in the 1950s. He eventually amassed a large collection, mostly of marine mammals, in which fifteen new species and two previously unknown families have been identified to date. Much of his collection was purchased by the NMNH in 1967. From July 1971 until his death in 1980, Emlong collected additional specimens for the NMNH and for many of those years worked under a program supported by the Smithsonian Research Foundation. The Emlong Collection is currently catalogued at more than 1260 specimens.

The Initial Trip to Lee Creek Mine

After a short break in Washington, D.C., Dr. Ray and Dr. Frank Whitmore Jr. of the U.S. Geological Survey (USGS) left in mid-August 1971 for North Carolina. This trip began what eventually would become almost 45 years of short field trips to the Lee Creek Mine near Aurora, North Carolina. This site, geologically located mostly in the Yorktown Formation of the Chesapeake Group, was subsequently revealed to be one of the most productive Pliocene/Mio-Pliocene localities on the East Coast. Ray made four separate trips to the site in 1971, both to personally collect and also to pick up donations from local amateur collectors. He noted that the finds for the year included numerous good specimens of cetaceans, birds, sharks, bony fishes, and seals. He also acknowledged the invaluable assistance of amateur collectors from both the company that owned the mine (Texas Gulf Sulphur) and a local fossil club: “Some, if not most, of the finest specimens have been found and donated by Gerard Case, Peter Harmatuk, Roy and Gene Mapes, and Jack McLellan.”³ Indeed, most of the Lee Creek specimens now in the NMNH collections were donated by amateur collectors.

Smithsonian personnel made a number of short follow-up visits to the Lee Creek Mine in 1972. Dr. Ray had the primary responsibility, but Dr. Emry, Dr. Whitmore Jr., Dr. Alexander Wetmore (retired ornithologist, avian paleontologist, and former Secretary of the Smithsonian Institution), Frank Pearce, Al Myrick and research and collections assistant Robert Purdy all participated at various times. Over the course of the year, a large variety of whale, seal, turtle, dolphin, shark and walrus fossils were collected, with bird and crocodile remains thrown in for good measure. The NMNH later reported “...we are slowly

accumulating a fragmentary, but best yet, record of the vertebrates of the Yorktown Formation, plus a few from the Pungo River Formation.”⁴

The Lee Creek Mine

The Lee Creek Mine near Aurora, North Carolina, may be the most studied paleontological site on the Atlantic Coastal Plain. Although terrestrial vertebrate fossils are occasionally found, fossils of both marine flora and fauna are common at the mine, and primarily range in age from roughly 18.0 to 0.8 mya (i.e., Early Miocene to Middle Pleistocene). The open-pit type mine cuts through the Pungo River, Yorktown, Chowan River, and James City Formations.

Fossils from the Lee Creek Mine have now been collected and studied for almost 45 years. Contributions by 48 researchers over the years have been documented in four large volumes (“Geology and Paleontology of the Lee Creek Mine, North Carolina”, Vols. 1-4). Dr. Ray was the senior editor of all volumes and has been instrumental in advancing research. As early as 1984, the importance of the mine to paleontology was recognized and the Smithsonian’s Annual Report for that year stated: “...the mine to date has yielded one of the largest fossil sea bird faunas in the world; a superb collection of true seals, as well as an abundance of new and different species of whales; and a remarkable assemblage of sharks and bony fish, extensive enough to be considered the essential reference for reconstructing the history and development of the modern Western Atlantic fish fauna.”

Dr. Emry, and Sigmund (“Sig”) Sweda and Leroy Glenn (two preparators from the VP Lab) left Washington D.C. for Flagstaff Rim in mid-May 1972. There, they spent the first few weeks working some quite productive late Eocene localities discovered the previous year within the White River Formation. A number of good fossils, including roughly 25 specimens of the small ruminant *Leptomeryx* were shipped back to the Museum. It was not the best of trips as both Emry and Glenn fell ill with fever and chills. Both recovered quickly, and on the 10th of June, the party moved to Douglas, Wyoming. There they collected more than 200 specimens (field numbers) of the whole range of taxa from the White River Orellan NALMA (early Oligocene, roughly 33.7



Skull of *Cedromus wilsoni*, USNM 256584

-32.0 mya). Notable among the discoveries was a small, but rich, concentration apparently the result of owls. (Owls can eat small animals whole, but cannot digest their bones. The bones and hair are regurgitated in pellets, which in totality generally contain the entire skeleton of the consumed animal.) The find included “hundreds of bones, including numerous skulls and jaws, of sciurids, small eomyid and heteromyid rodents, and small marsupials, as well as many well preserved bones, including at least three skulls of the owls themselves.”⁵

Among the specimens found were several skulls of a new species of fossil squirrel. One of these was named the holotype of *Cedromus wilsoni* Korth & Emry and designated USNM 256854. The find was so rich that, more than 40 years later, much of this concentration of bones remains unprepared. The party also found a nice skull and associated skeleton of a *Poebrotherium* (an ancestor of modern camels, about the size of a sheep). However, as they were running out of time in the area, the *Poebrotherium* was left in place for excavation later in the same summer. Glenn returned to Washington at the end of June, and Emry and Sweda spent most of July continuing their explorations in the Orellan White River deposits northeast of Lusk, Wyoming, finding the usual wide variety of White River fauna. Hundreds of specimens were shipped back to the museum, including 50 oreodont skulls and various parts of *Mesohippus*, *Poebrotherium*, *Hoplophoneus*, *Daphoenus*, and a variety of rodents, lagomorphs, and other small mammals. At the beginning of August they turned their attentions to the sandstones in Big Sand Draw at the western end of Beaver Rim in central Wyoming, and ended the collecting season on September 9.

Dr. Ray made eight short trips to the Lee Creek Mine in 1973, with a variety of colleagues. Although bad weather hampered several trips, most were productive, with more than 600 specimens of fossil bird, seal, walrus, whale, dolphin, and shark skeletal elements collected either by the NMNH parties or donated by local amateurs.

Dr. Emry left Washington in late May 1973, accompanied by his wife Jennifer, and Michael Cohen of the VP Lab and his wife Karen, and headed for Nebraska. The party spent a week in Nebraska preparing for the field, and was joined by Dan Chaney of the VP Lab and Dr. Roger Hamilton, head of the Fossil Mammal Section at the British Museum (Natural History).

Hamilton's objective was to collect a good sample of fauna from the White River Formation for the British Museum, so the early part of the trip was designed with that in mind, with Hamilton's collections destined for the British Museum and the remainder of the party collecting for the USNM. The group proceeded to localities north of the town of Harrison, in northwest Nebraska, and from June 3 to June 14 prospected in White River strata, which in that area are principally Orellan (early Oligocene) in age. Over the 11 days spent in the area, the USNM party collected a few hundred specimens, representing the whole range of White River fauna, including small marsupials, insectivores, rodents, lagomorphs, carnivores, perissodactyls, and artiodactyls.

