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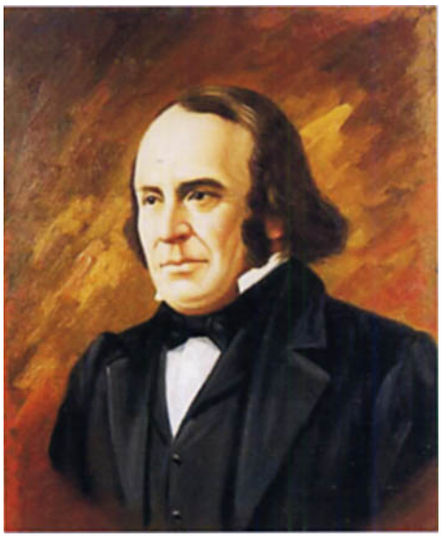
GREAT GEOGRAPHERS

Louis Agassiz

By Jeffrey A. Lee



Louis Agassiz (1807-1873) was a leading natural historian of the Nineteenth Century. Although he devoted most of his time to studies of zoology, Agassiz is the person most responsible for the 'glacial theory' that ice covered large portions of earth's surface in times past. Born in a French speaking part of Switzerland, he had a mostly rural childhood and loved the natural world he found all around him; he was particularly interested in fish and began at age 11 to keep detailed notes on his findings. At age 15 his parents wanted Louis to apprentice with a businessman or study for the ministry. But Louis convinced them to let him go to medical school, which for him was an excuse to learn more natural history. He attended the University of Zurich, then switched to the University of Heidelberg, where he reveled in the German traditions of science and philosophy. There, much of his education came outside the classroom, in nature studies done with his friends. He then continued his schooling at the University of Munich, where he earned a doctorate, not in medicine, but in natural history. To please his parents, he returned to school and earned a medical degree, though he never practiced medicine.

In 1832 Agassiz spent time in Paris, studying fossil fish at the Muséum National d'Histoire Naturelle. There he met Georges Cuvier, who is widely regarded as the "Father of Paleontology," and he learned much from the distinguished scientist. While in Paris, he also met the German geographer, Alexander von Humboldt, and the two formed a lifelong friendship; von Humboldt acted much like a favorite uncle, providing advice and used his influence whenever possible to help Agassiz's career.

Later in 1832, Agassiz became a professor at a new college in Neuchâtel, near his family in Switzerland. The following year he married Cécile Braun, the sister of a German school friend and a talented artist who assisted Louis in his studies. Based on his studies in Paris and elsewhere, he published a major work on fossil fish. This treatise was based on his analysis of over 1700 species and brought him acclaim throughout Europe.

In 1836, Agassiz spent the summer vacationing with his friend, Jean de Charpentier, who was a supporter of the idea proposed by E. T. Venetz that glaciers had at one time been far more extensive. On trips spent looking at the glacial features of the Alps, de Charpentier convinced Agassiz of the validity of Venetz's theory. Agassiz worked on the idea for the next decade, collecting evidence of glacial features, like moraines (ridges of sediment deposited by a glacier) and erratics (boulders carried by glaciers and located far from their bedrock source), from throughout Europe and Britain. He also led field studies on the workings of active glaciers in the Alps. These studies were more of a hobby, providing a respite from his paleontology work. He wrote two books, *Études sur les Glaciers* in 1840 and *Système Glaciaire* in 1847. Few naturalists supported the idea of an ice age before Agassiz's work, but, over time, he convinced the scientific community that such an event had indeed occurred.

In 1846, he traveled to the United States to give a series of popular lectures and was treated as visiting scientific royalty. Americans knew that science was important for the future of their young country and a group of influential and wealthy citizens persuaded him to move permanently to Harvard College as a professor. Louis, marveling at the natural history of the eastern United States and the enthusiasm and vitality of the people, was happy to comply. Harvard was just opening a school of science and getting a leader of European natural history was quite a coup. He brought to the United States the strengths of European science and education, especially the idea of a university where, as opposed to a college, research and graduate education are an integral part of the institution.

Agassiz was driven by ambition and all that mattered to him was science. Cécile had left him in 1845, largely because of his neglect of his family, taking their three children with her. She died of tuberculosis in 1848 in Germany, after Louis's move to the U.S. Two years later, he married Bostonian Lizzie Cary and his children joined them in Massachusetts. While he remained devoted more to his science than anything else, they did have a happy family life. Since Louis spent most of his money on his work, Lizzie and the children later opened a modest college for women in their home. Women were barred from attending Harvard lectures, so Agassiz frequently taught them in his house.

In the 1850s, Agassiz established himself as one of the leading scientists in the United States. He started an ambitious study of U.S. fishes and turtles and was sent specimens from all over the country by professional and amateur naturalists and fishermen, all wanting to aid the renowned naturalist. He also raised considerable funds to start and maintain the Museum of Comparative Zoology at Harvard, which opened in 1860. He wanted, and eventually had, a museum comparable to the best found in Europe. He turned down job offers from leading European universities, preferring to stay in the U.S.

