

Norman H. Boss – A Near “Indispensible Man”

Introduction

Norman H. Boss, preparator of vertebrate fossils extraordinaire, had an exceptionally long and productive career with the United States National Museum (USNM). Over his tenure, the number of vertebrate fossils in both the public display and research/study collections grew dramatically, with many of the major specimens prepared under his direct supervision.

Boss was born April 20, 1886 in Washington, D.C. In 1903, at age 17, he was able to convince the Carnegie Museum of Natural History in Pittsburgh to take him on as an assistant in its Section of Paleontology. He spent roughly a year at the Carnegie Museum, beginning to learn how to remove fossils from their surrounding rock matrix, suitably clean them for display or study, and make duplicate copies (casts). His primary focus at the Carnegie was on reptile and dinosaur fossils, and he helped with their famous *Diplodocus* mount. It also was there that he met John Bell Hatcher and Charles W. Gilmore, events that helped determine his future career path.



Norman Boss working on the Eocene lizard *Saniwa ensidens*, 1922

In early 1904, Boss moved back to Washington and on April 1 became only the fourth full-time paid staff vertebrate fossil preparator ever hired by the USNM. Hired as an assistant preparator, he had found his calling, and remained at the USNM for 46 years.

The USNM definitely had need of a vertebrate fossil preparator in 1904. During the late 1800s, Prof. O. C. Marsh at Yale University was also the “Vertebrate Paleontologist of the United States,” working under the auspices of the United States Geological Survey (USGS). Although Prof. Marsh had been provided governmental funding for himself and a number of assistants, the sheer quantity of the vertebrate fossil material collected in the 1880s and 1890s was such that he and his staff could not keep up with the amount of preparation needed. While many of the “Marsh Collection” specimens transferred to the USNM upon his death in 1899 came either fully or partially prepared, the bulk of the material transferred (five train car loads) was in essentially the same condition as when shipped to Marsh from the field.

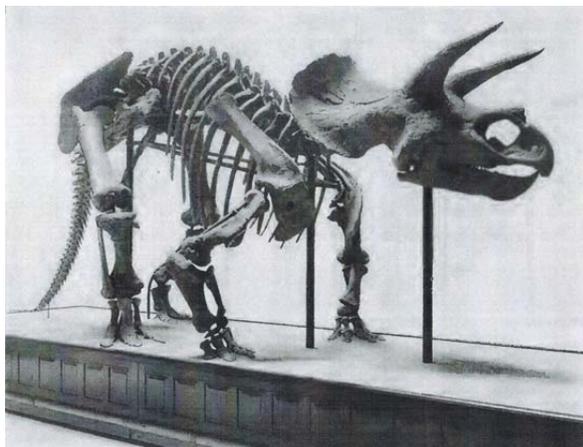
Up until the receipt of the Marsh Collection, preparation of vertebrate fossils had not been a high priority for staff in the USNM. Most specimens had been transferred to other individuals or institutions for study, and what limited work was necessary—usually to support expositions—was done internally by the Department of Osteology. J. W. Coleman, Jr., the first USNM staff preparator devoted full-time to vertebrate paleontology, only had been hired in 1898. A second vertebrate preparator, Alban Stewart, was hired at the end of 1900. Unfortunately, Coleman left the museum in mid-1903 due to failing health; he was replaced by Charles Gilmore later that year. Then Stewart left in early 1904, and was replaced by Norman Boss. Another preparator, James Gidley, was hired a year later. Gilmore and Gidley were “dual hatted,” with Gilmore having curatorial responsibility for the reptile and dinosaur collections, and Gidley the mammals.

So, in 1905, a huge amount of the vertebrate fossil material was still in unopened crates, with the small staff having little or no idea of what they actually had. In addition, the study collections were in terrible shape, with very little systematic arrangement of the fossils, and with many labels either incorrect or out of date. With only a high-school education, Boss did not have the scientific background to assist in much of this work, and spent much of the time consolidating and moving material. Fixing the study collections and opening crates took priority, and only limited work was done on preparing and mounting specimens for display. However, one of the first new exhibits to be considered was that of a three-horned dinosaur, *Triceratops prorsus* (now considered to be *Triceratops horridus*).

The *Triceratops*

Among the Marsh fossils were the partial remains of more than 12 individual *Triceratops*, containing almost all the bones necessary to create a single complete skull and skeleton. Charles Gilmore realized that preparing and mounting such a specimen would have a triple benefit – it would decrease the amount of unprepared material in storage, create a significant exhibit-worthy mount, and possibly most importantly, would result in the first complete *Triceratops* ever mounted for display.¹ With Gilmore taking the scientific and preparatory lead, this mount was the first major specimen on which Norman Boss worked for the USNM.

It was a tough first project. Not only were bones from different individuals used, many of the animals were of different sizes, so that some of the bones were too small relative to the remaining skeleton. No *Triceratops* foot bones were available and bones from a suitably sized duck-billed dinosaur were used



The *Triceratops* as seen in 1905

instead. And, unfortunately, some bones simply could not be found and had to be completely restored (fabricated using scientific comparison to related specimens). The *Triceratops* was mounted standing on a base designed to mimic the color and texture of the Wyoming sandstone in which it was found. Boss was mostly assigned to removing and cleaning bones from the rock matrix. His work was competent and careful, and proved more than adequate for the display mount.

