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1992, pp. 241-250. https://doi.org/10.56577/FFC-43.241

in:

San Juan Basin IV, Lucas, S. G.; Kues, B. S.; Williamson, T. E.; Hunt, A. P.; [eds.], New Mexico Geological Society 43rd Annual Fall Field Conference Guidebook, 411 p. https://doi.org/10.56577/FFC-43

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CHARLES H. STERNBERG AND THE COLLECTION OF LATE CRETACEOUS VERTEBRATE FOSSILS FROM THE SAN JUAN BASIN, NEW MEXICO

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Abstract—Cope (1885) first described fossil vertebrates from the Fruitland and Kirtland Formations. Prior to 1921, collecting was sporadic. In 1921–1922, Charles H. Sternberg amassed the largest collection of fossil vertebrates to that time, principally for the University of Uppsala, Sweden, but also for the Field Museum of Natural History and the American Museum of Natural History. Little collecting occurred for 50 years after Sternberg. In the later 1970s through the present, large collections of fossil vertebrates were made.

INTRODUCTION

The Fruitland and Kirtland Formations are nonmarine units of Late Cretaceous age that are widely exposed in the San Juan Basin of northwestern New Mexico. These formations have yielded the largest Late Cretaceous fauna in the southern portion of the Western Interior (Hunt and Lucas, 1992). Here, we document the history of collection of fossil vertebrates from these strata with particular emphasis on the work of Charles H. Sternberg. Sternberg's collecting is important because it produced the largest collection of fossil vertebrates from the Fruitland and Kirtland. In addition, because of Sternberg's autobiography and letters and notes published for the first time here (Appendixes 1–3), we have a good understanding of how and where Sternberg collected in 1921 and 1922.

COLLECTING FOSSIL VERTEBRATES IN THE FRUITLAND AND KIRTLAND FORMATIONS

The early years (pre-1921)

Cope (1885) first reported fossil vertebrates from the Fruitland and Kirtland Formations collected by David Baldwin. These included indeterminate theropod teeth (*Laelaps*), hadrosaur bones (*Dysganus*) and trionychid turtle specimens. Cope (1885) named isolated crocodile teeth from this collection as a new taxon, *Crocodilus stavelianus*. Most isolated crocodile teeth are undiagnostic and thus this taxon is a nomen dubium.

G. H. Pepper of the American Museum of Natural History (AMNH) found numerous bones near Ojo Alamo in 1902 (Baltz et al., 1966). This led Barnum Brown of the same institution to make a preliminary expedition in 1904. Brown collected ceratopsian and hadrosaur specimens, including the holotype of *Kritosaurus navajovius*, from the Dena-zin and Naashoibito Members of the Kirtland Formation (Brown, 1910; Lucas et al., 1987). W. J. Sinclair of Princeton University and W. Granger of the AMNH also collected dinosaur specimens from the upper two members of the Kirtland (Sinclair and Granger, 1914). In 1915, a USGS party led by C. Bauer collected vertebrate fossils from numerous localities in the Fruitland and Kirtland Formation that were described by Gilmore (1916, 1919). Subsequently, J. B. Reeside of the USGS collected additional specimens, including the holotype of *Alamosaurus sanjuanensis* (Gilmore, 1922).

Charles H. Sternberg (1921–1922)

Charles H. Sternberg, one of the greatest commercial fossil collectors of the late 19th and early 20th centuries, collected abundant vertebrate fossils for many institutions (Rogers, 1991). By 1921, Sternberg was 71 years old, but he was still actively involved in collecting fossils. In that year, Sternberg was hired by Dr. Carl Wiman of the University of Uppsala, Sweden, to collect vertebrate fossils from the Cretaceous of the San Juan Basin for the sum of $2500. Sternberg (1932) described his collecting experiences in the San Juan Basin, and much of the following is from this account and from letters and other documents written by Sternberg, now in the archives at Uppsala University (Appendixes 1–3).

Sternberg was drawn to collect in New Mexico principally by Gilmore's (1919) monograph on the vertebrate fossils of these strata. It is evident that Sternberg much admired Gilmore (e.g., Sternberg, 1932, p. 193; Rogers, 1991, p. 180). He probably astutely realized that Gilmore (1916, 1919) had described generally fragmentary specimens which hinted at the presence of rich and unexploited fossil beds. Sternberg was also encouraged by the archaeologist E. L. Hewett, who was at that time interested in Chaco Canyon.

Sternberg had spent his entire life collecting fossils with a wagon, but on 4 May 1921 he set out from his home in California in a new one-ton Ford truck, which had cost him $1055 (letter 2, Appendix 1). Sternberg traveled with his assistant, John Bender. They reached Thoreau on 17 May, where Sternberg learned that his wife was very ill (letter 2, Appendix 1). He waited in Thoreau for three days and on the twentieth he received a note saying that she must be operated upon immediately, whereupon he caught the first train home to Glendale, California, a trip that took 24 hours. His wife survived her operation on the twenty-second when an eight-pound tumor was removed (letter 2, Appendix 1). She recovered fairly quickly, and on 14 June Sternberg took a train back to Thoreau. He and Bender drove to Chaco Canyon, where he found *Inoceramus* fossils that he later tried unsuccessfully to sell to Dr. Wiman (Sternberg, 1932; letter 2, Appendix 1). It is not clear what subsequently happened to Bender.

On 21 June, Sternberg arrived at Ojo Alamo trading post, where he was very fortunate to meet the USGS geologist J. B. Reeside. Reeside was not only very familiar with the stratigraphy and geography of the Upper Cretaceous of the San Juan Basin but he had also collected many of the vertebrate fossils described by Gilmore (1916, 1919). Reeside directed Sternberg to the areas of Hunter Wash and Kimbeto Arroyo. Sternberg later acknowledged that his success was largely due to Reeside's advice (Sternberg, 1932, p. 207).

On 11 July, Sternberg wrote to Dr. Wiman stating that he had found several fossil turtles and dinosaur bones (letter 2, Appendix 1). On this date he was 55 mi (92 km) south of Kimbeto. Sternberg had hired two Navajos as assistants, first Dan Padilla, who brought a team of ponies and the heavy wagon, and a week later Ned Shouver, who brought the light wagon with two horses (Rogers, 1991). These two helped Sternberg throughout the summer and were good assistants in the field.

Charles Sternberg had a rigorous routine when he was in the San Juan Basin (Sternberg, 1932, p. 219–222). He rose at dawn, woke his two assistants and sent them to retrieve the hobbled horses that were often on a nearby mesa. While they were gone he prepared breakfast. He "was forced to do the cooking as a matter of self-protection" but let his assistants wash the dishes (Sternberg, 1932, p. 219). If outcrops were within walking distance he started out immediately after breakfast. If the outcrops were several miles away Sternberg went in a wagon and they all took lunch pails and made coffee in the field. He searched on foot and marked all bone occurrences with a rock cairn. Sternberg

quickly appreciated the dangers of walking through the mudrock badlands and learned to "ski" down slopes rather than to slide down on his buttocks. To avoid delays, Sternberg always sent one of his assistants to Farmington for supplies. He worked even in the rain, although walking in the wet clays quickly tired him. Once a week they filled their 50-gallon water tank.

On 21 July, Sternberg wrote to Wiman from Kimbeto and listed new dinosaur and turtle discoveries, and also mentioned his desire to receive payment (letter 3, Appendix 1). On 26 July, Dan Padilla and Sternberg were caught in a particularly bad storm and it took them three hours to reach camp. On 28 July, Sternberg reexamined a portion of a ceratopsian skull, one mile south of Kimbeto, that he had discovered when he first arrived at this trading post. Until this time he had been collecting within a 5 mi (8.3 km) radius of his camp. This camp may have been northwest of Kimbeto as Sternberg (1932, p. 216) noted collecting a turtle from the middle branch of Meyers Creek (Ah-shi-sle-pah Wash) 6 mi (10 km) northwest of Kimbeto. This ceratopsian skull turned out to be complete and 7.5 ft (2.5 m) long. It was later described as the holotype of *Pentaceratops fenestratus* by Wiman (1930). On 30 July, Sternberg jubilantly wrote to Wiman from Kimbeto, telling of his discovery and dropped the hint that he had, in his career, collected seven *Triceratops* skulls, none of which had been sold for less than $1000 (letter 4, Appendix 1). However, on 29 July, he had explored Escavada Wash and subsequently returned to Ojo Alamo. It is not clear when he excavated the skull.

