Edward Drinker Cope's Paleontological Activities in the Dakotas

John W. Hoganson

Cope and Marsh's Bone Wars

One of the most interesting and bitter scientific rivalries in American history was, of all things, over dinosaur fossils. Most of you have probably heard of the "bone wars" that took place in the late 1800s. The protagonists were Edward Drinker Cope and Othniel Charles Marsh. Although from a humble farm background, Marsh's millionaire uncle George Peabody was his benefactor and funded his education. Later, Marsh became associated with the Yale Peabody Museum and eventually became the first professor of paleontology at Yale. Marsh was a skilled self-promoter and employed Buffalo Bill to guide his first fossil collecting expedition to the western frontier in 1870. Harpers Monthly published stories about his collecting. At Yale, Marsh was well-connected and influential but had few friends and no family. He lived alone in a mansion for most of his life. In addition to his study of dinosaurs, Marsh is known for his work on the evolution of the horse, which provided credibility for Darwin's (then) new theory of evolution.

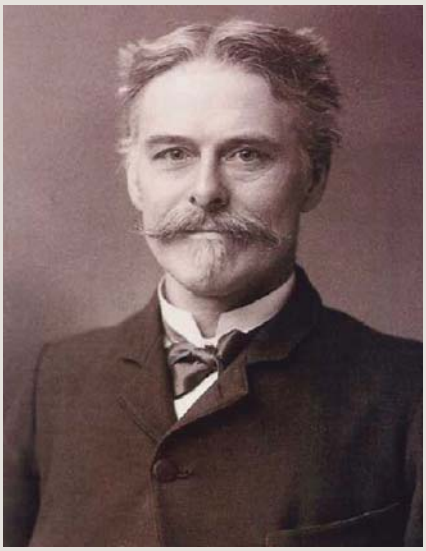

Figure 1. Portrait of E.D. Cope.

Edward Drinker Cope (fig. 1) was associated with the Academy of Natural Sciences in Philadelphia. He was a self-taught child prodigy and during his frequent visits to the Academy as a teen, learned anatomy and developed a passion for natural science and paleontology. He was born to a wealthy Quaker family with plenty of money to support his interests. At age 28, he was involved with mounting the first skeleton of an American dinosaur in Philadelphia, a hadrosaur from New Jersey, and named another early American dinosaur *Laelaps*, now called *Dryptosaurus*. He published his first of about 1,200 scientific papers at age 19. His mentor was one of America's founding paleontologists, Joseph Leidy. Cope was married and had one daughter.

Cope and Marsh started out as colleagues and friends but eventually became bitter rivals vying for dominance over the rich fossil dinosaur and mammal deposits in the western frontier. Both men became obsessed with trying to outdo the other in the quantity of fossils found and the number of publications they could write about them. Some have suggested that the rivalry took place because of the Fred C. Dobbs Syndrome. The Fred C. Dobbs Syndrome refers to the old movie *Treasure of the Sierra Madre*, where Fred C. Dobbs (Humphrey Bogart) goes mad because he thinks his partners are stealing the gold. With Cope and Marsh it was fossil bone fever, not gold fever. The three-decades-long "bone war" became nasty, with each publicly accusing the other of theft, fraud, and plagiarism. Ultimately, this rivalry was the demise of both men and each, more or less, died in poverty. Dinosaurs, at times, can bring out the worst in people. Interesting reading about this feud is in Colbert (1984).

