

Edward Drinker Cope (1840-1897) ^[1]

By: Moeller, Karla T. Keywords: [Biography](#) ^[2] [Anatomy](#) ^[3] [Evolution](#) ^[4]

[Edward Drinker Cope](#) ^[5] studied fossils, [evolution](#) ^[6], and reptiles in the late nineteenth century United States. Based on his observations of skeletons, Cope proposed a novel mechanism to explain the [law of parallelism](#) ^[7], the idea that developing organisms successively pass through stages resembling their ancestors. Others had proposed the addition of new body forms at the end of an individual organism's development as a mechanism through which new species arose, but those proposals relied on changes in the lengths of [gestation](#) ^[8] or incubation. Cope proposed that a change in the growth rate of an embryo or [fetus](#) ^[9] would allow the formation of new body forms while [gestation](#) ^[8] or incubation periods remained constant. Thus, the growth of an embryo or [fetus](#) ^[9] must become faster or slower to alter the number of stages during growth. Many paleontologists and geologists of the time, including [Henry Fairfield Osborn](#) ^[10] and [Louis Agassiz](#) ^[11], accepted Cope's mechanisms of [evolution](#) ^[6] as alternatives to [natural selection](#) ^[12] as the causes generating new species, yet Cope proposed his mechanism solely as a way by which new genera arise. He advocated the neo-Lamarckian theory that new species evolve through the inheritance of acquired characteristics.

Cope was born 28 July 1840 in Philadelphia, Pennsylvania, the first of three children of Hannah Edge and Alfred Cope. Alfred Cope was the son of Thomas Pim Cope, a wealthy merchant who owned the largest foreign trade shipping business in the US in the early 1800s. Alfred took over the business after his father's death, continuing the financial prosperity of the Cope family. Edward's mother died when he was three, after which his aunt helped raise the children just outside of Philadelphia, on the family's eight-acre farm called Fairfield. From 1849 to 1853 Cope attended the Friends Select School, a Quaker day school in Philadelphia that gave him access to the museum at the [Academy of Natural Sciences](#) ^[13], which offered courses for students in the School District of Philadelphia. From 1853 to 1856, Cope attended Westtown, a Quaker boarding school near West Chester, Pennsylvania.

Cope aspired to a scientific profession, but his father hoped he would pursue a career in farming. At his father's direction, from 1856 to 1860, Cope mastered his farming skills by working at home and on the farms of relatives. Farm life further ignited Cope's interest in [natural history](#) ^[14] and he used his free time to study local wildlife. He published his first scientific paper, on salamanders, in 1859 at the age of nineteen. In 1860, Cope's father relented to his son's unwavering scientific interests and allowed him to attend the comparative anatomy course led by Joseph Leidy, a paleontologist and anatomist at the [University of Pennsylvania](#) ^[15], in Philadelphia. Cope spent part of the next two years working under Leidy. He also began recataloguing the collection of reptiles and [amphibians](#) ^[16] at the [Academy of Natural Sciences](#) ^[13], which led him to examine the collection at the Smithsonian Institution in Washington D.C. with natural historian [Spencer Fullerton Baird](#) ^[17].

In 1863 Cope's father sent him on a trip to Europe, with two alleged goals: to separate Edward from a love interest and to help him avoid the US Civil War draft. Cope wrote to his father from Europe, stating his intention to enlist in the military upon his return, but his trip was extended and he avoided service. In Europe, Cope continued his informal training in biology. He met with leading anatomists, naturalists, and paleontologists and visited the advanced museums and institutions of the time. Othniel Charles Marsh, a paleontologist of traditional training, was among the promising scientists Cope met. Both men had strong personalities and disparate levels of training and scientific achievement: Marsh held two university degrees but had no publications, while Cope had no degree, but had already published thirty-seven papers when the two met. Relations between them were cordial at first, but these differences in accomplishments later influenced the tone of their relationship.

During his study abroad, Cope's letters to his family reflected his dissatisfaction with himself and some aspects of his work. Cope, as with many scientific scholars of the time, worried that his pursuit of science might conflict with some aspects of his religious beliefs. Though Cope's letters to his family did not indicate his turmoil over science and religion, he destroyed many of his own scientific illustrations before he left Europe. Upon his return to Philadelphia in 1864, Cope renewed his religious vows before his family.

After returning to the US, Cope continued his scientific career as professor of zoology at Haverford College, in Haverford, Pennsylvania. He received an honorary master's degree from Haverford in 1864 before beginning his zoology department appointment, which he held a little more than two years. During his time at Haverford, Cope began taking geology trips throughout the eastern US. On these initial trips he collected vertebrate fossils wherever he found them. In light of the running

conflict of various theories of evolutionary processes, including those proposed by Lamarck, Haeckel, and Darwin, Cope felt that enhancing the fossil record was a vital step to understanding [evolution](#) ^[6].

The life of a field paleontologist consumed much of Cope's time, yet he married Annie Pim, his distant cousin, in 1865. They had one daughter, Julia Cope, though for much of her childhood, her father was absent. From Julia's birth in 1866 until 1879, Cope collected fossils on many journeys throughout the US, and he was at home only four months of each year between 1871 and 1879. Cope's interest in evolutionary theory began soon after his pursuit of paleontology and fossil collecting. He stated his scientific conservatism outright to his father in letters, but his published works indicate that his stance was less straightforward. Cope's conflict between scientific process and religious belief remained a major theme in his thoughts, as he supported both adaptive and divine influences on [evolution](#) ^[6]. Cope believed that any large-scale changes in organismal body structure were preordained, yet he accepted that adaptation played a role on a smaller scale. In his 1868 paper "[On the Origin of Genera](#)" ^[18], Cope discussed God's influences on [acceleration](#) ^[19] and [retardation](#) ^[20], Cope's proposed mechanisms for the [law of parallelism](#) ^[7].