Sternberg collected turtles at Ojo Alamo from strata that are now assigned to the Naashoibito and De-na-zin Members of the Kirtland Formation. The next camp was at a small water hole near Hunter's store on Hunter Wash, where he collected several fossil turtles. Sternberg's final camp was on the south branch of Meyer's Creek (Ah-shi-sle-pah), about 7 mi (11.6 km) northeast of Pueblo Bonito. Near this camp they collected several turtles. In early August, Wiman wired Sternberg that he wanted only vertebrate fossil specimens, not invertebrate fossils or paleobotanical specimens. Sternberg wrote to Wiman on 14 August and complained that he had not been paid yet (letter 5, Appendix 1). Sternberg noted his expenses included hay and oats for his horses which cost $40 a ton and ?$5 a hundredweight, respectively. Among the specimens mentioned in this letter was the back of the skull and what appeared to him to be part of the lower jaw of *Tyrannosaurus*. These specimens turned out to be part of the skull and part of the tubular crest of a hadrosaur that was described by Wiman (1931) as a new species, *Parasaurolophus tubicen*. While camped in this area, Wesley Bradfield, a photographer from the American School of Research (now School of American Research) in Santa Fe, spent some time with Sternberg and took a number of photographs of him and his assistants (e.g., Sternberg, 1932, figs. 53–55).

On 3 September, Sternberg found a nearly complete ceratopsian skeleton (assigned with no evidence to *Pentaceratops* by Wiman, 1930) when he drove his pick into a tooth row (Sternberg, 1932; letter 8, Appendix 1). Sternberg (1932) gave the discovery date as 2 September but we prefer to believe the date from the letter (letter 8, Appendix 1), as this was written much closer in time to the actual discovery. Sternberg believed that he was excavating a hadrosaur because he found what he thought were ossified tendons. He apparently did not discover the true identity of the specimen until he saw Wiman's (1930) paper assigning the specimen to *Pentaceratops* (Sternberg, 1932). The articulated skeleton lacked a head when Wiman (1930) described it, although the fact that Sternberg found a tooth row suggests that at least part of a skull was present.

This specimen was found late in the season and Sternberg had to work hard through several bad storms to remove it (letter 8, Appendix 1). The skeleton lay parallel with the edge of a hill in the badlands (Sternberg, 1932, p. 226, fig. 55). It was difficult to excavate for a number of reasons (Sternberg, 1932; Appendix 3):

1. The matrix was a very hard sandstone and Sternberg could make no impression on it with his Marsh pick, which was the principal tool he had used to excavate dinosaurs from the Lance Formation of Wyoming and the Judith River Formation of Alberta. The only tool that was useful was a soldier's trench pick, which was heavier.
2. There was abundant plant debris concentrated in distinct laminae. These laminae were planes of weakness in the sandstone, and if the rock was struck hard, vibrations would damage the bone.
3. The skeleton required a large excavation, and Sternberg's two assistants had to dig a platform 10 ft (3 m) wide and 18 ft (5.5 m) long with a backwall against the hill of 6 ft (1.8 m), and yet the limbs extended farther.
4. The weather was deteriorating, and every night it froze.
5. Sternberg ran out of plaster, and Ned spent four days going to Farmington only to come back empty-handed. Ned forwent going to a Navajo festival to spend another five days traveling to Farmington, and this time he returned with the precious plaster.
6. The wet plaster and cold weather caused bad cracking of Sterberg's fingers, which he could only alleviate by rubbing on animal fat (Crisco).

To add to the problems a tripod, which was being used to lift the 3100 lb (6800 kg) block (weight when packed) containing the pelvis, collapsed and nearly killed the two Navajos, who laughed through the whole affair. Finally, the pelvic block was loaded on Dan's four-horse wagon, and the rest of the skeleton and the camping supplies were placed in Ned's two-horse wagon and they headed for Farmington.

Sternberg decided that he would like to walk across the badlands of Ah-shi-sle-pah (Meyer's Creek) and meet his assistants on the mesa on the north side. However, on reaching the other side of Ah-shi-sle-pah, Sternberg was surprised to see no sign of the wagons. The goal for the day was to travel to Royal Davis' store 30 mi (50 km) to the northeast. Sternberg had remained at work while his assistants went to Farmington for supplies, so he was not familiar with the roads to the north. North of Ah-shi-sle-pah the country appeared rough, and Sternberg wrongly assumed that the best route to the north, the location of which Ned had tried to explain to him, must branch off the road to Kimbeto which headed to the southeast road. As the Kimbeto road veered ever more south, Sternberg realized that he had made a mistake. He assumed that Ned's route must indeed have headed through the rough country. He decided that rather than retracing his steps he would cut across country and intersect the correct road. After several miles, Sternberg again realized that he had made a mistake, for there was no sign of the road.

He was becoming increasingly tired and thought that he did not have the energy to go back to Ah-shi-sle-pah and start afresh. He therefore decided that his only hope was to head for the Davis trading post. For mile after mile there was no sign of the trading post and worst of all no sign of any drinking water. Finally, after the sun went down, at about eight o'clock, Sternberg collapsed under a tree and made a small fire with twigs from a salt cedar. As the sun rose, an area of badlands became visible to the north, and Sternberg thought that he had at last reached Alamo Wash, with Davis' store at its head. However, as he reached the edge of the badlands, he saw to his despair that before him was a vast area of badlands that he had never seen before. Furthermore, the road that he hoped would lead to the trading post descended into the enormous area of badlands.

Sternberg was now sure that his only hope was to retrace his steps to Ah-shi-sle-pah. He was equally convinced that he would surely die if he tried. However, he started back in the direction that he had come from, following a slightly different route across country. Miraculously, after a mile he found himself at the top of a small cliff overlooking a settlement of a log cabin and several hogans. He staggered down to the cabin and told one of the men that he was thirsty. He was taken inside and given his first drink in 24 hours. Sternberg then asked if they knew where Davis' store was located. An Indian replied "no savvy." Sternberg then asked if the wash to the north was Ojo Alamo. Still, there was no comprehension. Finally, Sternberg told them that he was lost and tired *and* that he would pay them $2 if he was taken to Davis' store. Miraculously, he was instantly understood and he was sat down and served a breakfast of mutton and bread. After breakfast he was taken in a lumber wagon to the store *which was only 1 mi (1.6 km) away!* Sternberg had gone one mile too far north and had crossed the road to the store. He finally met up with his two helpers who had been hunting for him all night.

At Farmington, 1400 lb (3080 kg) of crates (Appendixes 2–4) were

shipped to Richards and Co., shipping agents of 29 Broadway, New York, who subsequently placed them on a vessel of the Swedish Steam Ship Co. (letters 7–8, Appendix 1). On 14 November Sternberg, in Farmington, started a letter to Wiman telling him of the shipping arrangements. Detailed shipping lists were included with the shipment (Appendixes 2–3). Sternberg had requested more money than the $2500 that had been agreed upon, and Wiman had written back "no more money" (letter 8, Appendix 1). However, in this letter Sternberg again asked for more money, this time for $622.50. If this was not received, he wrote, he would have worked only for enough money to cover his expenses (letter 8, Appendix 1). Sternberg wrote that he was obliged to send Wiman the ceratopsian skeleton but that it alone was worth $2000. This is probably a slight exaggeration because 10 years before he had received $1000 for a headless hadrosaur skeleton he had sold to the Institut de Paleontologie in Paris (Michard, 1986). However, hadrosaur skeletons were more common than ceratopsians and may have commanded lower prices. We do not know if Sternberg received his extra money, but it seems unlikely in view of Wiman's cool receptions of previous requests for extra money. Finally, Sternberg reached home on 27 November.

In 1922, Sternberg returned to the San Juan Basin to work "on my own account" (Sternberg, 1932, p. 253). All the specimens collected in this year probably came from the area now referred to as the Fossil Forest (Hunt, 1991), which is southwest of Ojo Alamo and southeast of his collecting area in Hunter Wash. This is consistent with a number of old vertebrate quarries in this area (Hunt, 1984, 1991). These specimens include the holotype of *Pentaceratops sternbergi* (Osborn, 1923) and a ?*Kritosaurus* ischium and metapodial (Lull and Wright, 1942) collected 9 mi (14.5 km) northeast of Tsaya. The Fossil Forest is 7.65 mi (12.3 km) at a bearing of 45° from the original Tsaya Trading Post; there are no badlands 9 mi northeast (Hunt, 1984, 1991).

