Neuchâtel, Switzerland, in Guyot's day

Guyot's Geoscience & Geohistory Education

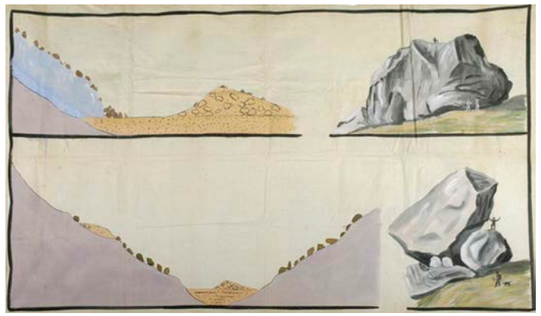
Guyot, one of twelve children born to David Pierre and Constance Favarger Guyot, was born in Boudevilliers, in the Swiss Canton of Neuchâtel on 28 September 1807. He became enamoured of the natural world through studies at La Chaux-de-Fonds and at the Collège de Neuchâtel where he studied alongside Leo Lesquereux, later a noted paleobotanist as well as with the later prominent theologian, Frédéric Godet. These studies were enhanced in 1825 by a long academic-oriented visit to the Braun estate in Karlsruhe, Germany. There, working alongside other budding naturalists including Alexander Braun, Carl Schimper, Ludwig Imhoff – and most particularly, Louis Agassiz – Guyot became a devotee of natural science through extensive systematic field study.

Abandoning his earlier intentions to pursue only theology studies, Guyot entered the Friedrich-Wilhelms-Universität in Berlin in 1829. There he gained an outstanding breadth of learning through coursework in theology, anthropology, philosophy, classics, history, philology, geology, mineralogy, chemistry, physics and meteorology.

Carl Ritter (1799-1859)

Even more enduring were Guyot's mentorship under the geographer Carl Ritter and the intellectual influence of Alexander von Humboldt. The Earth, according to Ritter, had been divinely provisioned as "the school of man; its highest function being to assist him in his training, and to prepare him for the discharge of the noblest duties of life." It was a dynamic, living organism that contained regions in which the history of all life and of mankind's progress could be found.

Upon completing his Ph.D. thesis on *The Natural Classification of Lakes* in 1835, Guyot secured the position of tutor to the sons of Count de Pourtalés-Gorgier. He taught these children in their Paris home and expanded their natural science education in travels throughout France, Belgium, Holland, Spain, Italy, and Switzerland. At the founding of l'Académie de Neuchâtel in 1839, Guyot was appointed Professor of Physical Geography and Universal History. There, as he later claimed, he experienced the most intellectually active period of his life. His extensive lecture courses became foundational for his later writings. He spent summers working alongside his Neuchâtel colleague, Agassiz, in studying glacier formation in Switzerland and Italy. Guyot shared the findings of his extensive glacial fieldwork with Swiss, French, and German audiences.



Princeton University Archives

Process of the Deposition of Erratic Boulders as displayed on one of Guyot's many large cloth Classroom Teaching Maps

From Switzerland to the United States

Among the Swiss Cantons, Neuchâtel was peculiar in that although being part of the Swiss Confederation, it was also governed by Prussia. When the anti-aristocratic 1848 Revolution erupted, l'Académie de Neuchâtel, thought to be a haven for reactionaries, was closed. Though initially reluctant to leave Switzerland, Guyot followed the path of his close friend and colleague, Agassiz, in emigrating to the U.S. Agassiz's influence prompted similar passages of other Swiss natural scientists including Edouard Desor, Charles Frédéric Girard, Leo Lesquereux, Jules Marcou, and Louis François de Pourtalés.

In 1849, Guyot delivered a series of career-enhancing lectures in one of the Lowell Institute's halls in Boston. In these lectures, Guyot expanded the view of geography from a descriptive gazetteer of places and chronology of discovery to an all encompassing view of geography as "the mutual [inter]actions of . . . different portions of physical nature upon each other . . . the perpetual play of which . . . might be called the life of the globe." These lectures appeared in an enormously popular book entitled *Earth and Man: Lectures on Comparative Physical Geography, in its Relation to the History of Mankind*.