Dr. Hamilton was then given a two-day tour of sites in east central Wyoming, northwestern Nebraska, and southwestern South Dakota, and he obtained a second excellent sample of White River fauna. The party returned to Ainsworth, where they sorted and listed the specimens, and packed them in boxes for shipment. Dr. Hamilton left and the remainder of the party spent the next two weeks at late Eocene sites at Flagstaff Rim. Although they devoted most of their time to screen washing matrix collected from several existing sites, they also found significant specimens by prospecting, notably a block found by Dan Chaney containing most of the skeletons of two individuals of *Brachyrhynchocyon* (formerly called *Daphoenocyon* - an extinct carnivore sometimes popularly referred to as a bear-dog). This material was brought back to Ainsworth, and the group spent the next 10 days sorting the concentrate. On July 25, they returned to Wyoming and collected in the Orellan White River deposits exposed southeast of Douglas. This work resulted in another few hundred specimens of a broad range of White River taxa. The party returned once again to Ainsworth, NE, where the fossils were sorted, listed, and packed in 5 large wooden boxes, totaling more than 1,000 pounds, for shipping. In mid-August the party returned to a previously discovered Miocene site in north-central Nebraska, where they removed most of the ribs and vertebrae of a gomphothere (a now extinct elephant-like animal). Lack of time prevented collecting the whole specimen and it was reburied for later collection. They did some additional prospecting and collecting in Nebraska and closed the busy season out in mid-September.

A New Approach to the Ice Age Hall

In an attempt to reenergize progress on the stalled Pleistocene/Ice Age Hall, Dr. Porter Kier (then Director of the NMNH) asked Dr. Leo Hickey (a paleobotanist in the NMNH Department of Paleobiology), Dr. Emry, Dr. William Fitzhugh (an archaeologist from the NMNH Department of Anthropology), and Dr. Thomas Simkin (a volcanologist from the NMNH Department of Mineral Sciences), in 1973 to form an interdisciplinary curatorial team to work with a "small team of scientifically trained conceptualizers/writers"⁶ from the Smithsonian Office of Exhibits. This approach was first broached by the Office of Exhibits in 1971 and represented a dramatic departure from past practice. Up to that time, curators had to design an overall exhibit structure and write all the exhibit text labels -- activities which took significant amounts of time and which seriously reduced their collecting and research activities. As the Smithsonian Year for 1971 noted: "A new approach to exhibits planning and preparation has been initiated this year. While the staff scientists must always be the ultimate source for evaluation of the

accuracy of the science to be presented, they are not required to spend literally years conceiving and writing exhibits. A small team of scientifically trained conceptualizers/writers (an exhibits planning group) works with the curators, and interacts with the other half of the team, the exhibits designers and producers.”⁷ Curators were still required to create text outlines for the technical writers, obtain, select and oversee preparation and mounting of appropriate specimens, and review and ensure the accuracy of the final written and graphical products, but they did not have to design the exhibits, oversee hall construction, or be the primary drafters of explanatory text. While the new process did relieve the curators of some of the exacting work necessary to create a new hall, the number of meetings required still created a significant demand against both their research and field collection time.

In the first example of this process used in the paleontology context, the group proposed broadening the theme of the Pleistocene Hall. Rather than being simply a hall devoted to Pleistocene mammals, the new hall was designed to be “multidisciplinary, blending objects from the paleontology, mineral science, and anthropology collections into a thematic context that described the great physical and biological events of the Ice Age, including the development of the continental glaciers, the evolution of large mammals, the extinction of many of them, and the arrival of man.”⁸ All the required fossil vertebrate specimens were already in hand, and only limited additional work needed to be done to revise the existing mounts, although all the exhibit labels needed to be redone. It took less than a year to rearrange the exhibit space, reposition the specimens, and create new written, pictorial, and sculptural material. On September 13, 1974, the revised Pleistocene Hall, now called “Ice Age Mammals and the Emergence of Man”, finally formally opened to the public.

The Mid-1970s

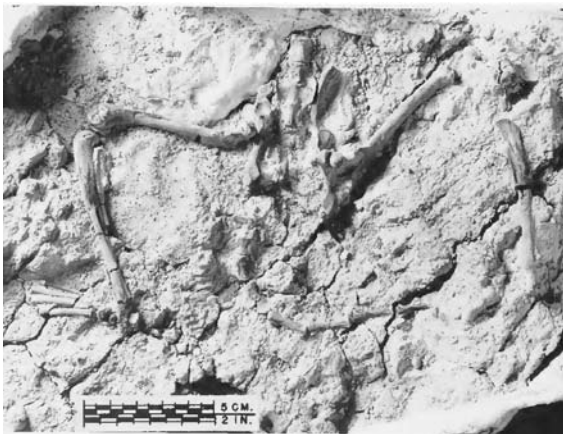
Dr. Ray made seven short collecting trips in 1974, including six to the Lee Creek mine. While the majority of Lee Creek material obtained that year was discovered or collected by Texas Gulf personnel, Dr. Ray, usually accompanied by Dr. Whitmore Jr., Frank Pearce, or Calvin Allison (a volunteer in the VP Lab) had significant success, bringing back a significant number of fossils, including seal bones, bird bones, sting ray elements, and both baleen and sperm whale skull elements. Ray noted in early February: “Got 75 seal bones from all collectors this trip that are worth cataloguing; one of our best hauls from the mine.”⁹ In mid-March, he further noted: “I had about as good a day as ever at Lee Creek. Found a good sea urchin, several bird bones, 2 seal jaws, about a dozen porpoise periotics [bones around the internal ear], and other run-of-the-mine specimens including 2 fair sized *Carcharodon* teeth.”¹⁰

Dr. Emry, his wife Jennifer, and Dan Chaney and his wife Barbara, returned to Nebraska in late June 1974. Picking up their field equipment at the Ainsworth house, they went back to the gomphothere site they had initially worked in 1973 and continued to excavate, collecting part of a scapula, several more vertebrae, a mandible, a tusk, a humerus, and some skull elements (which unfortunately were badly crushed). Returning the material to Ainsworth, the party then set out for Flagstaff Rim. They prospected around the Flagstaff Rim area through mid-July and worked two very rich late Eocene (Chadronian NALMA) sites in Lone Tree Gulch and Dry Hole Pocket. Dr. Emry actually had discovered Dry Hole Pocket years before, while still a graduate student. The locality was rich enough that he continued to quarry it for several years after coming to the USNM. He later estimated that he had washed “tons” of matrix from the locality over the years, looking for small mammal teeth. On this trip, Dry Hole Pocket yielded a large rodent jaw, later designated as the holotype of *Metaparamys dawsonae* Korth & Emry (USNM 521359). The party also collected a large micromammal block that looked productive as more than 30 skulls could be seen on the surface. When prepared, it proved to contain a bonanza of hundreds of specimens of several species of rodents, including the holotype of *Aulolithomys vexilliamae* Korth and Emry, a series of skulls of the insectivore *Centetodon*, two species of the insectivore *Oligorcytes*, some small marsupials, two skulls and partial skeletons of the small canid carnivore *Hesperocyon*, and a

number of teeth of a new species of the early lagomorph *Palaeolagus*, one of which (USNM 365759) was later designated as the holotype of the species.

Dr. Ray made three short trips to Lee Creek in 1975 and also joined Frank Whitmore Jr., newly hired preparator Arnold (“Arnie”) Lewis, and student James Kaltenbach on a drive to Church Point, Virginia, to examine the local stratigraphy. (Frank Pearce had retired in June 1974, after a career of some 28 years with the Smithsonian. Arnie Lewis was hired to replace him as head of the VP Lab. These trips were Lewis’ first field expeditions for the museum.)