It also seems possible that the holotype of *Parasaurolophus cyrtocristatus* (Ostrom, 1961) came from this area (Wolberg et al., 1988). Wolberg et al. (1988) suggested that a hadrosaur locality yielding phalanges and cervical vertebrae, which was collected by Bauer and described by Gilmore (1916), also came from the Fossil Forest. This could be significant as Reeside, who had been Bauer's assistant, had given Sternberg most of his leads in 1921. It was only late in 1922 that Sternberg found the skeleton that was later described as the holotype of *Parasaurolophus cyrtocristatus* (Sternberg, 1932; Ostrom, 1961).

He again thought that he had found a ceratopsian skeleton, which would require much work, and he was worried about being in the field late in the year. Sternberg thought that this was the first ceratopsian skeleton from New Mexico and that the American Museum of Natural History in New York would want such a prize. He wrote to Henry Fairfield Osborn, the autocratic head of that institution, and "begged him to send out a man to help" (Sternberg, 1932, p. 253). Sternberg had sold some spectacular dinosaur skeletons to the AMNH and was much respected. Therefore, Osborn sent C. C. Mook, one of his paleontological assistants, and Mr. Kizen ("their greatest dinosaur collector") with $1000. Unfortunately, Kizen quickly determined that the skeleton was a hadrosaur. Since the AMNH already had several skeletons of this family, they were not interested in purchasing this one. However, the $1000 had already been contributed to Sternberg's coffers, so the whole affair was very expensive for Osborn. In 1922, Sternberg also received two payments of $500 each from Miss Ellen B. Scripps, the second after he ran out of money. No one before or since has collected such a significant array of fossil vertebrates from the Fruitland and Kirtland Formations as Charles H. Sternberg.

The majority of Sternberg's specimens have been described (Mateer, 1981; Lucas, 1981 and references therein), but a few have been overlooked. Here we document some of the remaining undescribed specimens in the Uppsala collection. One of the better specimens is a partial left ilium (Fig. 1B). This ilium has a very sinuous dorsal profile and a narrow anterior process. In both of these features it resembles the ilium of *Kritosaurus* (Parks, 1920), and we tentatively assign this specimen to *Kritosaurus* sp. A partial right dentary of a hadrosaur (Fig. 1A) is not diagnostic at the generic level. Other indeterminate hadrosaur specimens include a left femur (Fig. 1F), a terminal phalanx (Fig. 1C), a second phalanx (Fig. 1D) and a posterior dorsal vertebra (Fig. 1E).

Other previously undocumented, and uncatalogued, specimens include a ?theropod tooth, in association with *Neurankylus baueri* from the Fruitland Formation at the head of Ah-shi-sle-pah Wash, 6 mi (9.6 km) west of Kimbeto (drawer no. 142:C:3). Another specimen is a crocodile tooth (drawer 142:C:4), supposedly from the Kirtland Formation. However, the locality is recorded as the same as for crocodile specimens (drawer 142:C:4) from 3 mi northeast of Kimbeto, in the Nacimiento Formation.

The later years (post-1922)

In 1929, C. W. Gilmore of the National Museum of Natural History, Smithsonian Institution, revisited most of Sternberg's locality areas near Kimbeto, Ojo Alamo and Hunter Wash. Gilmore (1935) later described the specimens discovered during this trip, plus some turtles bought from Sternberg that were collected in "1923." Gilmore (1930, p. 21–22) was not too impressed with the quality of fossils and noted that as:

> a collecting field for fossil vertebrates, the San Juan Basin area, taken as a whole, is disappointing. Extensive areas of well dissected bad lands with surfaces practically free from vegetation and debris, an abundance of "float" or surface indications of fossils, are ideal conditions that give every promise of yielding rich returns. It was found, however, that in the greater number of instances, the clues followed led only to a single or at most two or three bones of a skeleton. It was readily apparent that individual skeletons had been widely scattered before internment, and that isolated or partially articulated specimens are rarities.

In 1941–1942, J. W. Stovall of the University of Oklahoma collected several dinosaur specimens from the Fruitland and Kirtland Formations, including partial skeletons of *Pentaceratops* (Kues et al., 1977) and *Aublysodon* (Lehman and Carpenter, 1989).

In 1962–1967, field parties from the University of Kansas Museum of Natural History, led by W. A. Clemens, collected in the Hunter Wash area. They screenwashed microvertebrate sites and recovered the first Cretaceous mammals from the San Juan Basin (Clemens, 1973). Clemens also collected dinosaur specimens, including a skull of *Pentaceratops* (Rowe et al., 1981).

In the 1970s, E. H. Lindsay and R. F. Butler studied the magnetostratigraphy and paleontology of the Fruitland and Kirtland Formations (Lindsay et al., 1981). Their collections encompassed screenwash material (Armstrong-Ziegler, 1978, 1980; Flynn, 1986) and dinosaur specimens, including a partial skull of *Pentaceratops*. In the late 1970s, paleontological surveys were conducted for the U.S. Bureau of Land Management (Froehlich and Kues, 1977; Kues et al., 1977; LeMone, 1979). The largest of these surveys was by Kues et al. (1977), which included the collection of many vertebrate specimens now reposited in the New Mexico Museum of Natural History.

In 1979, D. L. Wolberg and J. K. Rigby Jr. of the New Mexico Bureau of Mines and Mineral Resources and the U.S. Bureau of Land Management, respectively, initiated a collecting project in the Fossil Forest area that included screenwashing (Rigby and Wolberg, 1987) and the collection of dinosaur specimens (Wolberg et al., 1988). The dinosaur specimens were given to the University of Kansas, where they are being studied by J. Hall. From 1983 until the present, the University of New Mexico and the New Mexico Museum of Natural History (NMMNH) have collected sporadically from the Fruitland and Kirtland Formations. This effort has yielded much material, including four partial skeletons of hadrosaurs (e.g., Hunt and Lucas, 1991).

In the late 1970s and early 1980s, the Museum of Northern Arizona collected fossil vertebrates from the Fruitland and Kirtland Formations. Rowe et al. (1981) gave a preliminary description of a new skull of *Pentaceratops* in the Flagstaff collection. However, this collection is largely unstudied, although Mateer (1981) mentioned a new specimen of *Parasaurolophus*.

ACKNOWLEDGMENTS

We thank Barry S. Kues and Tom E. Williamson for reviews of an earlier version of this manuscript, and the New Mexico Museum of Natural History for support.