Although new and original to many U.S. readers, Guyot's *Earth and Man* popularized Humboldt's geohistorical view that was central to German Romantic idealism. Guyot guided his readers both across the globe and through history and, employing Humboldtian methods, ventured from the realm of speculation to that of a measurable reality. The interconnectedness of the Cosmos was physically observable within the Earth and in its inhabitants. The "physical domain" of the civilized nations of each continent expanded in accordance to a corresponding moral development. Progress occurred, according to Divine guidance, in precisely the regions that allowed for the passage of both the geographical and the human soul.

Guyot's argument about the interrelationship between mankind's development and geography pleased many progressive-minded U.S. readers who envisioned a grandiose future of their own country. Supporting the Manifest Destiny thinking, Guyot argued that history and geography have worked for America "not to give birth and grow [in]to a new civilization, but to receive one ready-made, and to furnish forth for man, whose education the Old World has completed, . . . the scene most worthy of his [future] activity. It is here that all the peoples of Europe may meet together, with room enough to move in; may commingle their efforts and their gifts; and carry out, upon a scale of grandeur hitherto unknown the life-giving principle of modern time – the principle of free association." The popularity of *Earth and Man* prompted at least thirty-one printings in the U.S. into the twentieth century, as well as five British editions, and foreign translations into German, Russian, and French.

Guyot at Princeton

Further appreciation of Guyot's intellectual prowess is evident in Daniel Price's offer to fund a Professorship of Physical Geography and Geology at the College of New Jersey (now Princeton University), exclusively for Guyot. The offer was readily accepted and, beginning in 1854, Guyot began a thirty-year career in which he delivered geoscience lectures to students in the junior and senior classes. According to Guyot's student (and later successor) William Libbey, Jr., Guyot's lectures were "always adapted to the capacity of his hearers. The simplicity of his manner was but the index of the purity and lucidity of his thoughts; and his explanations of the laws of nature, whether concerning matter, or force, or life were satisfying because they seemed to draw the learner into an unstrained communion with nature itself." Guyot's success was partially attributed to having "avoided the snare of routine which entraps so many of the college professors" and by "always proposing to himself new lines of inquiry and new subjects of investigation" such that "he kept his mind perpetually fresh."

In 1864, Guyot's position was elevated to the second endowed chair in the College's history, the Blair Professorship. Sheldon Judson (1918-1999), the Knox Taylor Professor of Geology a century later, claimed that Guyot's appointment "epitomized the goals of the new [John Maclean, Jr.] administration, which had set out to place a new emphasis on teaching and research, to encourage scientific activity on campus, and to strengthen the place of religion as the keystone of the academic program." Guyot's geology lectures employed three *Pestalozzian* methods: studying local nature before comparing it with distant regions; observing nature first hand, then later integrating this perceptual knowledge with more profound analytic and synthetic thinking; and utilizing extensive visuals to clarify observations. These pedagogical methods remain crucial in provoking an understanding of the history of the globe and mankind's interconnectedness with the cosmos.

In addition to his lectures at the College, Guyot served as a lecturer for the State Normal School at Trenton, New Jersey, delivered regular presentations at the Smithsonian Institution, and frequently spoke at the Princeton Theological Seminary on the "Connection of Revealed Religion with the Physical and Ethnological Sciences."

Like all College of New Jersey faculty of his day, Guyot upheld strong Christian convictions. Amongst the most pious of the faculty, he carried forth the Calvinist leanings common in Switzerland into Princeton's strict Presbyterian climate. He further advanced his view of the harmony of science and religion in twice serving as a delegate to international gatherings of the Evangelical Alliance.

Members of Guyot's family from Neuchâtel initially lived in Princeton with him in his home at 31 Nassau Street, where he also created a luscious, formal botanical garden. This garden provided Guyot "a tranquil retreat among the greenery where one may study and write, [and] where good friends may visit me." He became a naturalized U.S. citizen in 1860, and in 1867, he married Sarah Doremus Haines, daughter of Daniel Haines, who was an elder of the Presbyterian Church, a Trustee of the College, and twice Governor of New Jersey.