The completed mount was first displayed in 1905 in the old USNM building (now called the Arts and Industries Building).

Moving to the New USNM Building

Boss had proven his ability working on the *Triceratops* with Gilmore. Although the preparation team still spent the majority of their time culling the backlog of unopened crates, consolidating and moving material into new storage areas, and fixing the study collections, some time was spent creating additional display mounts. Over the next two years, Boss prepared and mounted two more specimens for display, the skull of a bear and a complete skull and skeleton of *Dinornis maximus*, a large flightless bird.

The period between 1905 and 1909 was spent primarily in getting ready for the move from the old USNM Building to the museum's new building (sometimes called simply the Natural History Building or NHB, and now called the National Museum of Natural History) on the other side of the National Mall. Much of

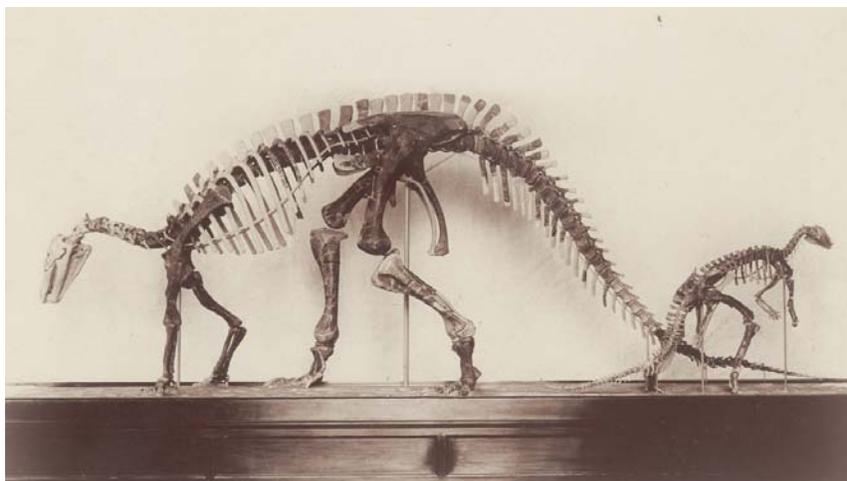
this work simply involved finding out what the Museum had and correcting records. For instance, Gilmore noted in 1907 that:

“Aside from the preparation of specimens, the work in the section of vertebrate paleontology consisted largely in designating the types, cotypes, and illustrated specimens, completing the records, preparing card catalogues, and revising the manuscript and correcting the proofs of the Type Catalogue Bulletin. For the first time in the history of the department it is possible to state with comparative certainty the nature and whereabouts of the type material in this section.”²

Despite this progress, the large amount of material in storage remained a major issue. At the end of 1907, there were 409 unopened boxes and 882 unprepared trays of reptilian and mammalian remains in storage, spread among three buildings.³

Much of 1909 and 1910 were spent moving the stored fossils and exhibits from the old USNM building to the new NHB. The size and fragility of many of the specimens mandated that they be dismantled, moved, and then remounted in the new display halls, itself necessitating several months of work. Gilmore, Gidley, and Boss took the opportunity to both repair and renovate any specimens damaged either at the old building or in the move, and to generally upgrade the exhibits. By the end of 1910, repairs were finished, older skeletal casts had been retired, and most of the mounts were installed. The “Hall of Extinct Monsters” in the NHB was essentially ready to open to the public.

Boss had now been with the Museum and studying with Gilmore for more than six years. As the preparators moved into their new lab in the NHB, Boss was given responsibility for the first time to take the lead on a dinosaur display, a dinosaur known at the time as *Camptosaurus nanus*. Although still under Gilmore’s scientific direction, Boss was responsible for the cleaning, preparing, and final mounting of the specimen (USNM 2210). The *Camptosaurus* was an unusually perfect skeleton -- with the exception of the skull, much of the skeleton as collected was intact. Even with such a complete specimen, significant reconstruction and limited “mix and match” from other specimens was still required. The most noticeable problem was the lack of a skull. The skull finally mounted on the display was completely restored, which must have been a challenge for the still-new Boss. The dinosaur was placed next to a larger *Camptosaurus* (USNM 4282) that Gilmore, with some small assistance from Boss, had completed the year before. The skeletons were mounted side-by-side on the same artificial base, textured and painted to represent the texture and color of the sandstone matrix in which the bones had been found. The larger USNM 4282 was mounted in a quadrupedal position and USNM 2210 was shown walking on its hind legs.⁴ The mount remained on display until 2004, when it was removed for renovation.