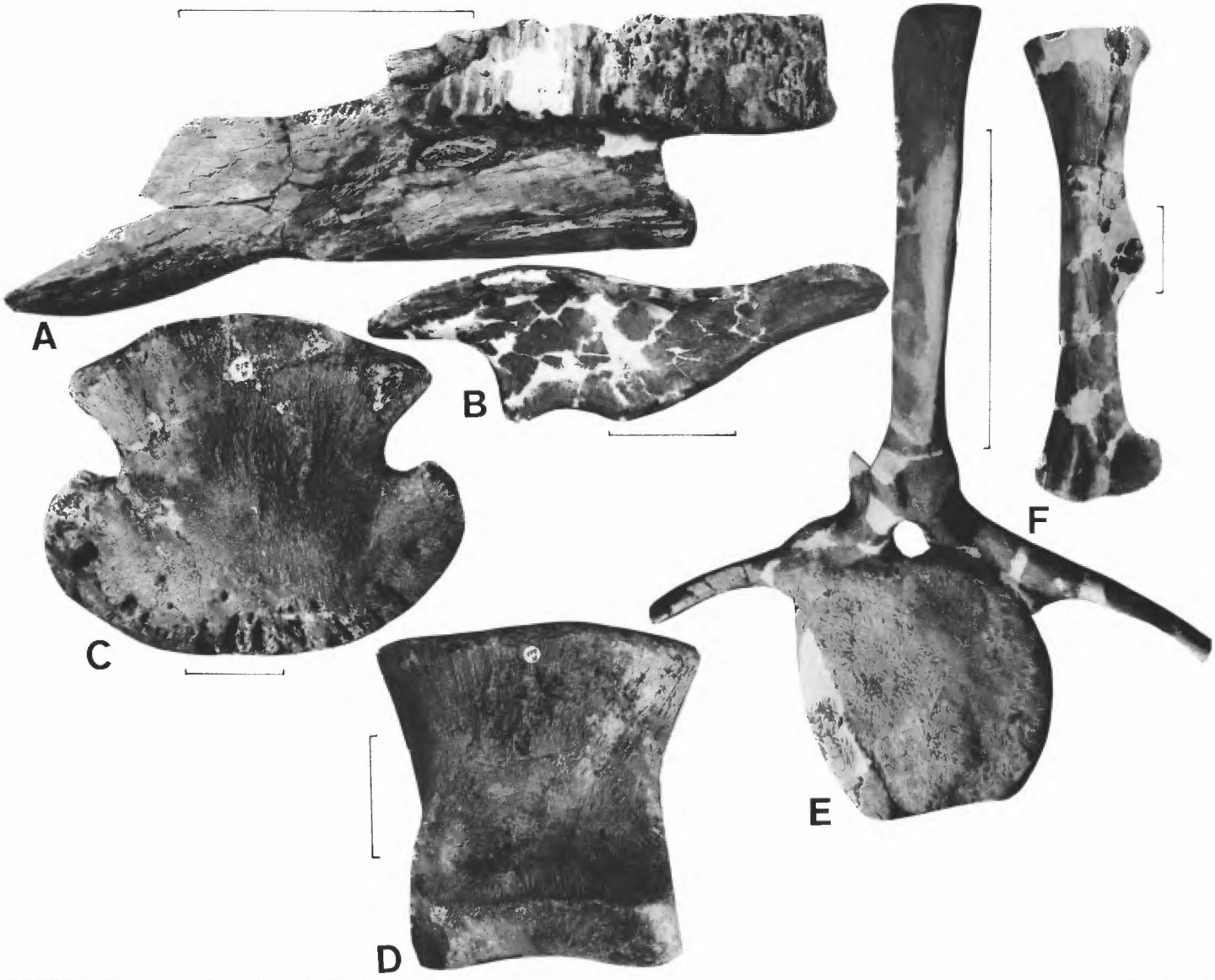


FIGURE 1. Dinosaur specimens from the Fruitland and Kirtland Formations of northwestern New Mexico in the paleontological collections of the University of Uppsala, Sweden. A, PMU.R. 60, Right mandible of indeterminate hadrosaurid in medial view. B, PMU.R. 236, Left ilium of *Kritosaurus* sp. in medial view. C, PMU.R. 212, Terminal phalanx of indeterminate hadrosaurid in dorsal view. D, PMU.R. 201, Second phalange of indeterminate hadrosaurid in ventral view. E, PMU.R. uncatalogued, Dorsal vertebra of indeterminate hadrosaurid in posterior view. F, PMU.R. 98, Right femur of indeterminate hadrosaurid. Scale bars are 10 cm (A), 20 cm (B, E–F) and 5 cm (C–D).

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APPENDIX 1

Letters to Dr. Carl Wiman, Uppsala University, Sweden, from Charles H. Sternberg in 1919–1921. These letters are preserved in the archives of the Paleontological Museum of Uppsala University, Uppsala, Sweden. All letters were typed. Letters 1, 4 and 5 are signed in ink, and the remainder have typed signatures. Only in letters 2, 3 and 8 is the punctuation typed, and in the rest it has been inserted in ink. The original spacing of words is not retained here as in several cases words are crowded, particularly around punctuation marks. There are, however, so many grammatical and spelling errors that these letters are presented as they were written.

Letter 1

Office of Charles H. Sternberg AM
617 Vermont Street
Lawrence
Kansas

December 6 1919

Prof. C. Wiman
Upsala Universities

My dear Sir:—

Many, many thanks for your splendid letter of the 25th of October last. I was very much pleased to know you were pleased with the material I secured from the Kansas chalk Yes! the new species is your own to describe at your leisure. There was never any thing like it, to my knowledge ever described The peculiarity especially is the distinct heads to the femora and humeri and narrowness. You will doubtless find other peculiarities. I will enclose a type written label for it.

You please my personal vanity beyond expression when you congratulate me on my over fifty years service to science. My own University here has realy ignored me and my work. I have collected enough material to have filled one of the greatest museums in the world. My own state allowed it to circle the world. A man with out honor was never more fully exemplyfied than in my case, Although I have many friends, who like you have an appreciation of my work, even here. A famous Doctor of Medicine was reproached for throwing money away by the purchase of one of my books. He answered he would buy it if he never looked within the cover. when he was asked why, he answered because Sternberg has put Lawrence on the map. The late great astronomer Lowell once made arrangements to lecture to the scientific class at the university on condition that I be introduced to him, when I was, befor the Chancellor and all the professors he said in regard to "The Life o of a Fossil Hunter" that "it was the greatest work published in this generation So you see that I have had, and still I believe I have, friends who appriciate as as you do my life work for science. Of course the great Museums appreciate my labor, and I have sold thousands of dollars worth of fine material to the American Museum Selling them $8000.00 at one time from the Red Deer River, where they had their collectors for 5 years. Every dollar I receive goes back into the expences of my field and laboratory work. I have trained three sons two of them are head collectors, and preparators one for the Geol Survey of Canada, and one for the Royal Museum of Paleontology of Toronto. So I feel with you I can look back upon my life with gratitude to God that He has chosen me, a *small insignificant crippled* man to add to His glory, by adding to human knowledge the wonderful story of his buried dead. With that sentiment I have been able to endure contempt, lack of support and a thousand other things that irritate a man, who works among a people so wrapped up in the pursuit of the Almighty Dollar, they can see nothing else. But enough of my self. Let my works stand as an enduring monument to my devotion to science.

wards will soon offer his customers my splendid skeleton of *Equus scotti* the eleventh specimen of this ancient Equus, the only one known to science of this genus in America. It is as good as the best one found I believe. He will also offer the great fish *Portheus molossus*. Cope It nearly equals the best known specimen, I sold to the British Museum some years ago In ma many respects it is better, because the fins except part of the dorsal and caudals and the head and column to the 19th caudal are present. The only supply is the caudal fins and 19 vert and top of dorsal fin, and a few ends of ribs and spines while in the British specimen The head was from another individual and the gill bones are restored.

The one in the American Museum I sold years ago had no spines and they were incorrectly restored I will give desired information on another sheet

Thanking you again I am faithfully yours
Charles H. Sternberg

Letter 2

Farmington N.M. U.S.A.
July 11 1921
Care Royal Davis

Dear Dr. Wiman:

I was indeed glad to receive your cable of the 21:st I answered it "Among Dinosaurs, money to Glendale National Bank" meaning California, my home.

I have gotten to the field at great expense and when I reached my head quarter at Thorean(?) N.M. I learned my wife was sick and must be operated. I took the first train for Glendale Calif. and we took her next day to hospital where an 8 lb tumor was removed. I remained with her a month and she is nearly well now.

I will not charge you for the time taken in coming here. But from 1:st though I had spent some days here since June 16:th exploring the badlands.

I have already found *a nearly perfect turtle and 6 or 8 more or less perfect,* I have also learned the horizons and now know the dinosaur beds. They seem equivalent to the Belly River of Alberta Canada. I have already *many bones of duck-billed and other dinosaurs*. This too is (a) comparatively new (field) *3 skulls have been found 2 of Kritosaurus I believe this is the best field for dinosaurs* I can reach at this season of the year. 3 of my sons with large parties to (?) the Red-Dew beds have been at work there 6 weeks already as the exposures are limited and few I might get nothing there. I have here for transportation a Ford truck automobile that cost me $1055, a heavy team of horses and wagon a light wagon. The dinosaur beds are enormous in area and with my car I can travel 12 to 15 miles an hour and reach all the beds with team can go into them and haul out my material. I expect to make a great collection of turtles and dinosaurs here. I have found two specimens of straight(?) ischia, no footed ones jet.

Shall I collect shells and plants here. I found a fine locality at Pueblo Bonita, where I got some fine Inoceramus shells. They may be new Shall I ship a fine series to you? *I am 55 miles south of (?) Kimeto(?) a government station for Navajo indians*. My address will be as above. I paid for the answer to cable as I could not reach a Postal Telegraph Office.