In his paleontological and glacial work, Agassiz saw his role as that of an interpreter of God's work. While evolution was a common topic among naturalists of the time, he saw no evidence of species change in his fish studies. He believed strongly in special creation, that God created species as they are and they do not change into new species. Agassiz would not recognize variations within species and frequently

identified several species, which were really just varieties of one. During the 1800s, there was a debate between the proponents of 'catastrophism,' the idea that earth history is dominated by cataclysmic events like Noah's flood, and 'uniformitarianism,' where earth history has been relatively steady, with slow change caused by processes still acting today. In this debate, Agassiz was a catastrophist, believing that God created species, then wiped them all out and started with new species. Like most natural historians of the time, he was not a Biblical literalist; he looked for evidence of God's work in nature, not in Scripture. The glacial theory fit into his belief, in that he felt that only one ice advance had happened, causing widespread extinction. This was a more realistic catastrophe than the Great Flood described in the Bible.

After Darwin's *Origin of Species* was published in 1859, Agassiz argued against it, using the same arguments he had used against earlier theories of evolution. But Darwin's natural selection theory was much stronger than previous explanations of evolution, Agassiz's points were, therefore, much weaker. Over time, he lost the respect of most of the naturalists in the U.S. and elsewhere. While many leading scientists did not embrace evolution right away, most were convinced by the evidence within a decade or so. Agassiz, however, was certainly not the only leading scientist not to embrace evolution. Sir Richard Owen, the leading zoologist of England (and inventor of the word 'dinosaur') also argued against Darwinian evolution until his death in 1892.

In 1865 and 1866, Agassiz led an expedition to Brazil. Over 80,000 items, mostly animals and plants, were collected from throughout the country. He later reported on past glaciations of the Amazon Basin, something for which no good evidence exists. This is an example of how, later in his life, the strong empiricism of his early studies was replaced by a tendency to support his theories whether or not there was favorable evidence.

In 1871 he led a voyage along both coasts of the Americas to study sea life. They used newly developed dredging equipment, which, unfortunately, never worked well. To make matters worse, two years earlier he had suffered a cerebral hemorrhage, became temporarily paralyzed, and was bedridden for fourteen months. As a result, he tired easily. On this trip, though, he visited the Galapagos Islands where he found fault with Darwin's explanation for the evolution of species there. Agassiz argued that the islands were too young for new species to have developed as the leading evolutionists of the time described. While we now know that species can develop in less time than the Galapagos have been around, Agassiz was correct with respect to the theories of the time.

The Galapagos debate is one example of Agassiz's return to valuable scholarship near the end of his life. He never accepted evolution, but his arguments against it were empirically based and forced his adversaries to delve deeper into the concept to answer his charges. In this way, he became a useful scientist once again.

In 1873, Louis Agassiz died of another cerebral hemorrhage. A 1000 kilogram boulder was brought from the Swiss Alps to mark his grave near Harvard. While he did not originate the idea of an ice age, he developed it fully and convinced most earth scientists that it did occur. Our current ideas on ice ages are much different than Agassiz's, but that is the nature of science and does not detract from his contributions. In addition, Agassiz was a brilliant zoologist who excelled at collecting, maintaining, and examining specimens. His weakness was in the interpretation of his findings; his personality was such that he refused to change his mind no matter how compelling the evidence against his views. Despite this weakness (not uncommon among scholars), he is a towering figure of science.

Further Reading

Lurie, Edward, 1960, *Louis Agassiz, A Life in Science*. Chicago: University of Chicago Press, 449 p.

Bolles, Edmund Blair, 1999, *The Ice Finders: How a Poet, a Professor and a Politician Discovered the Ice Age*, Washington D.C.: Counterpoint, 257 p.

http://www.wku.edu/~smithch/biogeog/AGAS1850.htm
http://www.sentex.net/~tcc/glaciers.html
Http://www.lib.ndsu.nodak.edu/govdocs/text/lakeagassiz/preface.html

Editor's note:

Because of Agassiz's influential work on glaciation and his glacial theory, North American geomorphologists named the legendary lake in the Laurentian Shield after him in 1879. Due to glaciation, Lake Agassiz is believed to have been formed 12,000 years ago as a result of glacial melt from the last Ice Age. It extended from northwest in Saskatchewan to the south at Lake Travis which is now the border between South Dakota and Minnesota. Located in the short distance in between Lake Travis and Big Stone Lake is a point (not very high) that demarcates the little known north/south continental divide. Water that flows into Lake Travis will subsequently flow northwards along the meandering Red River in a flat topography into Lake Winnipeg, which is believed to be a large part of Lake Agassiz. The map to the right, published by the U.S. Geological Survey, shows the extend and location of Lake Agassiz.