Dr. Emry also had a successful field season in 1975. Emry, his wife Jennifer, and his son Owen all left for Wyoming on June 1. When they arrived, they were joined by Fred Grady of the VP Lab and focused their attentions on Eocene outcrops in and around the Flagstaff Rim area. They continued to prospect and collect in the area of previously discovered sites through late August, with excellent results. Among the specimens returned to the Museum were a nearly complete and articulated fossil squirrel, *Protosciurus jeffersoni* Douglass (USNM 243981 – discovered by Jennifer Emry and until recently still on display in the "Mammals in the Limelight" exhibit), significant skull elements of *Agriochoerus borealis*, and significant skull elements of the rare, small rhino-like animal *Toxotherium hunteri*. The *Protosciurus* specimen was particularly important – squirrel fossils from the late Eocene are relatively uncommon, and at the time of this discovery, were almost completely unknown in anything other than bits and fragments. The relatively complete skeleton allowed Dr. Emry to definitively link the fossil to modern squirrels and note that it “may be the oldest fossil squirrel known”¹¹. This important fossil was later described by Emry and Dr. Richard Thorington (Division of Mammals, NMNH).



Hindquarters of *Protosciurus* USNM 243981, as discovered and jacketed in Wyoming.



Protosciurus USNM 243981, as formerly seen on display.

Dr. Ray made two short trips to the Lee Creek mine during March and June of 1976. In addition to doing his own collecting, he picked up the material collected and donated by local amateur paleontologists, primarily Peter Harmatuk and geologist Jack McClellan of the Texas Gulf company. Current catalog records show that in 1976, Ray returned to the museum nearly 170 specimens including fossil seal skeletal elements, skull elements and teeth of various shark species, sting ray dermal elements and scales, turtle elements, and even some terrestrial fossils including horse and gomphothere parts.

Dr. Ray also spent mid-late July in New Mexico, California, and Washington. In particular, he and Arnie Lewis spent a week near Port Angeles, Washington, helping Doug Emlong excavate more than 7,000 pounds of whale skull and skeletal elements he had previously found in Oligocene Epoch rocks of the Twin River Formation. On July 26, they “carried out as many blocks of fossils as Arnie’s van would hold and as time and tide allowed.”¹² Lewis then proceeded to Utah to join Dr. Emry.

Dr. Emry had an exceptionally wide-ranging field season in 1976, collecting in Nebraska, Nevada, Wyoming, Utah, and South Dakota. He, his wife and son, and Fred Grady left Washington, D.C. on June 1 for Wyoming. After spending a week in the Flagstaff Rim area prospecting around Little Lone Tree Gulch and the Dry Hole Quarry with limited results, they moved to Nebraska. Near the end of June, they were joined by graduate student John Flynn and headed for the June Quarry, previously discovered by the AMNH north of Johnstown, Nebraska. (June Quarry is of Miocene/early Clarendonian age, roughly 13.6-10.3 mya). A local resident named Earl Brown had discovered in the quarry parts of the borophagine dog *Strobodon stirtoni*, including a skull, jaw parts and lower front limb elements. Mr. Brown donated those parts to the Museum and Emry’s party collected the rest of the nearly complete skeleton. (This specimen, USNM 215320, was on display in the "Mammals in the Limelight" exhibit until 2014, when it was dismantled as part of the overall paleo halls renovation. Current plans have it going back on display in 2019 as part of the new Deep Time exhibit.)



Strobodon stirtoni, USNM 215320, as it appeared on display.

After spending a few weeks in Nebraska, in mid-July the party travelled to the Elderberry Canyon near Ely, Nevada. Dr. Thomas Fouch (USGS), his daughter Melissa Fouch, and Forrest G. Poole (USGS) had discovered bones in the local limestone while doing geologic mapping of the canyon in 1975 and had sent some blocks (including the bones) off to the NMNH for identification. Dr. Emry had some of the bones prepared sufficiently to determine that they were of the middle Eocene perisodactyl, *Hyrachyus*. Given that, at the time, there were no known Eocene vertebrates from the Great Basin of the U.S. West, the specimen was of high interest and Emry asked Fouch to show him where they had been collected. The result was Emry’s mid-July trip. The limestone in Elderberry Canyon is very hard and has proven to be both difficult to work and remove. Blocks and matrix (rather than discrete specimens semi-prepared in the field as is typical at other sites) generally are returned to the NMNH, where the fossils are extracted slowly by reduction in a bath of dilute formic acid. This makes it difficult to immediately assess what had been collected – what parties collect are basically big blocks of limestone, sometimes with some bone visible but also including encased bone of unknown condition. After preparation, many bones are found to be compressed and distorted, but otherwise are often complete. The party had limited success on this initial visit, although a variety of mammal fossils were found. Despite the disappointing start, this was the first of Emry’s five trips to the area (1976, 1977, 1979, 1980 and 1983) and later trips were more productive, leading him to produce a number of publications describing the Elderberry Canyon fauna.

At this point the party split up, with Fred Grady and John Flynn heading back to the Flagstaff Rim area and Dr. Emry driving to the Uinta Basin in Utah to meet up with Arnie Lewis to review the stratigraphy of the Eocene sediments of the Duchesne River Formation. After spending two days in the area, Dr. Emry left for Flagstaff Rim in mid-August. After approximately a week of collecting, the two parties rejoined in Ainsworth, Nebraska. Short trips to the June Quarry, a highway cut near St. Francis, South Dakota, that had exposed Miocene (Clarendonian NALMA) fossiliferous sediments, and a short return to Flagstaff Rim finished the season.

Also in 1976, Dr. Hotton resumed the trips to the upper Pennsylvanian/lower Permian localities in north-central Texas that he had originally begun in the early 1960s. He and Arnie Lewis explored a variety of localities, some first discovered by the eminent vertebrate paleontologist Alfred Sherwood Romer and some new, around Seymour and Wichita Falls between October 13 and November 5. Collecting was plentiful, although Hotton noted that specimens were generally fragments or scraps, albeit with good preservation. Most of what he collected were amphibians and pelycosaurs, particularly *Eryops*, *Dimetrodon*, and *Trimerorhachis*. The occasional find of a good skull, articulated skeletons and the general state of preservation drew him back in following years.

The Late 1970s

In 1977, it was once again time to begin thinking about the renovation and reorganization of the paleontology exhibit halls. An ambitious, multiyear project was conceived that would treat the entire paleo space in the museum as a series of integrated exhibits that would present the history of life in a multidisciplinary fashion. All the paleo halls (except for the recently redone Ice Age Hall) would be redone in a phased and coordinated fashion, building to an overall plan rather than as independent activities. Museum Director Porter Kier asked Dr. Ian MacIntyre (an expert on coral reefs in the Department of Paleobiology) to head an NMNH scientific committee that would be responsible for developing the theme plan for the new hall and collaborating with the Smithsonian's Office of Exhibits to execute.

Drs. Hotton and Emry were the vertebrate paleontologists on the committee, which was composed of seven curators or associate curators from across the Departments of Paleobiology and Mineral Sciences. The group began work immediately, and was able to provide a final coordinated theme statement to the Office of Exhibits in mid-1978. Dr. Emry noted that even though he and Hotton did not need to create first drafts of labels and wall text as they would have in the past, they "...expect[ed] to devote an increasingly greater share of time to this program for the next two to three years. Much of the efforts of the vertebrate paleo preparation lab are also now devoted to exhibits preparation, which will also continue for some time into the future."¹³ So, while research activities did not take a back seat, they still had serious competition for time.