Faithfully
Charles H. Sternberg

Letter 3

Kimbeto N. Mex
Post Office Farmington
N. Mex
July 21 1921

Dear Dr. Wiman:

I was delighted to receive your letter with enclosure. As I wrote you my best judgement induced me to come here. The formations Fruitland, Kirtland and Ojo Alamo are evidently from my explorations the past month, equal to the Belly River of Alberta. I have found enough dinosaur to testify to that fact. I am at work now on the squamosal of a *Ceratops + Lambe's Chasmosaurus*. I have found a straight ischia a(?) Trachodont is present I have sections of dorsal vertebrae of a Trachodont's back-bone, Ilia Sacrum etc. the largest Metarsal I have seen phalangs etc. My best discoveries are *two fine turtles*, one *Adocus Baneri*, Gilmore has nearly perfect plastron and carapace about 2 ft long better than type, a fine *Baena about 15 in. long*. Althought this is very difficult country to explore (we have to hand water and feed for teams and cannot get into the bad-lands with car) I believe judging from my discoveries in July that 4 months of the persistent effort I put into it will jeeld a good deal of valuable materail. I am also glad to tell you I have discovered a complete cooking pot of the ancient people that built the great city of Pueblo Bonita 15 miles south. The geographic Magazine are opening one Pueblo now, that contains a 1000 rooms and was 5 stories high and erected before cartes conquered Mexico. I will indeed be glad to receive the funds. As my expences have been as great I have used up my means and send in a load of fossils to Farminfton soon

Faithfully
Charles H. Sternberg

Letter 4

Kimbeto
PO Farmington N Mex
Care Royal Davis
July 30th 1921

My dear Dr. Wiman:—

I am glad to write you an encouraging letter, In addition to the *two nearly complete Turtles* described in my last. I have been so fortunate as to find a *Triceratops Skull* in what our geologists call the Kirtland Shales. See US Geol Bulletin No 716-G *And C W Gilmore Professional paper 119 Washington 1919*

Mr Gilmore agreeing with Mr Barnum Brown, places the formation in the Mid-Cretaceous, Or Belly River of Alberta and Judith River of Montana. But who ever heard of a Triceratops in either! So one of two things only is possible, Either they are mistaken and Triceratops begins in the early Cretaceous or else there are Lance Beds The most recent of the Dinosaur beds. At all events I call it a great discovery to find this genus for the first time west of the Rocky Mts. It is going to help definately to settle the horizon of these beds and proves to me as I hope it will to you that I made no mistake coming here. Further it is the longest skull I have seen about 8 feet long. It is entire except for the dentaries and predentaries Unfortunately it is badly crushed, The crest not over 13 inches wide, and the distance between the orbital horn cores only about 18 inches. I never met with this peculiarity before, Although I have collected 7 Triceratops skulls, None of which I have sold in the field, for less than a thousand dollars. Owing to the new Triceratops locality it likely represents a new species.

For my dear Doctor I want to put some questions to you I always collect every thing in the line of fossils, With the skull I have found, what I take to represent the following genera of plants in much better condition than hither-to found. Date Palm, Sequoia Locatia Pupulus, Pine, Pealanus Fir, reeds etc I got a lot of leaves also at the turtle locality I have only found the three fine show specimens, but a large collection of many species in fragmentary forms good for scientific study and to help elucidate the age of these beds, Evidently the paleontologists are at fault and Kritosaurus or Gryposaurus, continued to live beyond the Mid-Cretaceous I spoke also of the Inoceramus shells and I have several pounds of carboniferous Producti etc collected enroute

What I want to know then is this, Are you willing to trust to my judgement and allow me to send every thing that has a scientific value. Shells Leaves A few fine specimens of opalized, and other wood and fragmentary turtles and *good loose Dinosaur bones*.

Or you prefer that I leave all this and ship only the fine show specimens.

The freight rates to New York will be Car load lots minimum 30 000 ilbs per cwt $3 70 Less than car lots $6 11 pr 100 pounds Further it must ship to C B Richards of New York Who will pay the rail Road freight Ship to you and collect the total freight from you If you have some other party in New York to ship to Please notify me and, if you are satisfied to allow me to ship through C B Richards Brokers of N Y also notify me, so I will have no trouble about shiping from here The rules of the road allow them to collect in advance That will be impossible on my part to advance the freight

The prospect now is that I will get near enough a car load to sh ship that way. CW Gilmore was very anxious for our Government to employ me this season here, They were too poor, So the rich returns in this virgin field will be to you, and I hope you have authorities to work up all the new material

Faithfully yours
Charles H Sternberg

PS I am depending on the money being sent to Glendale National Bank Calif. The first of August, to meet my expences here they are heavy

C.H.S.

Letter 5

Dear Dr Wiman:—

Ojo Alamo N Mex
Post Office Farmington N Mex
Aug 14 1921

Your Wire received. Although I have collected leaves, shells and opalized wood; It was done without any expence to you in loss of time, Further: as I did not charge you with a months salary; While I was getting here and finding the ground I will simply keep that I have already collected and pay no further attention to them, I have not as yet receieved notice from by Bankers The Glendale National Bank Glendale Calif that the $2500 has been recd as I directed the $2500 be sent there I suppose it went by mail and has not yet arrived Please see to it that the money is sent as promised for I have made obligations in expectation that it would reach me on time.

I have already told you of the finds last month. The 8 ft *Triceratops and two fine turtles* I have moved over to this locality and have found 2 thirds of the carapic and plastron of another turtle a good many turtles on the wash. Some: though broken up and scattered can be restored with patience My greates finds however, have been of *Tyrannosaurus rex* I have been unable to account for the enormous single bones I have found, I find they belong to this huge carnivore

I am now at work on the scattered bones of one, I have found a complete ilium which is large enough indeed; also the centra of the sacrum with some of the spines etc A,good many more bones are in the quarry, I cannot tell how much of the skeleton I will find. I have in another individual I have found the back of the skull and what seems to be much of a lower jaw I am finding a good many isolated large bones of different sps and found the bar of the crest

of a Ceratops You will see therefore my first supposition is correct. That our Paleontologists have entirely misunderstood the age of these rocks, Expecting turtles, I have already found more material that all that has been collected heretofore As A region so remote from the type localities I feel sure all the dinosaur material will be new. I have a hard time of it as we have had a great deal of rain that interferes with my work some Tho realy I have lost no time and work early and late, taking several soakings, My worst trouble is being obliged to send often to town for supplies I have to hire two teams and drivers on that account, I have to feed these teams hay and oats Hay costs me about $40 a ton and Oats $5 00 or hundred sometimes too I have to haul water to the teams But I feel much encouraged and think you will be thoroughly pleased with the material It is not as well preserved as in some localities this is a virgin field, unexplored, and very extensive

Hoping to hear from you
I am faithfully yours
Charles H Sternberg

Letter 6

Post Office Farmington New Mexico Not Mexico
Sept 4th 1921

My dear Dr Wiman :—

I am happy to report I am now camped on the most extensive badlands in this part of the country within a mile of the Navajo Reserve On the Ojo Alamo I have received permission from the Assist Sec of the Interior to collect for your University The thing that wories me is that I have received no notice from the Glendale National Bank that the $2500 has been received It is very serious as I depended on that money to continue my work until the end of my contract and I do not want to lose any time going to town as I will have to in order to cable you asking where the money is, It is a serious thing to be out of money here among strangers. I have reached the extensive exposures of the Fruitland Formation and have found some magnificent turtles One the largest and most perfect known that is three feet long and two feet wide the shell beautifully sculture, I have found in the four formations Puerco (Basal Eocene). The Ojo Alamo Sandstones, the Kirtland Shales and the Fruitland, Where I am now 50 turtles among 10, that for perfection I do not think they were ever equaled more, I believe I have collected in these upper Cretaceous beds the finest collection known. Please; If you do not have them, secure from the Dept of the Interior at Washington Charles W Gilmore's Papers 98-2 Published December 19 1916 and Professional Paper 113 119, 1919 and Bulletin 716-G 1921. The Skeleton of the great Tyranosaurus consisted of the centra of the sacrum the illium and a mass of rock weighing over 200 pounds so covered with the matrix that could not identify the bones, I wish to know if you would like me to collect the turtles of the Puerco as well, I have also found part of a skeleton of a dinosaur but do not know how much is present, I have also found part of the frill op a large Triceratops in the Fruitland You wrote me that I was to send the freight to a Sweedish S S Co but did not give me the adress, Please get this subject of freight straightened out The R R Co will not except them unless the charges are guarantesd by reliable parties in New York, Further, as I will work here so late I cannot remain in a moment after the time I am employed as winter will be coming on and I must cross th mountains into California with my Ford Truck befor the snow blocks th roads. From the present indications I will have the best collection of the beautifully sculptured turtle shells of the Upper Cretaceous known, The ten of the finst, so far discovered will make a magnificent display and I think they are more perfect than those dercribed by Gilmore