E. M. Museum, established at the College of New Jersey in 1874

Ever the educator, Guyot strengthened the College's teaching experience by securing specimens for a Museum of Geology and Archeology that he established. This museum – the E.M. Museum (named in honor of Elizabeth Marsh Libbey, whose husband, William Libbey, Sr., financed it in her honor) – was first housed, in 1874, in what is now Nassau Hall's Faculty Room.

Guyot filled this room with thousands of specimens that he personally collected on return trips to Europe and purchased on behalf of the College from private collectors. Around the upper periphery of the museum he displayed maps that he had designed together with his long-time cartographic assistant (and nephew), Ernest Sandoz.

He arranged the specimens in this museum – or "Synoptic Room" as he called it – in an order that they would "strike the eye as an open book, in which the student might read at a glance, the history of creation from the dawn of life to the appearance of man." The E. M. Museum, and that which Agassiz established at Harvard, were second only to the Smithsonian in the strength of their collections.

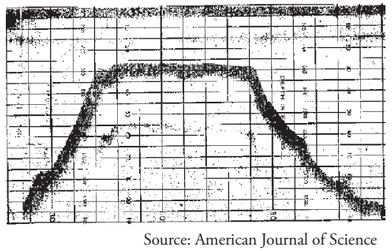
Throughout his career, Guyot became increasingly committed to involving students in fieldwork and scientific research. He had at least one College of New Jersey student accompanying him on each of his summer excursions where, in some 12,000 barometric

measurements, he determined the heights of Eastern U.S. mountain ranges, including the White Mountains, the Green Mountains, the Allegheny, the Appalachian, Adirondack, and Catskill ranges. The true purpose of these summer ventures was more "a drill in precise field technique for his students" than an attempt to provide a complete hysometrical topography.

Guyot's insistence upon the study of natural specimens prompted his organization of a transcontinental scientific organization – the first of its kind in the U.S. – to gather further original evidence. Guyot's former students including William Libbey, Jr. (who in 1879 received the College's first doctoral degree), Henry Fairfield Osborn (later president of the American Museum of Natural History and Columbia University professor), and William B. "Geology Bill" Scott (later the College's 2nd Blair Professor) participated in the initial expedition in the summer of 1877. This venture exposed and retrieved many paleontological specimens from the Bridger Basin area of Wyoming's Bad Lands, which were subsequently added to Guyot's teaching museum. Two further summer science student research expeditions were sent from the College during Guyot's lifetime.

Guyot's principal publications that appeared during his Princeton tenure were educational in orientation. His series of geographical textbooks (1866-1882), prepared with assistance from Mary Howe Smith Pratt, revolutionized geography teaching. His *Directions for Meteorological Observations* (1850), produced at the behest of Smithsonian Secretary and one-time College of New Jersey Professor of Natural Philosophy (i.e., Science), Joseph Henry, were revised while at Princeton. This Smithsonian system, to which Guyot, working with Henry, made significant contributions, standardized the gathering and recording of changing weather conditions. Their work paved the way for a post-Civil War national network of weather stations, the Signal Service System, later, the U. S. Weather Bureau.

Most important for Guyot, however, was the educational use of science to illuminate God's handiwork in the creation and ordering of the universe. In his own words, for the individual who can "embrace with a glance the great harmonies of nature and of history there is here the most admirable plan to study; there are the past and future destinies of the nations to decipher, traced in ineffaceable character by the finger of Him who governs the world. Admirable order of the Supreme Intelligence and goodness . . . . . has arranged all for the great purpose of the education of man and the realization of the plans of mercy for his sake."



Source: American Journal of Science

Harry Hess's original 1946 fathometer trace of a flat-topped seamount or "guyot"

Guyot's ideas on the harmony of science and religion are best revealed through his final publication, *Creation or The Biblical Cosmogony in the Light of Modern Science*, the proof pages of which he corrected on his deathbed. In it, Guyot introduced the Bible and Nature as "legitimate sources of knowledge" derived from the "same Author" who intended for them to "complete one another" and to provide the "whole revelation of God to man." The Bible spreads "light upon the great truths needed for spiritual life," whereas Nature offers truth gathered through the senses and the intellect. In essence, Guyot recognized a separate, but complimentary harmony between science and religion. In *Creation*, Guyot expressed his belief in a limited evolution, without accepting Charles Darwin's idea of natural selection.