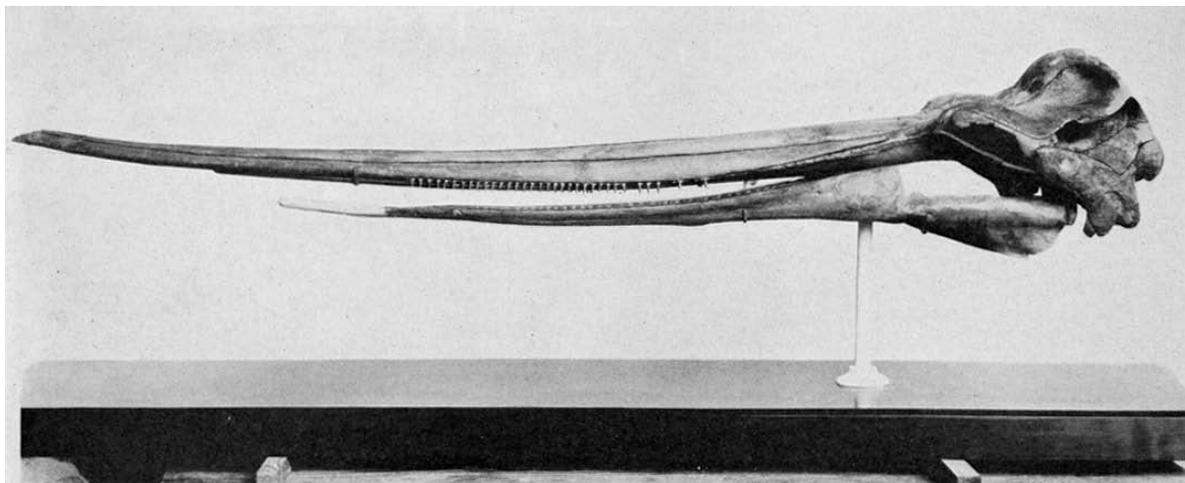
C. browni (USNM 4282 - left) and *C. nanus* (USNM 2210 - right), 1911

The next ten years or so were spent continuing to reduce the number of unopened boxes in storage, preparing study specimens, trying to keep pace with the amount of material coming in from the field, and preparing specimens for display. An enviable upside of the move from the old USNM Building to the new NHB was the greatly increased display space available for the vertebrate fossils, although initially the hall was more thinly populated than Gilmore and Gidley could have liked. Boss worked on eight major display specimens – mostly scientifically important type specimens – during these years. (See [Table 1](#) for a list of all the major display specimens on which Boss worked.)

An Avid Collector – Boss’ Local Excursions

Boss also was both an avid and prolific collector of local fossils for the Museum, both on official and his own personal time. Between 1908 and 1935, he conducted more than 30 one-to-four day local excursions, mostly in Miocene-age formations along the Chesapeake Bay in nearby Calvert County, Maryland. Early on, he generally was joined by William Palmer (Chief Taxidermist in the USNM Division of Birds, who also had an interest in fossils), later had the company of Remington Kellogg (both during his time at the Biological Survey, USDA, and later as Assistant Curator of Mammals in the USNM – and a world-class expert in marine mammals), and sometimes alone, he brought back a plethora of shark, ray, and cetacean fossils to increase the USNM collections.

While he was not lucky enough to find any complete skeletons, Boss did significantly round out the USNM collections and enable additional research. For instance, his find in August, 1918 of “a fine skull and lower jaws in association with 16 vertebrae, 10 ribs, a humerus, scapula, and sternum” from a long-beaked porpoise, when put together with earlier material, allowed Dr. Kellogg to confirm the occurrence of the genus *Eurhinodelphis* in the North American Miocene, and he named the new species *Eurhinodelphis bossi* in Boss’s honor.⁵



**Skull and partial lower jaw of *Eurhinodelphis bossi* (USNM 8842)
prepared and mounted for display**

Boss also prepared most of the local material he collected, much of which was placed on public display. For instance, in 1922, he was instrumental in preparing the display of a representative series of cetacean skulls, including examples of short-beaked, long-beaked and whalebone whales, and a small case of shark teeth and other fossil remains to illustrate the fauna of the Miocene in the Chesapeake Bay region.⁶

The work of Kellogg, Palmer, and Boss (and, later, USNM curator Clayton Ray and semi-amateur collector Douglas Emlong) grew the cetacean collection at the USNM to be the most important of its kind in the United States.

In 1924, Boss (by then promoted to Chief Preparator) also assisted Charles Gilmore (by then USNM Curator of vertebrate paleontology) in collecting the first dinosaur tracks ever found in Virginia⁷. A farmer in Loudoun County had been excavating in red Triassic shale on his property in search of flagstone when he noticed numerous fossil footprints, which he reported to the Smithsonian. Gilmore investigated and found at least four distinct horizons of footprints, with most comprised of three-toed imprints ranging in size from three to fourteen inches. Gilmore arranged for the tracks to be donated to the USNM, and he and Boss returned to the farm to excavate a slab two by twelve feet in size, with a weight of 1500 pounds, clearly showing the three-toed footprints of a dinosaur. Due to Boss's assistance in the field, only minimal additional preparation was needed, and the slab was quickly put on display in the USNM.

Major expeditions in which Boss participated

One of the “win-win” perks of being a preparator is the opportunity to participate in collecting expeditions. However, although Boss had done a fair number of short local excursions, he did not participate in a major USNM expedition until 1923.

1923 Expedition to Utah – the *Diplodocus*

Charles Gilmore was always looking for opportunities to improve the dinosaur displays. One of the specimens he wanted to add was a major sauropod dinosaur. He got his chance in 1922, when the Carnegie Museum of Natural History finished its excavations at the Dinosaur National Monument in Utah and turned the quarry over to the USNM. Two of the specimens left behind by the Carnegie museum were partially excavated individuals of the large sauropod dinosaur, *Diplodocus*. Although neither was complete, Gilmore thought that, together, they provided the basis for a mountable display.