Dr. Ray made three short trips to Lee Creek mine in 1977. Donations to the national collections included nearly 150 accessioned seal, walrus, dolphin, baleen whale, sperm whale, fish, shark, turtle, bird, and horse fossils.

Dr. Emry began his summer 1977 field season in mid-June. He was joined in Nebraska by Fred Grady and Arnie Lewis, and they proceeded to Little Lone Tree Gulch in the Flagstaff Rim area in early July. They found a number of *Cylindrodon* and *Leptomeryx* jaws, and a partial jaw and skull of *Palaeolagus*.



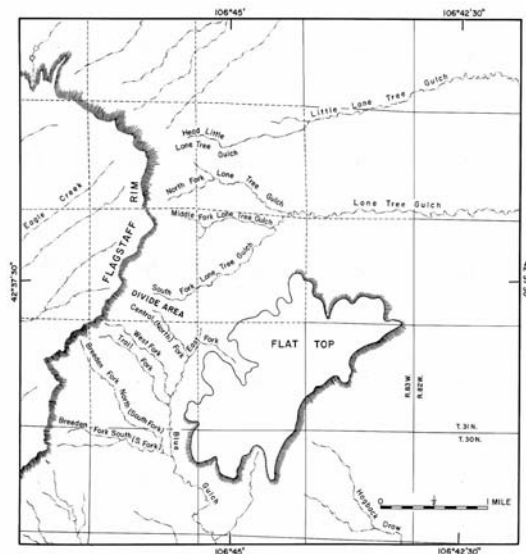
Trimerorhachis skull, USNM 531558, as it appeared on display.

At the end of July, they headed for the Elderberry Canyon in Nevada. Although Dr. Emry noted at the time that most of what was found in Nevada was fragmentary and unidentifiable, they collected 665 pounds of middle Eocene (Bridgerian NALMA, roughly 50-45 mya) matrix for later work. After a short trip to Montana to prospect Black Butte, the party returned to the Flagstaff Rim camp and, joining up with Dr. Storrs Olson of the NMNH Division of Birds, went on to a site yielding remains of the bird *Presbyornis* in the Eocene Green River Formation. This site proved to be extraordinarily productive, with "incredible numbers of individuals" collected. In particular they brought back the first known complete skulls of *Presbyornis* found. The specimens included USNM 299846 and USNM 430962, a slab with a complete skull and skeleton, which was prepared and put on display in the "Mammals in the Limelight" Exhibit.

Dr. Hotton and Arnie Lewis returned to north-central Texas in 1977, arriving in mid- October and again concentrating their efforts in or near the Permian sites discovered in 1976. As before, the cooperation and cordiality of the local landowners on whose ranches the sites were located was excellent. Hotton wrote in his field book: "Met James Parkey at his office in Wichita Falls. Very cordial – showed aerial photography of his place and suggested places to look at. Said the main reason he keeps bone-hunters off his place is to save the material for those who will do something with it. Claude Cowan said much the same thing."¹⁴ Hotton and Lewis had significant success during this trip, returning, in particular, good specimens of *Eryops*, *Trimerorhachis*, *Diadectes*, *Dimetrodon*, *Captorhinus*, and a "skull and partial skeleton" of *Edaphosaurus* (USNM 299844). They headed back to Washington, D.C. in early November.

Dr. Ray and NMNH research and collections assistant Robert Purdy made three short trips within Virginia and North Carolina during 1978, including visits to the Lee Creek mine, exploring the stratigraphy along the James River, and attending the second annual Fossil Fair sponsored by the North Carolina Fossil Club. (This fair offered an opportunity for the public to have their fossils identified in an "Ask the Expert" format, while also allowing NMNH paleontologists to see what finds had been discovered locally. It was so useful that NMNH Staff, generally Dr. Ray, Robert Purdy, Fred Grady or collections management assistant Dave Bohaska continue to support the fair even today.) Current collection catalog records indicate more than 100 baleen whale, sperm whale, beluga whale, seal, turtle, sting ray, dolphin and mackerel shark skull or skeletal elements were collected or donated to the museum that year.

Dr. Emry left for his summer field season on June 9, 1978. Arriving in Nebraska, he was joined by Arnie Lewis, Donald Prothero (then a PhD student at Columbia University) and Dee Hall, a preparator from the Field House Natural History Museum in Vernal, Utah. They prospected through the Duchesne River Formation (Middle Eocene) in Utah for a few days and then proceeded to Little Lone Tree Gulch in the Flagstaff Rim area of Wyoming. Shuttling back and forth to Ainsworth to drop bags of matrix, they remained in the Flagstaff Rim area until mid-August. Of particular note, the expedition returned a complete brontothere skull and mandible (USNM 482318), a *Poebrotherium* jaw, an oreodont skull and jaw, a *Meshippus* skull and jaw, and a number of rodent, insectivore and horse skeletal fragments.



Flagstaff Rim Map Detail
(after Emry, 1973)

Dr. Hotton returned to Texas in 1979, accompanied by his wife Ruth and arriving in Wichita Falls on April 11, the day after the area had been hit by a tornado. (Ruth Hotton had trained as a sedimentologist, and functioned as an unofficial research assistant to Hotton on many of his expeditions. He considered her knowledge and assistance, both in interpreting local stratigraphy and in spotting and collecting fossils, as extremely valuable to his work.) Hotton noted in his field book that the tornado had done extensive damage throughout his usual collecting area. While the damage made it difficult to find many of his landmarks and thus limited his take, the pair did collect fossils of the conifer *Walchia* and skeletal remains of *Megalichthys*, *Trimerorhachis*, *Eryops*, *Dimetrodon*, *Diadectes*, and *Edaphosaurus*. In particular Hotton noted finding a “beautiful” pelycosaur femur (USNM 407817), later identified as belonging to *Varanosaurus*. They left the area in mid-May. Hotton timed his return to Washington D.C. to be back in the museum when the existing dinosaur hall was scheduled to close for its part of the paleo halls update. On May 29, the hall (including the balcony) was closed to the public and renovation work officially began.

Dr. Emry and Mike Pechacek, an amateur fossil hunter from the Washington D.C. area, left Washington and travelled to Ainsworth in early June 1979. After spending some time prospecting south of the town of Springview, Nebraska, and along Plum Creek north of Johnstown, Nebraska, without finding much other than fragments, they left on June 26 for Sheep Mountain, South Dakota. There they found some partial jaws of the early horse *Mesohippus*, the camel *Poebrotherium* and the rodent *Ischyromys*. They then headed back to Ainsworth. Another student, Constance Gawne, joined the party in mid-July and the group went to the Miocene Egelhoff Quarry in north-central Nebraska, previously discovered by Morris Skinner of the AMNH. Over the next few days, they collected an estimated 2 ½ tons of matrix. Both Gawne and Pechacek became mildly ill with headache and light fever and consequently limited their field time over the next week, remaining in Ainsworth to wash and sort the take. Emry and Pechacek later drove to a site near Harrison, Nebraska, and recovered a variety of oreodont, horse, camel, carnivore, rodent, and lagomorph fossils.