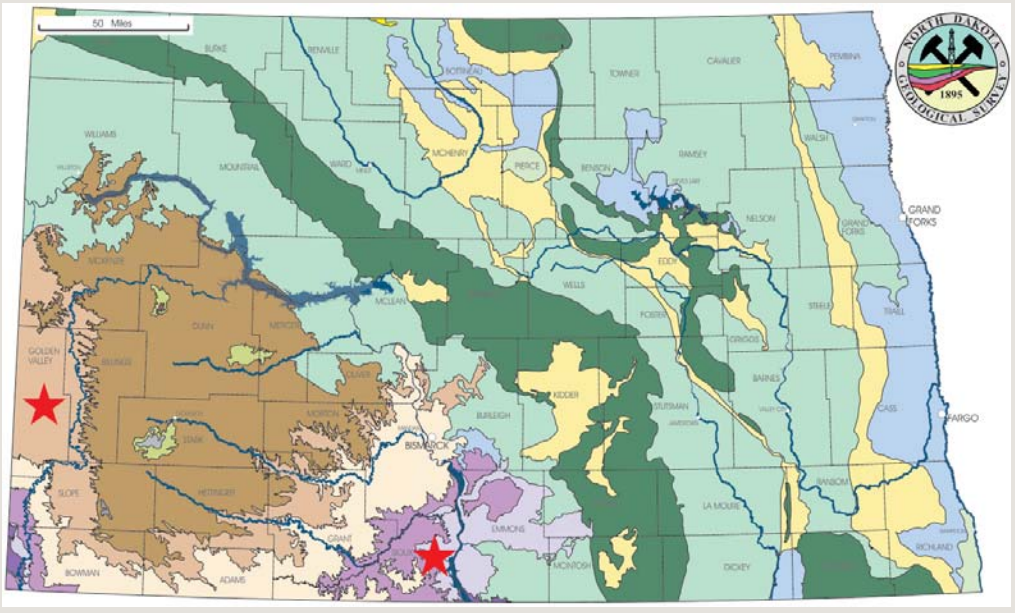

Figure 2. Simplified geologic map of North Dakota showing where the fossils that E.D. Cope studied were found.

Figure 3. *Plioplarchus* fish fossil from the Eocene Chadron Formation, Golden Valley County, North Dakota named by E.D. Cope.

Cope and Marsh did, however, revolutionize the science of paleontology in the United States through their collection of thousands of fossils, including many iconic dinosaurs, and their prolific scientific publications. Cope's investigations even brought him to North Dakota.

Cope's Chadron fish from North Dakota

Cope named more than 1,000 species of fossil vertebrate animals including fish, two of which were found in North Dakota. While studying the geology of western North Dakota, Charles A. White (1883) found beautifully preserved remains of fish fossils in a freshwater limestone cropping out on Sentinel Butte in Golden Valley County (fig 2). Because of the lithological similarities and the presence of fossil fish, he suggested that these strata were equivalent to the Eocene Green River Group extensively exposed in southwestern Wyoming. White turned the fish fossils over to Cope for study. Cope (1883) described a new genus and two new species of fish based on these fossils, *Plioplarchus whitei* and *Plioplarchus sexspinosus*, and placed them in the Percidae or perch family (fig. 3). He noted their similarity to fish in the Eocene Green River beds. Murphy et al. (1993) placed the fifty feet of green claystone capping Sentinel Butte containing the fossil fish-bearing carbonates in the South Heart Member of the Eocene age Chadron Formation. Although Leonard (1922), Feldman (1962), Kihm and Lammers (1986), and Murphy et al. (1993) mentioned these fish, they have not been adequately studied. The fish site is now protected as a North Dakota nature preserve.

Cope's Late Cretaceous fossils from the Dakotas

In 1893, about four years before his death at age 56, Cope launched an expedition to collect fossils in the Dakotas and Oklahoma. An uncataloged group of reptile fossils collected from the Dakotas was discovered in The Academy of Natural Sciences of Philadelphia in the 1980s (Deaschler and Fiorillo, 1989; Fiorillo and Deaschler, 1990). Fiorillo and Deaschler (1990) were able to determine that the collections were made near Fort Yates, North Dakota and Hump Creek, South Dakota (figs. 2 and 4) based on Cope's correspondence with the Academy of Natural Sciences of Philadelphia and his wife and daughter at the time. They were not sure why the specimens had not been curated. Many of the specimens were wrapped in newspapers from the Fargo Forum and Sioux County Herald dated 1893. Cope's primary objective was to collect remains of dinosaurs during this expedition.

Cope's party spent the first ten days of the expedition at Fort Yates while trying to secure horse and wagon. While sequestered at Fort Yates, they did collect dinosaur fossils from the badlands 8 to 15 miles west of the fort. Cope tried to get the War Department to allow him to borrow a team and men for the collecting expedition, but that request was denied, either because his old rival O.C. Marsh influenced that decision or because they were concerned for Cope's safety because he wanted to explore for fossils in an area where the Lakota leader, Sitting Bull, had been assassinated three years earlier. They were finally able to hire someone with a team and traveled to the Hump Creek area where they spent several days collecting fossils. Over 1,000 pounds of fossils were gathered and transported to Fort Yates. The fossils were eventually shipped to Bismarck by river boat.