Excavation began in late May 1923. Rock at the site is a sandstone of variable hardness, making fossil removal problematic at times. Gilmore employed three assistants and brought Norman Boss to the site to help assist in the removal of the often fragile bones. As Gilmore later wrote: “The work of quarrying these often fragile bones from the ledge of rock without doing irreparable damage is a slow and tedious operation, involving the skill of both tile stone cutter and the miner.”⁸ Boss had now been a preparator for nearly 20 years and understood both the rock and the best methods of removing fossils with minimal damage.

The party excavated until early August. When they finished, 35 boxes, with a combined weight of roughly 26 tons, were shipped back to the museum. The largest block quarried weighed almost 6,000 pounds when ready for shipment. Gilmore had his *Diplodocus*, but Boss's work was not done.

Once the boxes were back at the museum, the preparators got to work. Boss and fellow preparator Thomas Horne worked on the specimen preparation almost full time, with part-time assistance from scientific aide John Barrett. By June 1924, 10 of the 35 boxes had been opened and 7 of those worked up.⁹ Over the next year, Horne remained almost continuously at



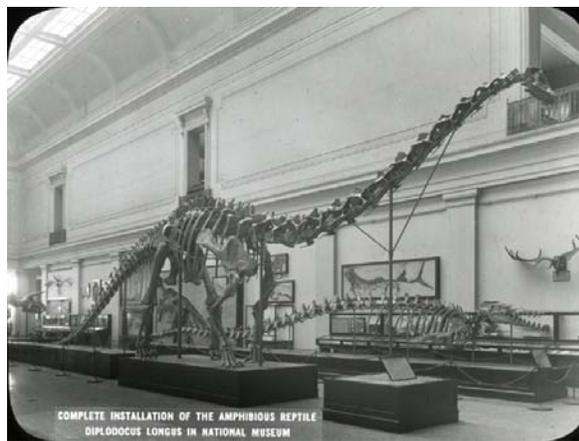
Gilmore and Boss discuss the *Diplodocus*, 1924

work, but Boss was occasionally called off the task to create molds and casts, and prepare other specimens that required an expert and delicate hand. By the end of June 1925, the tail, ribs, limb, foot, and pelvic bones had been completely removed from the hard sandstone, with 21 boxes opened and the contents of 19 completely worked up.¹⁰

Work on the dinosaur slowed at that point. While Boss and Horne continued to work on the specimen, two problems arose. First, it was discovered that the neck they were extracting was not from a *Diplodocus*, and other neck bones needed to be found. Second, Boss was called away for nearly three months to prepare and mount specimens for the 1926 Sesquicentennial Exposition in Philadelphia, and Horne was assigned to support the “Future of the Smithsonian” conference in 1927. Throughout the period, as Chief Preparator, Boss also was called upon to prepare other delicate specimens, to make casts of fossils and other objects, and to assist in the installation and rearrangement of study and exhibition specimens.^{11,12} Arrangements were made with the Carnegie Museum of Natural History to provide casts of the missing bones, and Gilmore developed a plan on how best to display the specimen that would become a centerpiece of the dinosaur hall.



The *Diplodocus* mount under construction in the lab



Diplodocus installed in the Vertebrate Paleontology hall

Boss and Horne were given the job of mounting the specimen, under the scientific direction of Gilmore. The scheme was to give the skeleton “...an upright quadrupedal pose, with the head uplifted as if scanning its surroundings” and to color any cast bones “to harmonize with the actual bones but with sufficient difference as at once to be distinguished from the originals.”¹³

Mounting work began in 1927 with the creation of a temporary supporting framework. Delays in obtaining the permanent iron supports, steel castings, and certain of the bones for the display caused work to be somewhat sporadic until 1930.¹⁴ The *Diplodocus* was finally complete and moved to the exhibit hall in 1931, where it retained a central place of honor until 2014, when it was removed as part of the Deep Time exhibit renovation activity.

Charles Gilmore later wrote that the *Diplodocus* was the most ambitious undertaking the Division of Vertebrate Paleontology had ever attempted. “The work of collecting this specimen occupied the energies of 5 men for 4 months to quarry out, transport, box, and ship the 26 tons of rock-enclosed bones. From first to last, 2,545 working days were spent on this specimen, which, translated into Government time, means 1 man working steadily for nearly 9 years.”¹⁵

Boss was involved with the specimen essentially from the start of excavation through to the completed mount. While this may seem a long time, it was not to be the longest Boss spent on a specimen.

1929 Expeditions to New Mexico

In 1928, Yale University's Peabody Museum of Natural History (YPM) received a letter from a Mr. Ewing Waterhouse of El Paso, Texas, describing his discovery of what were later identified as the remains of a Pleistocene giant ground sloth in a remarkable state of preservation. The remains, contained within a fumarole of an extinct volcanic crater near Aden, New Mexico, were essentially complete and articulated, and even contained patches of skin and muscle fiber. They also were mostly buried in a huge mound of bat guano – accumulated over thousands of years, and which, coupled with the dry climate, apparently led to the sloth's exceptional state of preservation. An expedition from Yale retrieved the specimen that year.¹⁶

The locality was determined to be on public land, and the right of further exploration was granted jointly to the Yale Peabody Museum and the National Museum. As it was expected that more remains would be found, at the end of March 1929, Fred W. Darby (a preparator from YPM), Norman Boss, and Ewing Waterhouse returned for further work.¹⁷ Unfortunately, after a month of prospecting around the area, not many “keepers” were found and current USNM collection records show no entries resulting from the trip.