In late July, Dr. Emry drove to Vernal, Utah, to prospect the Eocene Lapoint Member of the Duchesne River Formation. He didn't have much luck and continued on to the Elderberry Canyon locality in Nevada. He spent the next two days in Nevada and collected several large blocks, totaling possibly 700-800 pounds. Emry then returned to Ainsworth and continued on to Washington D.C. at the beginning of September.

Dr. Ray made at least one short trip to the Lee Creek mine in 1979. It was at this point that so many NMNH Staff, outside researchers, and amateur collectors were involved in the Lee Creek work that Ray stopped trying to detail all the trips made to the site. Relevant documentation was, as always, maintained regarding the specimens returned to the museum, but specifics about each individual's visit were not usually captured.

New Halls and the Early 1980s

On April 17, 1980, the first two of the new multidisciplinary paleontology exhibits called for in the themed plan were opened to the public. As noted in the Smithsonian Year report for 1980: “The Conquest of Land” and “The Flowering Plant Revolution” portrayed “the momentous emergence of plant and animal life from the oceans about 400 million years ago and the later developments that gradually enabled this life to perfect the ability to live on land. To explain and illustrate these developments, hundreds of plant and animal fossils from the museum's study collections were integrated in context with their ancient environments.” One of the highlights of “The Conquest of Land” was the vertebrate transition from sea to land. Many of the specimens Dr. Hotton had collected and studied over the previous 20 years were displayed in this exhibit.

Dr. Hotton was not present at the formal public opening of the new hall. He returned to his Permian localities near Seymour, Texas, arriving April 2, 1980. His field book notes in particular that he had found parts of the rhipidistian fish *Ectosteorhachis* and fragments of the amphibian *Trimerorhachis* that were “beautifully preserved but apparently broken up during burial”, a variety of shark teeth and pelycosaur “spare parts” and “articulated verts, sacrals, caudals” of a *Dimetrodon*, although no associated skull.¹⁵ He left the area in early May and spent an additional month in Arizona and California before returning to Washington D.C. in June.

Dr. Ray took four short trips to Lee Creek in March, May, July, and October, 1980. Current collection records show that a variety of mammal, fish, bird, and reptile fossils, either collected by Ray or donated by local amateurs, were returned to the museum. He also noted success during a short trip to Bone Valley, Florida at the end of May: “Split my travel money for the rest of the year between Arnie Lewis and [Dr.] Daryl Domning [Howard University] and they took the Department van to Florida...Obtained best collection yet from Bone Valley; several porpoise skulls, parts of several sea cows (one almost complete) and lots of other bones.”¹⁶



Carcharodon tooth donated by P. Harmatuk, 1980

Dr. Emry left for Nebraska at the end of June 1980, and was joined in Ainsworth by Dan Chaney. They spent two days collecting in the Miocene Norden Bridge and Egelhoff Quarry localities, and collected roughly a ton of matrix. After washing and drying, this matrix yielded roughly 250 pounds of concentrate. After a short visit to quarries in the Running Water and Sheep Creek formations to review stratigraphy, they returned to Ainsworth and were joined by Dr. Emry's wife Jennifer (Jenny), her mother, her sister Jill, and their sons Owen and Jesse. This turned out to be fortuitous. On July 22, they went to the South Fork of Lone Tree Gulch near Flagstaff Rim and Dr. Emry noted in his field book: "Jenny found a large *Hyaenodon* mandible. I got a nice rabbit skull, *Cylindrodon* skull, and a leptidid partial skull and an assortment of post-cranial elements."¹⁷ The *Hyaenodon* specimen turned out to include the first known jaw of *H. megaloides* (USNM 489154).

In late July, Emry and Chaney proceeded to the Elderberry Canyon locality in Nevada. Although they were able to collect some of the extremely hard rock with some bits of exposed bone, Dr. Emry noted: "It is now getting very difficult to get rock out of the bone bearing bed. It would require considerable work, possibly dynamite, to clear enough overburden to make it possible to get much more rock."¹⁸ Current collection records do not yet show any catalogued specimens resulting from this trip. They spent less than two days at the site, proceeding back to Ainsworth via Powell, Wyoming, for the Bighorn Basin Field Conference. Chaney left for Washington on August 10 and Dr. Emry left near the end of the month.

Dr. Hotton again collected in his Permian localities near Seymour, Texas, at the beginning of April 1981. Collecting in both the Belle Plains and Arroyo Formations, he returned to the museum a variety of skeletal elements from *Dimetrodon*, *Diplocaulus*, *Edaphosaurus*, *Eryops*, and *Trimerorhachis*. Although still busy with exhibit-related duties, he also was able to travel to Wyoming later in the year and prospected in the Permo-Triassic Chugwater Group with Arnie Lewis and Dan Chaney. The Chugwater is not particularly fossiliferous and only a few jaw fragments of an unidentified rhynchosaur (USNM 494329) from the Late Triassic Popo Agie Formation were returned to the museum and catalogued.

Dr. Emry, Dan Chaney and Fred Grady left Washington D.C. for Nebraska at the beginning of June 1981. They spent some time collecting in the June Quarry in Nebraska and then joined "a cast of thousands" at a joint dig with the University of Nebraska at the Norden Bridge Quarry from June 22 to July 22. The trip resulted in more than 800 collection catalog entries, primarily of *Merycodus necatus*, *Neohipparion republicans*, *Parahippus cognatus*, and *Ramoceros osborni*. The party also collected a nearly complete

skull of the giant beaver *Anchitheriomys* (USNM 299914). Following their time in Nebraska, Dr. Emry and Dan Chaney proceeded to New Mexico to examine micofauna sites.

In January 1981, Dr. Anna (“Kay”) Behrensmeyer was hired into the Department as Associate Curator of Vertebrate Paleontology. An expert in taphonomy and paleoecology, and with a deep interest in mammalian (particularly hominid) evolution, Dr. Behrensmeyer also maintained her association with a Harvard group examining hominid fossils in the Siwalik Sequence in Pakistan and modern taphonomy in Amboseli Park, Kenya. While not collection expeditions aimed at recovering specimens for taxonomic goals (the traditional focus of vertebrate paleontology), the results of her research and collection activities provided ongoing insights into our understanding of paleoecology and potential biases in the fossil record. Behrensmeyer made roughly biennial trips to Pakistan and Kenya in support of these projects, as well as frequent visits to taphonomic experiment sites in the U.S. where she investigated how bones are transported in different river systems.

What is taphonomy?

Simply put, taphonomy is the study of the processes that affect animals or plants after they die, through their fossilization, up until the time they are discovered, and including even further “natural” changes that can happen on museum shelves. Taphonomy is important in paleobiology as it can help tell us about the environment in which the plant or animal lived and shed light on any information about how it died, was buried, and its fossil preserved. Taphonomic processes can include biological processes (such as scavenging or decay), physical processes (such as movement of the specimen by a river or landslide), and chemical processes (such as mineralization or de-mineralization). All of these factors can help inform our knowledge of both the fossil itself and the overall paleoecology of the ecosystem in which the plant or animal existed.