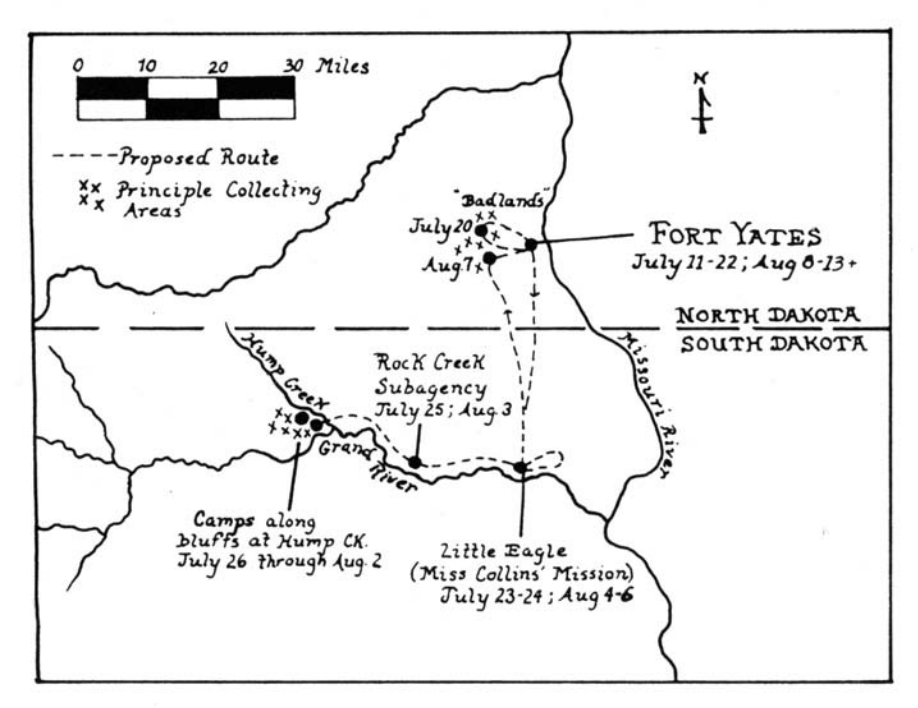

Figure 4. Route of E.D. Cope's fossil collecting expedition from July 11 through July 13, 1893 in the Dakotas (from Fiorillo and Daeschler, 1990).

Fiorillo and Deaschler (1990) determined that Cope and his party collected about 180 fragmentary fossil specimens, and they were able to identify about 35% of them (table 1). Most of the specimens were remains of terrestrial animals – dinosaurs, crocodiles, champsosaurs (crocodile-like reptiles), and turtles. These fossils were collected from the Late Cretaceous (Lancian) Hell Creek Formation (fig. 5). The cephalopod (ammonite) *Haploscaphites* cf. *H. nicolletii* shell and plesiosaur (marine reptile) vertebra were probably collected from the marine Late Cretaceous (Maastrictian) Fox Hills Formation or possibly from the Late Cretaceous Pierre Formation.

Invertebrate Fauna
- Order Ammonoidea (cephalopod)
  - Family Scaphitidae
    - *Haploscaphites* cf. *H. nicolletii*

Vertebrate Fauna
- Order Chelonia (turtles)
  - Family Trionychidae
    - *Aspideretes*
  - Family Baenidae
- Order Crocodylia
  - Family Crocodylidae
- Order Choristodera
  - Family Champsosauridae
    - *Champsosaurus*
- Order Plesiosauria
- Order Saurischia
  - Family cf. Ornithimimidae
- Order Ornithischia
  - Family Hypsilophodontidae
    - cf. *Thescelosaurus*
  - Family Hadrosauridae
    - cf. *Edmontosaurus*
  - Family Ceratopsidae
    - cf. *Triceratops*

Table 1. Fossils collected from the Dakota's in 1893 by E.D. Cope (from Fiorillo and Deaschler, 1990).