Although he was an undoubted expert in the preparation laboratory, Boss had limited field experience. He was somewhat despondent over the lack of results, and apparently worried over how this would reflect upon him. Both Gilmore and Alexander Wetmore, Assistant Secretary of the Smithsonian in charge of the USNM, tried to reassure Boss, with Wetmore going so far as to send him a personal letter stating:

“From my own experience in the field I know too well that such propositions are uncertain and may or may not yield return. When they turn out unsuccessful there is no one to blame and we merely charge the matter up to experience and go on with something else. When the next matter taken up brings success we feel all the more pleased. Let me say that we have no doubt, whatever, about your diligence and industry in the attempt you have made.”¹⁸

It had already been arranged that Boss would join Gilmore's impending expedition to New Mexico, and Wetmore wished him all success in this as both a collecting and educational opportunity.

So, in mid-May 1929, Boss joined up with Gilmore to prospect the San Juan Basin in New Mexico. They drove to Kimbetoh, New Mexico, where they met up with Charles W. and George F. Sternberg. Gilmore later noted that they had a few outstanding acquisitions, including “an articulated tail of a large hadrosaurian dinosaur; portions of the skull of a horned dinosaur of the *Chasmosaurus* type, new to the fauna and probably a new species; articulated limb and foot bones of a small ceratopsian reptile; and no less than 20 turtles, many of them complete shells and some of large size.”¹⁹



Norman Boss, C. W. Sternberg, Charles Gilmore and G. F. Sternberg
(from left to right) in New Mexico, 1929

Pick and shovel soon proved inadequate to the task, and Boss decided to try “stripping” the hill with a horse, plow, and scraper. After two weeks of intensive labor by the entire party (and the horse), an additional quarry area of roughly 5,000 square feet was exposed.²²

The party wrapped up at the end of July. Boss shipped back to the USNM 37 cases totaling 8,332 pounds, containing four more or less complete partly articulated skeletons, 32 skulls, 48 jaws, and a “vast number of bones representing all parts of the skeleton” of *Plesippus shoshonensis*.²³ These proved invaluable to the Museum, both for the study collections and as a source of “trade goods” for exchange with other museums.

A well-travelled dinosaur -- the *Camarasaurus*

The Smithsonian’s *Camarasaurus* specimen may be one of the best-traveled of the large display exhibits in the USNM, and is certainly the specimen on which Boss worked the longest.

In the 1930s, Charles Gilmore was planning a series of updates to the dinosaur halls. One of the specimens he desired, but did not have, was a *Camarasaurus*, an herbivorous dinosaur from the Jurassic. He knew that the Carnegie Museum of Natural History had excavated a *Camarasaurus* from their quarry at Dinosaur National Monument in Utah and in 1933 was able to work an exchange -- trading a skeleton and 8 skulls from the USNM Hagerman horse collection, some of his time, and a bit of cash²⁴ for a relatively complete, articulated, and unprepared *Camarasaurus* missing only a section of tail. At the time it was described as the “second most perfect specimen ever discovered”.²⁵

The exchange was executed and the *Camarasaurus* (USNM 13786) accessioned into the USNM in 1935.²⁶ Norman Boss was given lead on preparation under Gilmore’s scientific direction. Boss spent roughly five months in late 1935 and early 1936 working on the specimen, completing the preparation of the skull and the first five vertebrae in the *Camarasaurus*’ neck.²⁷ He stopped work in April-May, 1936, and those fossils and five large plaster-jacketed blocks of unprepared fossil bones still in their rock matrix were shipped to Dallas to form the centerpiece of the Smithsonian’s paleontology exhibit at the Texas Centennial Exposition.²⁸



The Smithsonian Institution paleontology exhibit at the Texas Centennial Exposition, 1936



Boss hard at work in Dallas, 1936

Part of the USNM’s Vertebrate Paleontology lab was transplanted to Dallas for the Exposition, and Boss was detailed there to continue preparing the *Camarasaurus*. He spent nearly seven months at the Exposition, removing the bones from the surrounding rock matrix and answering questions from the public, and his efforts resulted in the almost complete preparation of the material.²⁹

The idea of a preparator working in public and answering questions was a new one, and Carl Mitman (Head Curator of the Department of Arts and Industries in the USNM), later wrote of the exhibit that it "...proved to be of greater popular appeal than any of the Institution's recent efforts in this specialized field..."³⁰ Boss's knowledge and professional demeanor undoubtedly contributed to this success.

Boss returned to Washington in December 1936, and, after a short break, returned to working on the *Camarasaurus*. The specimen still lacked a tail, however. Leveraging the success of the 1936 Dallas effort, Gilmore was able to use money provided for the 1937 Greater Texas and Pan American Exposition to purchase a nearly complete and unprepared *Camarasaurus* tail (USNM 15492) from the Carnegie museum. In June, the tail bones, still encased in their rock matrix, were sent directly to Dallas, where they were met by Norman Boss, who had been detailed once again to prepare the fossils in front of the public. Boss spent nearly six more months in Dallas and returned to Washington with the completed tail in November 1937. See Abby Telfer's excellent blog article at http://nmnh.typepad.com/smithsonian_fossils/2015/01/camarasaurus-went-to-texas.html%20 for a more detailed discussion of the *Camarasaurus*'s time at the Texas expositions.