Dr. Behrensmeyer made extensive collections of taphonomically informative modern bones and fossils during the 1980’s that are being databased and will be catalogued to form the core of the National Taphonomy Reference Collection at NMNH. Because she worked in Pakistan and Kenya, fossils from these areas at NMNH are on long-term loan and cannot be catalogued in the USNM system because they belong to those countries. This means that the records of accessions of those fossils from her annual collecting trips are not available as they are for other Department of Paleobiology scientists, although some casts of specimens have become part of the NMNH collection. The National Taphonomy Reference Collection is used by visitors interested in examining, for example, damage caused by bone-crushing hyenas or abrasion typical of river transport of bones. Dr. Behrensmeyer continued her taphonomic study of the bones of Amboseli Park, Kenya throughout the 1980’s, with field work in 1982 and 1985 to monitor marked carcasses and re-sample recent bones on established transects, and collect fossils for the National Museums of Kenya.

On December 4, 1981, the renovated exhibit “Dinosaurs: Reptiles—Masters of Land” opened to the public. Following the approach mandated by the theme plan, this exhibit included not only dinosaurs, but also focused on the overall paleoecology, with reptiles and other animals and plants of the appropriate timeframes included as well. Also, for the first time, flight was included, with a life-size model of the reptile *Quetzalcoatlus northropi* on display near the exhibit’s overlook balcony.

Dr. Ray did not conduct a large field trip in 1982, but rather did a number of short excursions in Maryland, Virginia, and North Carolina. The current catalog reflects that he collected a Pliocene baleen whale skull from the Yorktown Formation in North Carolina in December.

In April 1982, Dr. and Mrs. Hotton prospected some well-known Permian East and Middle Coffee Creek localities in the Arroyo Formation in Baylor and Wilbarger counties, Texas. Although paleontologists have collected in and near these localities since the late 1890s, they had significant success, returning,

among other things 4 bags of *Lysorophus* (a small amphibian) fragments, numerous shark teeth, and significant quantities of *Diadectes*, *Dimetrodon*, *Eryops* and *Diplocaulus* (particularly a fine skull - USNM 406294) fossils. Early in the dig, Hotton was visited by the science fiction/fantasy author L. Sprague DeCamp, who was credited with assisting in the collection of part of a skeleton of *Dimetrodon* (USNM 406357). DeCamp appreciated the relationship that he developed with Dr. Hotton and went on to dedicate an anthology of short stories about a time-traveling safari guide to him.

Dr. Emry and family arrived in Ainsworth, Nebraska, on June 22. Fred Grady joined them about two weeks later. Some of the local Miocene Epoch sites they had earlier visited were no longer productive: "Went to Norden Bridge Quarry -- it is all covered, caved in, etc now...Went on to Egelhoff Quarry which has been partly excavated for road fill. Found nothing."¹⁹ In mid-July they left Ainsworth for their old Flagstaff Rim campsite in Wyoming. A short stop at Little Lone Tree Gulch was quite productive. Grady found a titanotherid mandible, which he jacketed and removed on the 17th. On July 20, Jennifer Emry found an armored lizard (*Helodermoides* sp.), catalogued as USNM 529372. Dr. Emry's field book noted: "It had a beautiful skull with all scutes in place."²⁰ In addition to these specimens, they found a number of fossil leaves, which they also sent back to the Museum. They headed back to Nebraska on July 21 to drop their material and headed for North Dakota a week later. They remained at the Oligocene (Orellan NALMA) Fitterer Ranch locality in North Dakota for a few days, finding jaws and associated post-cranial elements of a small carnivore and then made a quick pass through South Dakota, examining road cuts near St. Francis, before returning to Ainsworth. They shipped two large boxes (377 pounds) and two smaller boxes of material from North Dakota back to the Museum. Grady left on August 10 and the Emrys returned to Washington at the beginning of September.

Dr. MacIntyre, who had been Chair of the Paleobiology Exhibits Planning Committee since 1977, was appointed Chair of the Department of Paleobiology in September 1982. Dr. Emry agreed to be the new chair of the Planning Committee, and thus was now responsible for both leading the work of the committee and the detailed curatorial work necessary for the forthcoming "Mammals in the Limelight" hall. Emry retained the committee chairmanship through the remainder of the 1980s.

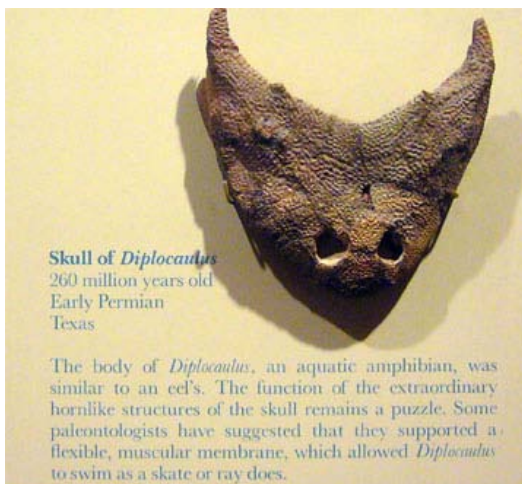
Dr. Hotton left for Antarctica at the end of 1982, arriving in McMurdo Sound on January 1, 1983 and spending the next few days learning "snowcraft". From there he was helicoptered out to the edge of the bay of ice that divides the east and west arms of Allan Nunatak. (Nunatak is an Inuit word designating an exposed rocky ridge or mountain surrounded by ice. Thus, the Allan Nunatak is an exposed area of the Allan Hills in East Antarctica.) Hotton noted that from top to bottom, the stratigraphy of the area was Feistmantel Formation, Weller Coal, Feather Conglomerate, Lashley Formation and Mawson Diamictite, all of Permian and Triassic age. The weather was extremely cold and windy and, finding no bones, he moved camp to the Lashley Mountains. On January 20, he noted: "It's been disappointing as far as bone is concerned, but each of the days that we found good plants we got better material than has so far been reported from Allan."²¹ He left nine days later, with no significant bones reported collected.



Part of the Alan Nunatak, Antarctica, 1983.

Dr. Behrensmeyer spent part of 1982 and 1983 with the Harvard team in Pakistan, studying the Miocene Siwalik sequence. She was accompanied by Dan Chaney in 1982 and Fred Grady in 1983.

Dr. and Mrs. Hotton were joined by Arnie Lewis at their Permian localities near East and West Coffee Creeks, Texas, in April 1983. Although they brought back a number of good specimens, including a large number of skulls and partial skulls of *Lysorophus*, *Eryops*, and *Diplocaulus*, collection success was extremely sporadic. Hotton was driven to note on April 4: "Two turds [coprolites – fossil dung] all day long; not one lousy bone."²² The party shifted their sites slightly and continued to prospect and collect in the areas of Brushy and Hog Creeks through May 5.



Diplocaulus skull, USNM 8814, as it appeared on display



Diplocaulus skull and axial elements, USNM 409620, collected by Dr. Hotton in 1983.