Hoping my anxiety in regard to money may be soon relieved I am your faithful worker Charles H Sternberg

Letter 7

Farmington N Mex
Sept. 20th 1921

Dr C Wiman :—

My dear Doctor:—

I have been disapointed in not hearing from you or receiving the $2500 at the Glendale National Bank at Glendale California, my home

The promise was made by cable that the money was to be sent in August, On the strength of that cable I have borrowed $600 to work here constantly, As it would cost you a hundred dollars in my loss of time if I went to Farmington, I have always sent in a hired men with the material to a house I have rented. It takes four days to make the trip so I have been unable, with out heavy loss to you to get in touch with you by cable, I have sent in to Thoreau to a friend to try and learn where the money is. Further I do not have any authority from a SS Co in New York to ship through to them with agreement on thei part to pay the freight to New York. As I wrote you I must return so I can reach home the first of Nov, when our contract expires, I hope indeed you will straighten th these things out that you will get the $2500 to me and arrange with some one in N Y The last letter you wrote me was addressed Mexico and luckily was sent here, Mexico is a foreign country to the south of the U.S. It is a wonder I got it.

My constant unremmitting efforts have secured a splendid collection I have over 60 turtles, All from the Upper Cretaceous I do not think there is such collection, any where among them are at least 15 almost or quite perfect One Plastomenus, the only perfect one known is three by two feet beautifully sculptured, I have also specimens of Adocus and Neurankylus and Baena as perfect and nearly as large, I have collected in the Cretaceous for fifty years and have never seen a collection of turtles to equal this, There are many species too of Baena and perfect shells Think of 15 of these beautifully sculptured shell on exhibit in your museum, there are many more that can be restored with patience. It will make the finest collection in the world, and be, as I hope one of the crowning expeditions of my life.

I have after three months search found where skeletons were buried I am at work now on four scattered duckbills How much of the skeletons have been washed out is impossible to tell. I found a mandible with teeth, So you can at least identify the species. If you have not already arranged for the money, and the freight, cable me on the receipt of this. This uncertainty is awful when I am working to the limit of my ability to secure you a fine collection, It already excells all others ever taken out of this region.

I hope too, if you should desire my services next year you will try and arrange at once, I can in these four months go over a very limited area of the exposed formations and every new camp I have yielded rich returns

I could make a fine collof leaves and shells

Faithfully yours
Charles H Sternberg

Letter 8

Farmington, N. Mexico
Nov. 14th 1921

My dear Sir: —

At last after untiring efforts extending through 4 months ans a half I have succeded in hauling in and packing my great collection, the best by far ever taken out of San Juan Co. N.M. The Triceratops skull though badly crushed will make a fine mount. The specimen worth all the rest NO 113 a duckbilled trachodon likely Kritosaurus of Brown are new. I found it on the 3d of sept. and worked with all the powerss to get it out before cold weather. I had several bad storms and it froze every night hard. I hired a four horse and 2 horse team to haul it in. I have packed the entire collection and am waiting to hear from Richards & Co. Shipping Agents, 29 Broadway N.Y. as I can not load on the car here until I learn that they will pay the freight. I have to guarantee that you will, wich I have done and hope there will be no more delay. Taking up this specimen and travelling by my Fords truck will take me to the end of December. You will realize as I found it during contract time I cannot keep it myself. farther that when I started taking it up I had to finish. This of course greatly injured me financially. For that reason I cabled you and you freeded yourself by saying "no more money". Unless I receive $622 1/2 in addition to the $2500 I will have worked 5 months for the bare expenses of my expedition. But under the circumstances I am forced to send the skeleton to you. I have sold skeletons no better for $2000. You will realize however I could not in honor retain what I consider worth all the rest. There are about 60 turtles of 5 or 6 families of them 25 are splendid for Museum specimens. I will write later.

Faithfully
Charles H. Sternberg

3015 Roselyn
Glendale Calif

APPENDIX 2

Packing lists of fossil vertebrates sent by Charles H. Sternberg to Uppsala University in 1921. The original document is in the archives of the Palaeontological Institute of the University of Uppsala, Uppsala, Sweden. The original is typed.

Contents of Boxes.

Box 1. No 113. Rt tibia and fibula. Rt femur. Hind foot next left femur. Fragments from sec. 3 and 4.
" 2. " " Ribs 3 pices sec. 5, ribs from Sec. 2 Frag. 2 and 3.

" 3 " " Sec. 4 and 7.
" 4 " " Hind limb and fragments.
" 5 " " Head and body, sections 1 and 2.
" 6 " " Section 3. Pelvis 91? and No. 16
" 7 " " Left femur, Turtle 112, a turtle without No also 105, 106.
" 8 Skull Triceratops, 82, 77, 18, 30, 20, 40, 70, 37, 50, 35.
" 9 Turtle near 42, 56, 57, 62. carniv. vert. Big turtle from Alamo No 60 bones of 113, 110, 59, No. 10, 55, 44, crocodile jaw 54, 59, 112.
" 10 105, 15, 107, 105, 55.
" 11 102, 63, 61, 93, 112, unnumbered turtle, Pelvic arch. Carniv. Barrel Springs 110, 50, vert 45, 44.
" 12 14, 90, 16, 42, 50, 24.
" 13 109. Pt Sec. 7 of 113. Rt tibia 113. Fragments 110, 15, 105, 55, 7, 84. Turtle phalanx 42, radius 5, 11, 85.
" 14 Bones carniv. Barrel springs 86, 51, 28 without No 107, 51, 2, unmarked ? 23, 22, 21, 25, 96, 48, 111, 102, 100, 83.
" 15 48,103, 99. Tibia near 99, unnumbered 104 ? and turtle
Fish all ? near camp in Fruitland Shales. Turtle 88, 17, 18, 19, 27, ? Huge.
" 16 36 unmarked [*sic*] 31, 34, 33 unknown organism with parallel cells.

APPENDIX 3

List of fossil specimens from New Mexico sent by Charles H. Sternberg to Dr. Carl Wiman in 1921. The typed original is in the archives of the Paleontological Institute of the University of Uppsala, Uppsala, Sweden. The list has been annotated with handwritten comments in Swedish. A few of these comments are indicated in square brackets.

List of fossil vertebrates

Collected for Dr Wiman by Charles Sternberg. From the upper cretaceous strata of San Juan Co. N. Mexico 1921. The numbers not mentioned represent fossil wood and not vertebrates.