Princeton bas-relief plaque of Arnold Guyot

Guyot Tributes

Guyot died on 8 February 1884 at the age of 76, and he was buried in the Princeton Cemetery of the Nassau Presbyterian Church. Princeton University commemorated his life's work with a bronze bas-relief profile plaque by Olin Levi Warner in Marquand Chapel in 1890, currently displayed in Guyot Hall. Guyot is also remembered through The National Geographic Society's Arnold Guyot Prize. The city of Neuchâtel recognizes him in a variety of ways ranging from street names to a bust by Charles Iguel, permanently displayed at l'Université de Neuchâtel.

Professor Guyot's scientific stature has been commemorated with mountains named in his honor in New Hampshire, the North Carolina-Tennessee border, Colorado, and California, as well as Guyot Hill in the Catskills. The fossil plant *Dryopteris guyottii* was named in his honor, as was a glacier in Alaska and a crater on the Moon. Princeton's 6th Blair Professor of Geology, Harry Hess (1906-1969), viewed many underwater seamounts (actually remnants of ancient islands) while echo sounding aboard the *Cape Johnson* in waters west of Hawai`i during World War II. In 1946, he named these flat-topped seamounts "guyots" – a term which has since become part of scientific nomenclature. Princeton's greatest tribute to Guyot lies in the naming of Guyot Hall. This building, completed in 1909, was financed through the benefaction of the mother of one of Guyot's students, Cleveland H. Dodge. At the time of its opening, it housed Princeton University's Biology and Geology departments, as well as the Natural History Museum. Its exterior is adorned with some 200 gargoyle-like carvings representing a range of the extinct and living organisms studied within Guyot Hall. In 1890, Professor Guyot's former students at Neuchâtel sent Princeton a large, erratic glacial boulder in his memory. This boulder, known locally as "The Guyot Stone," resided for many years at the entrance to Nassau Hall and, since 2004, has rested outside Guyot Hall.

Philip K. Wilson, MA, Ph.D

Princeton University's Guyot Hall, opened in 1909

About the Author

Philip K. Wilson, MA (Johns Hopkins), Ph.D. (London), a descendant of the Guyots of Neuchâtel, Switzerland, is an historian of science and medicine. He has traced Arnold Guyot's life of learning through archives and libraries in Neuchâtel, Berlin, Oxford, London, New Haven, CT, Worcester, MA, Washington, D.C., and Princeton, NJ. He is preparing a full-length biography of Guyot's scientific career in a work tentatively titled, Glaciers, God, and Geography: Neuchâtel's Arnold Guyot (1807-1884) at Princeton. *Wilson teaches in the Humanities Department at Penn State University's College of Medicine, Hershey, PA.*

Suggested Further Biographical Reading

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The Guyot Stone – A glacial erratic from Neuchâtel

Guyot of Guyot Hall

Edward Ludlow Mooney (1867)

Arnold Henri Guyot (1807-1884)

Physical Geographer, Geohistorian, & Princeton's First Blair Professor of Geology

Arnold Guyot gained international acclaim for his scientific endeavors in physical geography, glaciology, meteorology, mountain hypsometry, cartography, and science education. He is best remembered for:

- Discerning key processes (or "laws") of glacial motion
- Determining the origin and distribution patterns of those curiously deposited "erratic" boulders throughout Europe
- Advancing ecological concepts of the interconnectedness of the Earth, its inhabitants, the oceans, and climate
- Establishing a group of weather stations and a standard method of gathering and recording meteorological data that developed into the U.S. Weather Bureau
- Introducing a new *Pestalozzian* method of geography education into the U.S.
- Creating a lasting series of geography textbooks and topographically color-coded wall maps and atlases
- Initiating Princeton student field excursions and summer research opportunities
- Promoting a view of the "Harmony" between quests for the truth in Science and Religion

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