Dr. Emry left for Nebraska in late June 1983. In Ainsworth, he picked up the Departmental truck and he and Dan Chaney left for Ely, Nevada, on July 9. In Ely, they met up with Arnie Lewis and his wife Jane and proceeded to an Elderberry Canyon locality they had last worked in 1980. Work was difficult as the carbonate rock at the site was extremely hard and all the more easily collected bone-bearing rock had already been collected. They decided to clear the overburden from an area measuring roughly 3 ½ feet by 8 feet -- which meant using a jackhammer to drill and split the rock, and which took almost a week to complete. However, collecting was good -- they took out several 50-60 pound blocks of matrix and two larger blocks which weighed 300-400 pounds when jacketed for transport. Lewis left on July 22 and the party shipped a little over two tons of rock to the museum. Dr. Emry noted at the time that the site was both larger than expected and extremely productive, and that "each piece of overlying rock exposes more bone"²³, with bone appearing to be as concentrated near the back of the working as at the front. In addition to being problematic in the field, the hardness of the rock encasing the fossils also was a challenge back in the VP lab. Once back in the lab, blocks would be placed in a dilute acid bath, and after a millimeter or so of rock had been dissolved, the blocks would be removed in order to wash the exposed fossil, which would be brushed with a protective coating. The block then would be slipped back into the acid. This extremely slow and painstaking process was repeated until the encased specimens were free. Chaney, who did much of the initial acid-preparation work, estimated early on that at least 3500 pounds of the roughly 5000 pounds of material returned to the museum had been dissolved and flushed down the drain. The process took sufficient time and labor that some of the material from this site has still not been prepared, more than 30 years later.

Emry and Chaney returned to Ainsworth in late July. While Emry remained in Ainsworth, Chaney and Morris Skinner, a "retired" paleontologist long associated with the AMNH, went to a Miocene locality near McCann Canyon near the Niobrara River in north-central Nebraska, and brought back three very rich bags of matrix, which proved to include "mole, shrew, heteromyid, cricetid, aplodontid, castorid, artiodactyls, and lizard" bones.²⁴ Emry, his family, and Chaney returned to the site a few days later and collected a further 25 bags of matrix for later sorting. Chaney left Ainsworth about a week later. Emry and his wife proceeded to Flagstaff Rim, where they collected some *Leptomeryx* fragments and a nice lizard skull near Lone Tree Gulch. After a short visit with commercial fossil dealer Karl Ulrich in Kemmerer, Wyoming to examine a Green River fossil palm frond that the NMNH hoped to buy for exhibit purposes, the Emrys returned to Nebraska and stored the Departmental truck for the winter. The museum bought the fossil palm, and Emry drove it back to Washington D. C. in a rental truck at the beginning of September.

Dr. Behrensmeyer spent August 1983 in Colorado, Wyoming, and Nebraska continuing a project originally begun in 1974. Behrensmeyer and C. Bruce Hanson (University of California) had the idea that seeding streams, rivers, river banks, sand bars, and flood plains with tagged modern bones, and then tracking those bones over time could provide significant information both about environmental effects on the bones and their transport from where they were originally deposited. This information would then provide a better understanding of fluvial effects on similar fossil assemblages. Behrensmeyer continued to monitor the research sites for the rest of the decade and made extensive collections of both the recovered experimental bones that had traveled known distances downstream and "wild" or naturally occurring bones found along the various rivers. These bones represent a modern analogue for the kinds of animals and body parts found as fossils preserved in ancient channel deposits. See:

http://www.mnh.si.edu/ETE/ETE_People_Behrensmeyer_ResearchThemes_BonesTransport.html for more information on this project.



Dr. Behrensmeyer, intern Dana Coyle, and an array of the tagged experimental bones, 1983



Site where one of the experimental bones was buried. Glenn Yanagi is operating the metal detector and Chuck Behrensmeyer is pointing to the burial site.

The Mid-1980s

Dr. Behrensmeyer and Fred Grady traveled to Miocene localities in Pakistan in January 1984, where they explored the middle Miocene Chinji Formation. Dr. Behrensmeyer continued on to Kenya in February, where she joined a research team working on Miocene sediments and fossils of the Tugen Hills in central Kenya. Behrensmeyer's work in both Pakistan and Kenya continued throughout the 1980's, and she usually spent 2-3 months per year in the field.

Dr. Hotton again spent about five weeks in Texas. Arriving in early April 1984, and broadened his prospecting range to include Permian localities around Deadman's Creek, Hog Creek, and Indian Creek, although remaining in Archer and Baylor Counties for the most part. Much of the time was spent cross-checking and correcting maps. He noted in particular that the landmarks such as roads, fences and water tanks around Indian Creek did not conform to the maps he had – making finding previously discovered sites more difficult. Regardless, he had considerable success, finding various miscellaneous fossils of *Diadectes*, *Dimetrodon*, *Eryops*, *Trimerorhachis*, and *Lysorophus*, including a complete skull, and “many good coprolites”.²⁵ Dr. Behrensmeyer joined him on April 30 and remained at the site through his return on May 14.

In 1984, Dr. Emry was still deep in the midst of the work on the new "Mammals in the Limelight" Hall and had only a short field season. Leaving Washington on mid-July, he spent time in Ainsworth, Nebraska, and arrived at his regular Flagstaff Rim campsite at the end of July. He prospected both the head and south fork of Little Lone Tree Gulch, finding quite a few good fossil leaves and several seeds during this effort. It also was an exciting trip in that he had to kill two rattlesnakes in and near his campsite in the first few days. He returned to Ainsworth a week later and shipped four cartons of fossils back to the Museum over the next few days. On August 10, he drove to a ranch in Keya Paha County Nebraska where the rancher had recently collected what he thought were horse and camel bones. Enough bones were weathering out that Emry had to return to jacket them all. He ended up collecting two boxes of Miocene horse skull elements, some lower jaws, teeth, and miscellaneous parts of unidentified mammals. He returned to Washington later that month.

After several delays, the “Mammals in the Limelight” exhibit formally opened to the public on May 30, 1985.

In 1985, Dr. Emry, Dan Chaney, Fred Grady, and Mike Tiffany (a museum technician with the Smithsonian's Office of Exhibits) travelled to Garden County, Nebraska, to collect near Lisco. The “Lisco-C” localities (Broadwater Formation, Pliocene/early Blancan, roughly 3.5 mya), had been discovered in 1936 and had been worked heavily from 1939 to 1941 by field parties from the University of Nebraska State Museum. At that time, the localities were well known for yielding fossils of *Gigantocamelus fricki* (a giant camel), and Emry was hoping to collect sufficient bones to mount one for later inclusion in the “Mammals in the Limelight” exhibit. After making a survey of the area, Emry returned to Washington, leaving Chaney, Grady, and Tiffany to work in conjunction with a field crew from the University of Nebraska State Museum. In addition to camel skull and skeletal elements, the party also returned a variety of horse, turtle, snake, and lizard fossils to the museum. Although Emry now had most of a camel (either actual bones or casts, lacking only the ribs), it was decided that, as the exhibit was now open and relatively full, not to mount and display it.

Dr. Hotton returned to north-central Texas in mid-April 1986, mostly making notes of the stratigraphic bedding around his previously discovered sites and broadening out to the hills around Godwin Creek and the road into Fulda. He was joined by Arnie Lewis on April 28, and they prospected the areas around Cottonwood and Coffee Creeks. According to Dr. Hotton's notes, they pair found a lot of material, but most was badly weathered and thus was not collected. Lewis left about two weeks later. Hotton remained in the area until May 23, focusing his efforts particularly on the Early Permian Briar Creek Bonebed (discovered in 1912 by Prof. E.C. Case of the University of Michigan, and long a good source of *Dimetrodon* bones) but with limited collection success.

The Late 1980s

In early May, 1987, Dr. Emry was scheduled to present a paper on the middle Eocene (Bridgerian) mammals he had obtained from the Elderberry Canyon localities at a Geological Society of America

symposium in Boulder, Colorado. After the symposium ended, Emry continued on to Elderberry Canyon and collected a variety of small rodent and mammal fossils, mostly skull elements, jaws and teeth. This was Dr. Emry's last trip to this area.