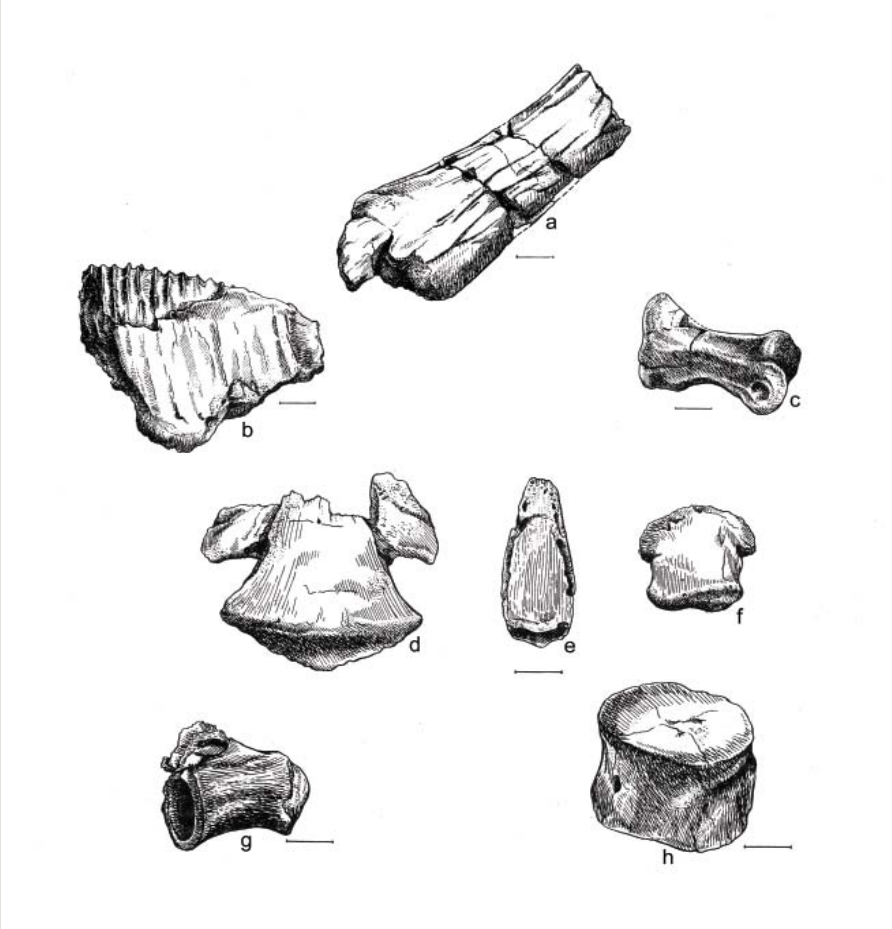

Figure 5. Sketches of some of the fossils collected during E.D. Cope's expedition to the Dakotas in 1893 (modified from Fiorillo and Daeschler, 1990); a. Partial ceratopsian orbital horn; b. Partial *Edmontosaurus* lower jaw; c. Ornithomimid phalanx; d. Hadrosauridae phalanx; e. *Thescelosaurus* phalanx; f. Ceratopsian phalanx; g. Partial crocodile vertebra; h. Plesiosaur vertebra. All scale bars are 2 cm except letter "a" which is 4 cm.

References:

Colbert, E.H., 1984, The great dinosaur hunters and their discoveries: Dover Publications Inc., New York, 283 p.

Cope, E.D., 1883, On a new extinct genus and species of Percidae from Dakota Territory: American Journal of Science, v. 25, p. 414-416.

Daeschler, E.B., and Fiorillo, A.R., 1989, Rediscovery of fossil material from E. D. Cope's expedition to the Dakotas: The Mosasaur, v. 4, p. 143-148.

Feldman, R., 1962, Oligocene fish on Sentinel Butte, North Dakota: The North Dakota Quarterly, v. 30, no. 3, p. 88-89.

Fiorillo, A.R., and Daeschler, E.B., 1990, E. D. Cope's expedition to the Dakotas revisited: Earth Sciences History, v. 9. no. 1, p. 57-61.

Kihm, A.J., and Lammers, G.E., 1986, Vertebrate biochronology of Oligocene sediments in southwestern North Dakota: Proceedings of the North Dakota Academy of Science, v. 40, p. 18.

Leonard, A.G., 1922, The White River Formation in North Dakota: North Dakota Quarterly Journal, v. 12, p. 27-114.

Murphy, E.C., Hoganson, J.W., and Forsman, N.F., 1993, The Chadron, Brule, and Arikaree Formations in North Dakota: The buttes of southwestern North Dakota: North Dakota Geological Survey Report of Investigation 96, 144 p.

White, C.A., 1883, On the existence of a deposit in northeastern Montana and northwestern Dakota that is possibly equivalent with the Green River Group: American Journal of Science, v. 25, p. 411-414.