Cope thought of [acceleration](#) ^[19] and [retardation](#) ^[20] as processes through which an organism may undergo additional or fewer [developmental stages](#) ^[21] compared to its ancestors, assuming that the time allowed for growth before birth or hatching remained constant across generations. In [acceleration](#) ^[19], the length of time for an embryo's [developmental stages](#) ^[21] to occur are shortened so that a new stage can be added as the final step in the creation of a new body form. Retardation relates to the removal of a step and a lengthening of stages, with the organism's final form a reversion to the body design of the organism's ancestor. [Alpheus Hyatt](#) ^[22], a contemporary paleontologist of Cope, had described similar mechanisms in 1866. Due to Cope's more extensive publications, he became the leading proponent of these mechanisms.

Cope continued to collect and describe fossil specimens during the 1860s. His quest to describe hundreds of vertebrate fossils spurred competition with Marsh. In the late 1860s Cope and Marsh's relationship strained. According to Cope, Marsh had unjustly exploited a fossil site that Cope had shown him, and over the following decades their initial clash developed into an acrid scientific battle. That feud became the backdrop to most of Cope's adult life.

Cope and Marsh raced to outdo one another in contributions to paleontology, and each person complained about the practices of the other. The allegations included poor scientific process, plagiarism, and unfair appropriation of both land and bones. For years, Cope claimed, Marsh used his political savvy and strong scientific network to delay Cope's publications as well as to prohibit his access to specific lands and to various private bone collections. Cope also accused Marsh of plagiarizing most of Cope's publications and ideas. In the 1870s the competition between Cope and Marsh increased, as both men vied to be first to describe mammalian fossils from fossil beds in Wyoming. One would, at times, be describing a fossil just hours before the other would discover a similar specimen. Thus, the rush for initial description of new specimens was often intense.

In 1879 the United States Geological Survey (USGS) was formed and absorbed various government-funded geological excursions under one government establishment. Marsh became director of the new USGS survey, and Cope, who had been partially funded under the absorbed surveys, was unable to acquire funding for his field collection trips. In the same year, Cope lost a quarter of a million dollars inheritance after making bad investments in the mining industry and he could no longer fund his own fossil-collecting expeditions. Unemployment and financial problems did not deter Cope's scientific productivity, as in his free time he wrote descriptive papers on many of the fossils in his collection. In 1889, after ten years of struggling for funding and employment, Cope acquired an appointment at the [University of Pennsylvania](#) ^[15] as a professor of mineralogy and geology. Soon after, in January of 1890, the Cope-Marsh clash became public when both parties aired their criticisms in the *New York Herald*.

The fallout from this public battle for superiority almost lost Cope his university position. He soon, however, gained an appointment with the Texas Geological Survey in 1892, was promoted by the [University of Pennsylvania](#) ^[15] to the chair of zoology and comparative anatomy in 1895, and received various honors and awards, including the position of president of the [American Association for the Advancement of Science](#) ^[23] in 1895.

Cope continued to publish on evolutionary theory and as he aged, he increasingly believing that Lamarckian mechanisms were responsible for [evolution](#) ^[6]. His defense of acquired inheritance continued through his final publication in 1896, *The Primary Factors of Organic Evolution*. Despite his support of the adaptive influence of the environment, until his death, Cope maintained that a divine force was ultimately responsible for directing [evolution](#) ^[6].

Cope died 12 April 1897, in Philadelphia. In 1931, a former colleague of Cope, [Henry Fairfield Osborn](#) ^[10] published *Cope: Master Naturalist*, an extensive collection of the letters Cope had written throughout his life, starting at age six and ending two weeks before his death. Over the course of his lifetime, Cope described more than 1200 vertebrate species, fifty-six of which were dinosaurs. His contributions to the study of reptiles and [amphibians](#) ^[16] helped found the discipline of herpetology, and *Copeia*, the journal of the American Society of Ichthyologists and Herpetologists, is named after him.

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Edward Drinker Cope studied fossils and anatomy in the US in the late nineteenth century. Based on his observations of skeletal morphology, Cope developed a novel mechanism to explain the law of parallelism, the idea that developing organisms successively pass through stages resembling their ancestors. Others had proposed the addition of new body forms at the end of an individual organism's developed as a mechanism through which new species arose, but those proposals relied on changes in the lengths of gestation or incubation. Cope proposed that a change in the growth rate of an embryo or fetus would allow the formation of new body forms while gestation or incubation periods remained constant. Thus, the growth of an embryo or fetus must become faster or slower to alter the number of stages during growth. Many paleontologists and geologists of the time, including Henry Fairfield Osborn and Louis Agassiz, accepted Cope's mechanisms of evolution as alternatives to natural selection as the causes generating new species, yet Cope proposed his mechanism solely as a way by which new genera arise. He advocated the neo-Lamarckian theory that new species evolve through the inheritance of acquired characteristics.

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