From left, Murray, Pearce, and Boss working on the *Camarasaurus* in the lab

Despite the desire to finish preparation, mount, and display the *Camarasaurus*, other work and lack of space prevented this from happening, and as of 1940, three boxes of unprepared material remained.³¹ By 1945, this had been reduced by only one box.³² Preparation by Boss continued at a slow pace in 1945, and plans began on the design of the display mount: "The skeleton is to be mounted as a horizontal relief mount, demonstrating approximately the pose encountered as the skeleton was uncovered. This type of exhibit is markedly popular with museum visitors,

as evidenced by the interest taken in the *Stegosaurus* skeleton similarly displayed."³³ In 1946, work resumed in earnest, with Boss spending almost the entire year on the "preparation, restoration, mounting and related construction work" for the *Camarasaurus*, with occasional help from preparators Franklin Pearce and Arlton Murray. The main exhibition hall was being partially reworked to make space for the new mount. By June 1947, the laboratory work was nearly finished, and the mount was moved in sections to the hall a few months later, where final assembly and base touchup was done.^{34,35} However, due to the lack of an adequate case, the specimen was covered with a cloth, and screens were placed around it to prevent damage.³⁶ A case was finally built a few years later, and the specimen was finally "unveiled" to the public in early 1950.



The *Camarasaurus* as it was ready to move to display, 1950

Boss must have been thrilled (and relieved) to see the *Camarasaurus* finally displayed. Although his total “hands-on” preparation time constituted only about two years, and restoration and mounting another year, he had been in one way or another connected with the specimen for more than 14 years, with only occasional assistance. It was the last major dinosaur specimen on which he ever worked.

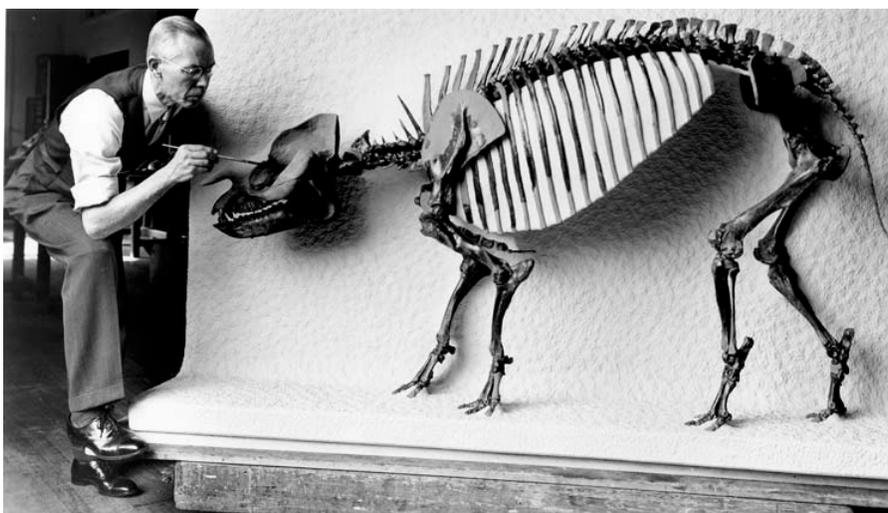
Boss' Legacy

Norman Boss finally retired from the USNM on May 31, 1950. Space prevents a discussion of each specimen, but he was involved with most of the displays in the vertebrate fossil halls up to that time, either as a preparator or as the supervisor of the vertebrate preparation laboratory. He prepared an uncounted number of study specimens, and he and the laboratory team had caught up with the unopened crate backlog – almost everything, except for 39 crates of Marsh material and some boxes from the 1949 expeditions, had finally been opened and examined.

Upon Boss's retirement, USNM Curator Charles Gazin, said: “Mr. Norman H. Boss, one of the most skilled and productive preparators in the profession, is retiring at the end of May, at the age of 64 and after over 46 years of service with the U. S. National Museum. His retirement is a great blow to the Division of Vertebrate Paleontology as he came near to being the fabulous indispensable man.”³⁷

Norman Boss died on May 21, 1963. In a memorial, David Dunkle, USNM Curator of Fossil Fishes, noted Boss's contributions in bringing an appreciation of fossils to the public: “During his long association the exhibits of vertebrate fossils in the National Museum grew from a few to one of the most impressive displays in the country, and most of the specimens were prepared under his direct supervision and a large part represents his own skillful work”.³⁸

Very true. The next time you're in the Museum, look around and reflect on the fact that collecting fossils is only part of the job. A skilled preparator is needed to clean, prepare, mount, and install them as required for either research or display. Not only are preparators critical to paleontological researchers, but they are also instrumental in creating the wonderful public displays we all enjoy. Norman Boss represented the best ideals of the profession, and many of the best vertebrate fossil displays seen in the USNM were due to his skill and handiwork.