No 4. Scattered Turtle bones. Kirtland Shales near Kimbeto Trading post.
No 7. " " " Head Blanco Canyon N. Kimbeto, likely Puerco Formation.
No 8. Ungual and caudal vertebra Carniverous [*sic*] Dinosaur. Kirtland Shales Kimbeto Wash St.
No 9 Orbital horn and foot ischium. Alamo wash near Old Trading Post.
No 11. Turtle fragments. Head S. branch Myers Cr. 3 miles west Kimbeto Trading Post. Kirtland.
No 14. Fine Baena nearly perfect. Same locality.
No 15. Adocus "Kirtlandicus". Gilmore Head middle branch Meyers Cr. Kirtland shales 6 miles West Kimbeto Trading Post. The best specimen known.
No 16. Several large vertebrae (dorsal) of a trachodont. 3 miles west Kimbeto St. on S. branch Meyers Cr. Kirtland
No 17. Turtle. Same loc.
No 18. " " " Picked up on the wash.
No 19. Fragments turtle. Same loc.
No 20. Large central phalanx Duckbilled Dinosaur.
No 21. Baena fragments. West Kimbeto St. 2 1/2 miles Kirtland.
No 22. Plastron Adocus. 3 miles South Kimbeto St.
No 23. " " " " "
No 24. Turtle. Same loc. Kirtland Shales.
No 25. " " "
No 26. " on wash 2 1/2 miles west Kimbeto St.
No 27. Dinosaur bone. Same loc.
No 28. Fragment turtle.
No 30. Dorsal and sacral centra. 2 miles S. Kimbeto.
No 31. Unknown organism parallel cells.
No 32. Turtle. same loc.
No 33. Turtle. Same loc.
No 34. Dentary Duckbill. Same loc. Kirtland.
No 35. 2 vert. and ilium ischium of Trachodon. Same loc.
No 36. Dentary 3 dorsals and turtle bones. Same loc.
No 37 Scapula Dinosaur. same loc.
No 38. 3 ilium ischium 2 vert. Same loc.
No 40. Ilia and 3 vert. 1 mile South Kimbeto St.
No 41. Triceratops skull 7 1/2 feet long. Kirtland Shales. 1 mile S. Stat. breakes of Kimbeto wash. There were many sections of bone from under side that fell out when I turn the skull over. They should be soaked in shillax (thin) and put in place. This is the first Triceratops found in this formation.
No 42. Skull Crocodile, without mandibles. Barell Springs 2 1/2 miles South Trading Post, Kirtland Shales.
No 43. Baena nodosa 2/3 of carapace and plastron. Same loc.
No 44. Fragments turtle.
No 45. Dinosaur vert. same loc. all Kirtland Shales.
No 46. Baena fragments on wash. Same loc.
No 47. Huge caudal. Same loc. Kirtland.
No 48. Limb bone dinosaur, same loc. Kirtland.
No 49. Turtle, same loc. all from barrel Springs from between the conglomerates Heuex Oje Alamo sandstone. That lie below the Puerco formation.
No 50. Large carniverous back of skull? 2 ? Oje Alamo.
[Parasaurolophus]
No 51 " " Illium and sacrum, last badly broken by Beye, who hawled it it in. Oje Alamo.
No 52. Turtle, same loc. near 42 Kirtland.
No 53. " " "
No 54. Metatarsal dinosaur.
No 55. Complete Carapace and Plastron, nearly Baena, Kirtland Shales. Below 2nd conglomerate 1 mile above 42.
No 56. Bar of Ceratops skull, near 55.
No 57. Section Dinosaur bone for polishing, near 42. Kirtland Shales.
No 58. Horn core, branch of Alamo 3 miles S. Old Trading Post.
No 59. Broken turtle skull on Escavada wash west of Kimbeto St. 6 or 7 miles.
No 60. Complete Turtle Plastron and Carapace 3′ × 2″. The finest ever found. I believe South Side Alamo wash, 3 miles above Havlies Store.
No 61. A fine Turtle, nearly complete carapace and plastron. same loc.
No 62. A huge Horn core, Triceratops. near 60.
No 63. Huge Tail Triceratops, near 60.
[Pentaceratops sp.]
No 64. Distal end dentary of carniverous, same loc.
[Ceratopsia]
No 65. Vertebrae of dinosaur " "
No 66. Toe bone of horned dinosaur " "
No 67 Vertebrae of dinosaur " "
No 68. Part Plastron like Asperedites. Loc. 1/4 mile below 60 loc.
No 69. Asperedites fragments on wash. Same loc.
No 70. Turtle fragments " "
No 71. " " " "
No 72. " " " "
No 73. " " Asperedites " "
No 74. " " " "
No 75. " " " "
No 76. " " " "
No 77. Turtle fragments Same loc.
No 78. Loose bones on the wash " " 68 loc. a level stretch of shale 200 × 100 ft. Turtle bones scattered over it.
No 79. Loose Turtle bones. Same loc.
No 80. " " " " "
No 81. Turtle " "
No 82 Carapace and Plastron ? " "
No 83 Turtle " "
No 84. Metatarsal Duckbill near 60.
No 85 Turtle " "
No 86. Turtle frag. Lower strata with carbonate of iron septaria. Just below the 68 loc. This loc. on alamo wash are in T 24 Range 18 W Ee 43 33 and 34.
No 87. Aspedirites frag. near 60
No 88. End of mandible " "
No 89. Bone of head. Coal Cr. on Road to ? ?
No 90. Turtle. Good near 60.
No 91 Tibia " "
Moved camp to South Branch, Myers Cr. about 4 miles above cattle ranch. All in Kirtland Shales.
No 92. Pelvic arch of dinosaur, across Myers Cr. from camp.
No 93. Turtle. Near 92. Aspederites Carapace.
No 94. Horned dinosaur. Part of crist
No 95. Metacar pax near 92
No 96. Edge of crist " "
No 97 Part of crist. Horned dinosaur. Near camp, south side Creek.
No 98 Jaw of duck bill. Same loc.
No 99. Tibia of " " " "
No 100. Metarsal and caudal duck bill
No 101. Vertebrae " "
No 102. Femur " "
No 103. Femur duckbill and other bones
all above from 97 in quarry 150 × 200 near camp on top of the badlands

No 104. Turtle on wash 1/2 mile above camp on level with crack bottom.
No 105. Turtle.
No 106. " " Baena, nearly perfect. 10 feet from 105
No 107. Adocus. This was a fine turtle, injured in taking it up under a high pilar. I could not get it without tumbling over the pilar.
No 108. Turtle.
No 109. 2 vert. and metatarsal of Dinosaur, near 108.
No 110 Ischium, Dinosaur
No 111. Phalanx
No 112. Teeth Nyledophus, scales Lepidosteus and scales crocodiles on wash.
No 112. Adocus a fine skull not far from 105.
No 113. Trachodont skeleton. Found on the 3d of september. [Pentaceratops fenestratus]
No 113 This is virtually a complete skeleton of a Trachodont, likely Kritosaurus. I had enormous dificulties in taking it up. I laid bare (in face of the bluff) a flour 11′ × 18″. I then owing to the graet mass of rock above had to dig caves for the tail and hind limbs. The rock a sandy clay or clay with a little sand was full of the impressions of ? ? of trees and some ? ? ? coal making hollow places every where. The pounding of the tools often broke up the bones. The right hindfoot was entirely destroyed on this I do not know if all the head is preserved in sec. 1, I found a p of mandibles first with teeth but as the bones are very brittle I explored no further. I advise that the great sections be laid on trucks smaller than the specimen secured there firmly. Then cut half the ? of plaster off exposing the bottom of the slabs (the plaster stripes of bottom put on last) soak all bones as fast as exposed with white shallax diluted 4 times with alcohol allow a day before touching. Keep all fragments in their separated packages well filled with shellax, mend with Gum Arabic disolved to consistancy of thin cream and plaster of Paris. Never pound with heavy tools, remove rock with light mammer and chisel. You may use water if the rock and bone is dried thoroughly. I broke the sections apart and you sure to get contacts in many places. So as to restore broken bones. The specimen must be made into a slab mount and I think mounted as found. I will gladly come over to help mount this skeleton and unless you have preparators who have worked in Cretaceous Dinosaurs it would be to your advantage to have my services. I have mounted several

Charles H. Sternberg

APPENDIX 4

Reptilian fossils from New Mexico in the collections of the Palaeontological Museum, University of Uppsala, Uppsala, Sweden.