Although he did not collect, Dr. Hotton returned to South Africa in August, 1987. Hotton spent most of his time in the Karoo region near Fraserburg in the company of Dr. Bruce Rubidge (then Head of the Paleontology Department of the National Museum in Bloemfontein) and Roger M. H. Smith (then a doctoral student at the South African Museum in Capetown). Hotton's interest on this trip was to examine trace fossils, and Rubidge and Smith were able to guide him to a variety of footprint trackways, worm trails, spiral burrows, and possible arthropod tracks.



Therapsid trackway,
South Africa, 1987

Dr. Hotton and Dan Chaney returned to Texas in early April, 1988, and prospected the Permian strata of Copper Breaks State Park, Texas, in support of the new "Evolution of Terrestrial Ecosystems" program started at the Smithsonian the year before. (See

<http://www.mnh.si.edu/ete/> for more information on this program.)

Over the next few days they collected "a few bags" of miscellaneous material. The "rest of the ETE crowd" (including Kay Behrensmeyer and Hans Sues from the VP Section) arrived on April 22, and they prospected through to the middle Coffee Creek Formation. The group was joined by Professor Everett C. Olson (University of California



Ophiacodon, USNM 487098

Los Angeles) and his wife Lila. (Olson had been one of Al Romer's doctoral students and was Nick Hotton's PhD advisor.) Hotton noted that they found "A number of goodies from the draw north of the bonebed, including the braincase of a small xenacanth [an early shark] and a partial skull and shoulder girdle of *Acroplous*" [a small amphibian].²⁶ After visiting various sites in Texas and Oklahoma, the ETE participants left on April 27 and Dr. Hotton returned to his usual sites in Archer and Baylor Counties. On May 7, Chaney and Dr. Robert Hook (then at the Balcones Research Center, Texas) found 31 articulated

vertebrae, an attached pelvis, and several fragmentary ribs of what turned out to be the holotype of a new Early Permian pelycosaur, *Ctenorhachis jacksoni* (USNM 437710) near Fulda. Chaney swapped out support duty with Arnie Lewis in early May, and on May 18 Lewis and Hotton discovered what turned out to be a complete skull and skeleton of the pelycosaur *Ophiacodon* (USNM 487098). Lewis left Texas on the May 24 and Dr. Hotton left three days later.

Dr. Hotton spent about two weeks in April 1989 prospecting the Early Permian Formations around Fulda, Texas. Accompanied by Dr. Robert Hook (a research associate at the University of Texas at Austin), Dan Chaney of the VP Lab, and a local amateur, Dr. Daniel B. Jackson, they uncovered a "pretty good skull of a very large *Dimetrodon*"²⁷ and another articulated sequence of vertebrae referable to *Ctenorhachis jacksoni* and some rib fragments (USNM 437711). This trip constituted the last major vertebrate paleontological expedition of the 1980s.

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**Finding the fossil is only the first step.
Next you have to get it home...**



Dr. Hotton cleaning and beginning to encase part of his 1989 *Dimetrodon* find in a plaster jacket for transport.



Even in relatively flat country, getting the specimen out can be a challenge.



Almost there. The specimen made it back from Texas to the NMNH safely.

**List of Major Vertebrate Fossil Collection Expeditions Conducted by the
National Museum of Natural History during the 1970s and 1980s**

| Year | Curator in Charge | Age/Formation of Primary Interest | Area of Primary Interest |
|-------------|--------------------------|---|---|
| 1970 | C. E. Ray | Pleistocene | South Australia |
| 1971 | R. J. Emry | Eocene/White River Fm. | Wyoming |
| 1971 | C. E. Ray | Miocene/Astoria Fm.; Oligocene/Yaquina Fm. | Oregon, Washington |
| 1971 | C. E. Ray | Pliocene/Mio-Pliocene/Yorktown Fm. | North Carolina |
| 1972 | R. J. Emry | Eocene, Oligocene/White River Fm. | Wyoming |
| 1973 | R.J. Emry | Eocene, Oligocene/White River Fm.; Miocene/Valentine Fm. | Wyoming, Nebraska |
| 1974 | R. J. Emry | Miocene/Valentine Fm.; Eocene/White River Fm. | Nebraska, Wyoming |
| 1975 | R. J. Emry | Eocene, Oligocene/White River Fm. | Wyoming |
| 1976 | C. E. Ray | Oligocene/Twin River Fm. | Washington |
| 1976 | R. J. Emry | Eocene/White River Fm; Miocene/Valentine Fm.; Eocene/Sheep Pass Fm.; Oligocene/Duchesne River Fm.; Miocene/Ash Hollow Fm. | Wyoming, Nebraska, Nevada, Utah, S. Dakota |
| 1976 | N. Hotton III | Pennsylvanian, Permian/Belle Plains Fm. | Texas |
| 1977 | R. J. Emry | Eocene/White River Fm; Miocene/Sheep Pass Fm.; Eocene/Green River Fm. | Wyoming, Nevada |
| 1977 | N. Hotton III | Permian/Arroyo and Belle Plains Fm. | Texas |
| 1978 | R. J. Emry | Eocene/Duchesne Fm.; Eocene/White River Fm. | Utah, Wyoming |
| 1979 | N. Hotton III | Permian/Arroyo and Belle Plains Fm. | Texas |
| 1979 | R. J. Emry | Miocene/Ash Hollow Fm; Miocene/Valentine, Ash Hollow Fm.; Eocene/Sheep Pass Fm. | South Dakota, Nebraska, Nevada |
| 1980 | N. Hotton III | Permian/Belle Plains Fm. | Texas |
| 1980 | R. J. Emry | Miocene/Valentine Fm.; Eocene/White River Fm.; Eocene/Sheep Pass Fm. | Nebraska, Wyoming, Nevada |
| 1981 | N. Hotton III | Permian/Belle Plains and Arroyo Fm. | Texas |
| 1981 | R. J. Emry | Miocene/Ogallala Fm. | Nebraska |
| 1982 | N. Hotton III | Permian/Arroyo and Belle Plains Fm. | Texas |
| 1982 | R. J. Emry | Miocene/Ogallala Fm.; Eocene/White River Fm.; Oligocene/Brule Fm. | Nebraska, Wyoming, N. Dakota |
| 1983 | N. Hotton III | Permian, Triassic/Lashley Fm. | Antarctica |
| 1983 | N. Hotton III | Permian/Arroyo Fm. | Texas |
| 1983 | R. J. Emry | Eocene/Sheep Pass Fm.; Miocene/Ogallala Fm.; Eocene/White River Fm, | Nevada, Nebraska, Wyoming |
| 1984 | N. Hotton III | Permian/Arroyo and Belle Plains Fm. | Texas |
| 1984 | R. J. Emry | Eocene/White River Fm.; Miocene/Valentine Fm. | Wyoming, Nebraska |
| 1985 | R. J. Emry | Pliocene/Broadwater Fm. | Nebraska |
| 1986 | N. Hotton III | Permian/Petrolia Fm. | Texas |
| 1987 | R. J. Emry | Eocene/Sheep Pass Fm. | Nevada |
| 1988 | N. Hotton III | Permian/Petrolia and Coffee Creek Fm. | Texas |
| 1989 | N. Hotton III | Permian/Nocona Fm. | Texas |

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