Norman Boss putting the finishing touches on the mount of the small brontothere *Palaeosyops paludosus*, 1945

Table 1: Major Fossil Skeletons Prepared and Mounted for Display by Norman Boss

Specimen (original name)	Date of First Display	Comment
<i>Triceratops elatus</i>	1905	USNM 2580. Mounted by Gilmore, assisted by Boss. Free standing. Later remounted and memorialized as the Smithsonian's "Digital Dinosaur".
<i>Ursus spelaeus</i>	1905	USNM 5495. Mounted by Boss, later remounted by Thomas J. Horne in 1913.
<i>Dinornis maximus</i>	1907	USNM 5521. Free-standing mount.
<i>Ceratosaurus nasicornis</i>	1910	USNM 4735. Holotype specimen mounted by Gilmore, assisted by Boss. Complete skull and skeleton in bas-relief.
<i>Camptosaurus nanus</i>	1911	USNM 2210. Type specimen. Free-standing mount.
<i>Hesperornis regalis</i>	1911	USNM 4978. Originally mounted by J.W. Scollick in 1901 and remounted by Boss in 1911.
<i>Stegosaurus stenops</i>	1913	USNM 4934. Type specimen mounted by Boss and C. V. Bressler. Slab mount displaying the bones in their relative position as discovered. A second, composite, free-standing mount (USNM 8612) was mostly prepared by Boss and mounted by Thomas Horne for display in 1917.
<i>Kentriodon pernix</i>	1914	USNM 8060. Type specimen collected by Boss in 1913 and mounted by him in 1914.
<i>Thescelosaurus neglectus</i>	1914	USNM 7757. Type specimen mounted by Boss and C. V. Bressler. Slab-mounted skeleton.
<i>Tylosaurus proriger</i>	1919	USNM 8898. Plaque-mounted skeleton.
<i>Brachyceratops montanensis</i>	1920	USNM 7951. Type specimen mounted by Boss. Skull only.
<i>Saniwa ensidens</i>	1922	USNM 2185. Type specimen mounted by Boss. Free-standing skeleton.
<i>Bison occidentalis</i>	1923	USNM 10545. Skull.
<i>Diceratherium sp.</i>	1923	USNM 10335. In-situ slab.
<i>Protostega gigas</i>	1926	USNM 11651. Hanging free-mounted turtle skeleton and carapace.
<i>Diplodocus longus</i>	1931	USNM 10865. Free standing mount by Boss, Horne and J. M. Barrett. Complete skull and skeleton.
<i>Hyrachyus eximius</i>	1934	USNM 12581. Semi-free-mount.
<i>Helaletes nanus</i>	1934	USNM 12584. Semi-free-mount.
<i>Platygonus pearcei</i>	1936	USNM 13800, 13798. Slab of several peccary skeletons.
<i>Scarrittia canquelensis</i>	1937	USNM 13879. Panel mount. Complete skull and skeleton
<i>Polyglyphanodon sternbergi</i>	1938	USNM 15477, 15816. Complete skull and skeleton. Slab mount.
<i>Corythosaurus casuarius</i>	1941	USNM 15493. Slab in relief showing partially mummified hind quarters and skin impression.
<i>Crocodylus clavis</i>	1942	USNM 12719. Nearly complete skeleton in slab mount.
<i>Edaphosaurus boanerges</i>	1943	USNM 16647. Skull and skeleton mounted in half-relief.
<i>Leptomeryx evansi</i>	1943	USNM 16754. Semi-free mount.
<i>Portheus molossus</i>	1944	USNM 11653? Skull only. Synonym of <i>Xiphactinus audax</i> or <i>Xiphactinus molossus</i>
<i>Ichthyodectes anaides</i>	1944	USNM 12061. Skull only, mounted as a slab exhibit.
<i>Echmatemys haydeni</i> , <i>Echmatemys wyomingensis</i>	1944	USNM 16761-16775. Relief slab showing 15 in-situ turtle carapaces.
<i>Hypertragulus calcaratus</i>	1945	USNM 16744. Semi-free-mounted skeleton.
<i>Palaeosyops paludosus</i>	1945	USNM 16881. Semi-free-mount composite skeleton.

Specimen (original name)	Date of First Display	Comment
<i>Merycoidodon culbertsoni</i>	1946	USNM 11909. Semi-free-mounted skeleton mounted by Boss, assisted by Arlton Murray and Thomas Horne.
<i>Scelidothorium capellini</i>	1946	USNM 13865. Begun by Thomas Horne and completed by Boss and Arlton Murray after Horne's death.
<i>Camarasaurus lentus</i>	1950	USNM 13786. Mounted by Boss, assisted by Arlton Murray and Franklin Pearce. Mount completed in 1947 and moved to display floor, but due to lack of a protective case, was not revealed to the public until 1950.

Acknowledgements

Unfortunately, Norman Boss left behind few notes and little correspondence. Charles Gilmore, on the other hand, was quite prolific in his writing, and, unlike many curators of the time, was especially generous in assigning credit to his fossil specimen preparators. Most of the information currently known about Boss comes from Gilmore's publications and the extensive notes recorded in his day books and annual curator reports. This article would not have been possible without those sources.