"Baena" nodosa

PMU.R. 11a Carapace (Wiman, 1933, pl. 1, fig. 1; Mateer, 1981, pl. 3.3, fig. 1). Locality I.
PMU.R. 11b Plastron (Wiman, 1933, pl. 1, fig. 1a; Mateer, 1981, fig. 2). Locality I.
PMU.R. 12 Carapace (Wiman, 1933, pl. 1, fig. 2; Mateer, 1981, pl. 3.3, fig. 3). Locality V.
PMU.R. 13a Carapace (Wiman, 1933, pl. 1, fig. 3; Mateer, 1981, pl. 3.3, fig. 4). Locality V.
PMU.R. 13b Plastron (Wiman, 1933, pl. 1, fig. 3a; Mateer, 1981, pl. 3.3, fig. 5). Locality I.
PMU.R. 14a Plastron (Wiman, 1933, pl. 1, fig. 4a; Mateer, 1981, pl. 3.4, fig. 2). Locality VI.
PMU.R. 14b Carapace (Wiman, 1933, pl. 1, fig. 4; Mateer, 1981, pl. 3.4, fig. 1). Locality VI.
PMU.R. 15 Carapace (Wiman, 1933, pl. 1, fig. 5; Mateer, 1981, pl. 3.4, fig. 3). Locality ?.
PMU.R. 16 Carapace (Wiman, 1933, pl. 1, fig. 6; Mateer, 1981, pl. 3.4, fig. 4). Locality VI.
PMU.R. 17a Carapace (Wiman, 1933, pl. 1, fig. 7a; Mateer, 1981, pl. 3.4, fig. 5). Locality VI.
PMU.R. 17b Plastron (Wiman, 1933, pl. 1, fig. 7b; Mateer, 1981, pl. 3.4, fig. 5). Locality VI.
PMU.R. 18 Plastron (Wiman, 1933, pl. 1, fig. 8a; Mateer, 1981, pl. 3.5, fig. 1). Locality I.
PMU.R. 18a Carapace (Wiman, 1933, pl. 1, fig. 8; Mateer, 1981, pl. 3.5, fig. 2). Locality I.
PMU.R. 19 Plastron (Wiman, 1933, pl. 1, fig. 9; Mateer, 1981, pl. 3.5, fig. 4). Locality I.
PMU.R. 20a Plastron (Wiman, 1933, pl. 1, fig. 10; Mateer, 1981, pl. 3.3, fig. 5). Locality ?.
PMU.R. 21 Carapace (Wiman, 1933, pl. 1, fig. 11; Mateer, 1981, pl. 3.5, fig. 3). Locality VI.

Thescelus insiliens

PMU.R. 22 Carapace (Wiman, 1933, pl. 2, fig. 6; Mateer, 1981, pl. 3.9, fig. 1). Locality VI.
PMU.R. 22b Plastron (Wiman, 1933, pl. 2, fig. 6a; Mateer, 1981, pl. 3.9, fig. 2). Locality VI.
PMU.R. 23a Carapace (Wiman, 1933, pl. 2, fig. 7; Mateer, 1981, pl. 3.9, fig. 3). Locality VI.
PMU.R. 23b Plastron (Wiman, 1933, pl. 2, fig. 7a; Mateer, 1981, pl. 3.9, fig. 4). Locality VI.

Neurankylus eximius

PMU.R. 24a Carapace (Wiman, 1933, pl. 2, fig. 1; Mateer, 1981, pl. 3.6, fig. 1). Locality I.
PMU.R. 24b Plastron (Wiman, 1933, pl. 2, fig. 1a; Mateer, 1981, pl. 3.6, fig. 2). Locality I.
PMU.R. 24c–j Cervical vertebrae (Wiman, 1933, fig. 4, pl. 3, fig. 2a–8b; Mateer, 1981, pl. 3.7, figs. 1–15). Locality I.
PMU.R. 24q Pelvis (Wiman, 1933, fig. 6; Mateer, 1981, pl. 3.3, fig. 3). Locality I.
PMU.R. 24r Femur (Mateer, 1981, fig. 3.3). Locality I.
PMU.R. 25a Carapace (Wiman, 1933, pl. 2, fig. 2; Mateer, 1981, pl. 3.6, fig. 3). Locality I.
PMU.R. 25b Plastron (Wiman, 1933, pl. 2, fig. 2a; Mateer, 1981, pl. 3.6, fig. 4). Locality I.
PMU.R. 26a Carapace (Wiman, 1933, pl. 2, fig. 3a; Mateer, 1981, pl. 3.8, fig. 2). Locality I.
PMU.R. 26b Plastron (Wiman, 1933, pl. 2, fig. 3; Mateer, 1981, pl. 3.8, fig. 1). Locality I.
PMU.R. 27 Carapace (Wiman, 1933, pl. 2, fig. 4; Mateer, 1981, pl. 3.8, fig. 3). Locality I.
PMU.R. 28 Plastron (Wiman, 1933, pl. 2, fig. 5a; Mateer, 1981, pl. 3.8, fig. 4). Locality I.

Basilemys nobilis

PMU.R. 29a Carapace (Wiman, 1933, pl. 4, fig. 1; Mateer, 1981, pl. 3.4, fig. 2). Locality VI.
PMU.R. 29b Plastron (Wiman, 1933, pl. 4, fig. 1a; Mateer, 1981, pl. 3.4, fig. 2). Locality VI.

Plastomenus sp.

PMU.R. 30 Carapace (Mateer, 1981, fig. 3.6). Locality VIII.
PMU.R. 31 Plastron (Wiman, 1933, pl. 5, fig. 1-2; Mateer, 1981, fig. 3.6). Locality VIII.

Platypeltis sternbergi

PMU.R. 32 Carapace, holotype (Wiman, 1933, pl. 6; Mateer, 1981, fig. 3.5). Locality VIII.
PMU.R. 33 Carapace (Mateer, 1981, fig. 3.5). Locality VIII.

Kritosaurus sp.

PMU.R. 224 Left pubis (Mateer, 1981, pl. 3.2, fig. 1). Locality IV.
PMU.R. 231 Left ilium (Mateer, 1981, pl. 3.2, fig. 1). Locality IV.
PMU.R. 236 Left ischium (Mateer, 1981, pl. 3.2, fig. 5). Locality IV.
PMU.R. unnumbered, Right ilium (Fig. 1B). Locality III.

Hadrosauridae indet.

PMU.R. 60 Dentary (Fig. 1A). Locality III.
PMU.R. 98 Right femur (Fig. 1F). Locality VIII.
PMU.R. 201 Second phalange (Fig. 1D). Locality I.
PMU.R. 202 Metacarpal. Locality VI.
PMU.R. 212 Terminal phalange (Fig. 1C). Locality VI.
PMU.R. 223 Left humerus (Mateer, 1981, pl. 3.2, fig. 4). Locality IV.
PMU.R. 245 Sternum. (Mateer, 1981, pl. 3.2, fig. 5). Locality IV.

Pentaceratops sternbergi

PMU.R. 200 Skull, holotype of *Pentaceratops fenestratus* (Wiman, 1930; Mateer, 1981, pl. 3.1). Locality IV.

Ceratopsidae indet.

PMU.R. 268 Post-cranial skeleton (Wiman, 1930). Locality IV.

Parasaurolophus tubicen

PMU.R. 222 Skull, holotype (Wiman, 1931; Mateer, 1981, fig. 3.1). Locality V.

Goniopholis kirtlandicus

PMU.R. 230 Skull, holotype (Wiman, 1932, pl. 4, 5, fig. 1). Locality V.
PMU.R. 231 Tooth (Wiman, 1932, pl. 5, fig. 2-3). Locality V.
PMU.R. 232 Scute (Wiman, 1932, pl. 5, fig. 4). Locality V.

Alamosaurus sanjuanensis

PMU.R. 280 Sacral vertebrae, topotype (Mateer, 1976, fig. 2; Mateer, 1981, fig. 3.2). Locality V.
PMU.R. 281 Left ilium, topotype (Mateer, 1976, fig. 1; Mateer, 1981, fig. 3.2). Locality V.

LOCALITIES

I—Head of Ah-shi-sle-pah Wash (secs. 3–4, ?8–9, T22N, R10W, secs. 33–?34, T23N, R10W) = "south branch Meyers Creek, 3 miles west of Kimbeto Trading Post." Kirtland Formation.

II—Middle of Ah-shi-sle-pah Wash (secs. 6–7, T22N, R10W; sec. 12, T22N, R11W) = "6 miles west of Kimbeto Trading Post" and "head middle branch Meyers Creek." Upper Fruitland–Hunter Wash Member of Kirtland Formation.

III—North flank of Betonnie Tsosie Wash (secs. 7–8, ?18, T23N, R9W) = "3 miles south of Kimbeto Station" and "2 miles south of Kimbeto." Kirtland Formation.

IV—South flank of Kimbeto Wash (secs. 1–?2, T22N, R10W) = "1 mile south of Kimbeto Station." Kirtland Formation.

V—Barrel Springs area, De-na-zin Wash (secs. 17, 20, T24N, R11W). Naashoibito Member of Kirtland Formation and lower members.

VI—South branch of Hunter Wash (sec. 33–34, T24N, R13W) = "mouth of Alamo Wash." Kirtland Formation.

VII—Coal Creek. Fruitland and Kirtland Formations.

VIII—Ah-shi-sle-pah Wash (secs. 4–9, T22N, R10W) = "south branch of Meyer's Creek. Kirtland Formation.