References

- ¹ Gilmore, Charles W., 1906. The mounted skeleton of *Triceratops prorsus*. *Proceedings of the United States National Museum* 29: 433-435, 2 plates.
- ² Division of Vertebrate Paleontology Annual Report for 1907-1908. SI Archives RU000158, Box 50, Folder 1.
- ³ Division of Vertebrate Paleontology Annual Report for 1907-1908. SI Archives RU000158, Box 50, Folder 1.
- ⁴ Gilmore, Charles 1912. The mounted skeletons of *Camptosaurus* in the United States National Museum. *Proceedings of the United States National Museum* 41: 687-696
- ⁵ Kellogg, Remington, 1926. On the occurrence of remains of fossil porpoises of the genus *Eurhinodelphis* in North America. *Proceedings of the United States National Museum* 66:26.
- ⁶ Division of Vertebrate Paleontology Annual Report for 1921-1922. SI Archives RU000158, Box 50, Folder 8.
- ⁷ Gilmore, Charles W., 1924. Collecting fossil footprints in Virginia. *Explorations and Field-work of the Smithsonian Institution in 1923* 76: 16-18
- ⁸ Gilmore, Charles W., 1923. Expedition to the Dinosaur National Monument, Utah. *Smithsonian Miscellaneous Collections* 76:12-16
- ⁹ Division of Vertebrate Paleontology Annual Report for 1923-1924. SI Archives RU000158, Box 50, Folder 5.
- ¹⁰ Division of Vertebrate Paleontology Annual Report for 1924-1925. SI Archives RU000158, Box 50, Folder 6.
- ¹¹ Division of Vertebrate Paleontology Annual Report for 1925-1926. SI Archives RU000158, Box 50, Folder 7.
- ¹² Division of Vertebrate Paleontology Annual Report for 1926-1927. SI Archives RU000158, Box 50, Folder 8.
- ¹³ Gilmore, Charles W., 1933. On a Newly Mounted Specimen of *Diplodocus* in the United States National Museum. *Proceedings of the United States National Museum* 81:18
- ¹⁴ Division of Vertebrate Paleontology Annual Report for 1929-1930. SI Archives RU000158, Box 47, Folder 6.
- ¹⁵ Gilmore, Charles, 1941. A History of the Division of Vertebrate Paleontology in the United States National Museum. *Proceedings of the United States National Museum* 90: 342
- ¹⁶ Lull, Richard Swann, 1929. A remarkable ground sloth. *Memoirs of the Peabody Museum of Yale University* Vol. 3, Pt. 2.
- ¹⁷ Unknown, 1929. The Sloth Pit in New Mexico. *Science*, March 29, 1929: 347.
- ¹⁸ Wetmore, Alexander, 1929. Letter to Norman H. Boss dated May 22, 1929. SI Archives RU007006, Series 1, Box 7, Folder 5.
- ¹⁹ Gilmore, Charles W., 1930. Fossil hunting in New Mexico. *Explorations and Field-work of the Smithsonian Institution in 1929*, pp 17-22

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- ²⁰ Kellogg, Remington, 1930. Ancient relatives of living Whales. *Explorations and Field-work of the Smithsonian Institution in 1930*, pp 83-90
- ²¹ Boss, Norman H. 1931. Fieldbook labeled "Boss 1931" (No accession number)
- ²² Boss, Norman H. 1932. Exploration for fossil horses in Idaho. *Explorations and Field-work of the Smithsonian Institution in 1931*, pp 41-44
- ²³ Wetmore, Alexander, 1932. Report on the Progress and Condition of the United States National Museum for the year ended June 20, 1932.
- ²⁴ http://nsmnh.typepad.com/smithsonian_fossils/2015/01/camarasaurus-went-to-texas.html, accessed 10/19/16.
- ²⁵ Division of Vertebrate Paleontology Annual Report for 1934-1935. SI Archives RU007314, Box 16, Folder 28
- ²⁶ http://nsmnh.typepad.com/smithsonian_fossils/2015/01/camarasaurus-went-to-texas.html, accessed 10/19/16.
- ²⁷ http://nsmnh.typepad.com/smithsonian_fossils/2015/01/camarasaurus-went-to-texas.html, accessed 10/19/16.
- ²⁸ Division of Vertebrate Paleontology Annual Report for 1935-1936. SI Archives RU007314, Box 16, Folder 29
- ²⁹ Division of Vertebrate Paleontology Annual Report for 1936-1937. SI Archives RU007314, Box 16, Folder 30
- ³⁰ Mitman, Carl W., 1937. Smithsonian Institution Exhibit at the Texas Centennial Exposition, Dallas, Texas. *Explorations and Field-Work of the Smithsonian Institution in 1936*, pp 99-100
- ³¹ Division of Vertebrate Paleontology Annual Report for 1939-1940. SI Archives RU007314, Box 16, Folder 34
- ³² Division of Vertebrate Paleontology Annual Report for 1939-1940. SI Archives RU007314, Box 16, Folder 38
- ³³ Division of Vertebrate Paleontology Annual Report for 1945-1946. SI Archives RU007314, Box 16, Folder 39
- ³⁴ Division of Vertebrate Paleontology Annual Report for 1946-1947. SI Archives RU007314, Box 16, Folder 40
- ³⁵ Gazin, C. L., 1947. Washington D.C. *Society of Vertebrate Paleontology News Bulletin* No. 20, Apr. 1947
- ³⁶ Division of Vertebrate Paleontology Annual Report for 1947-1948. SI Archives RU007314, Box 16, Folder 41
- ³⁷ Gazin, C. L. 1950. Personalities in Paleontology. *Society of Vertebrate Paleontology News Bulletin* No. 29, Jun. 1950, p 2
- ³⁸ Dunkle, David, 1963. Norman H. Boss. *Society of Vertebrate Paleontology News Bulletin* No. 69, Oct. 1963, p 28