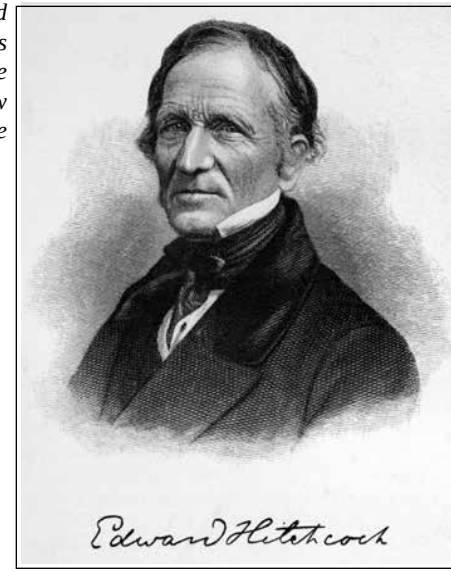
Revelations in Stone
Edward Hitchcock and the Geology of Martha's Vineyard

by Robert T. McMaster

Two hundred two years ago, Reverend Edward Hitchcock visited Martha's Vineyard in an effort to unravel the island's geological history. What he saw challenged his faith and changed the course of nineteenth-century science.

In June 1823, the residents of Vineyard Haven, known then as Holmes Hole, were no doubt intrigued, perhaps even a bit amused, by a curious sight. The packet boat from New Bedford had just arrived and a tall, gaunt man dressed in a black topcoat and a stovepipe hat had disembarked. He must have seemed out of place amidst the hustle and bustle at dockside, surrounded by fishermen hawking their wares and liverymen loading their wagons.



Portrait of Edward Hitchcock. W. S. Tyler, *A History of Amherst College* (Frederick H. Hitchcock, 1895), pp. 109.

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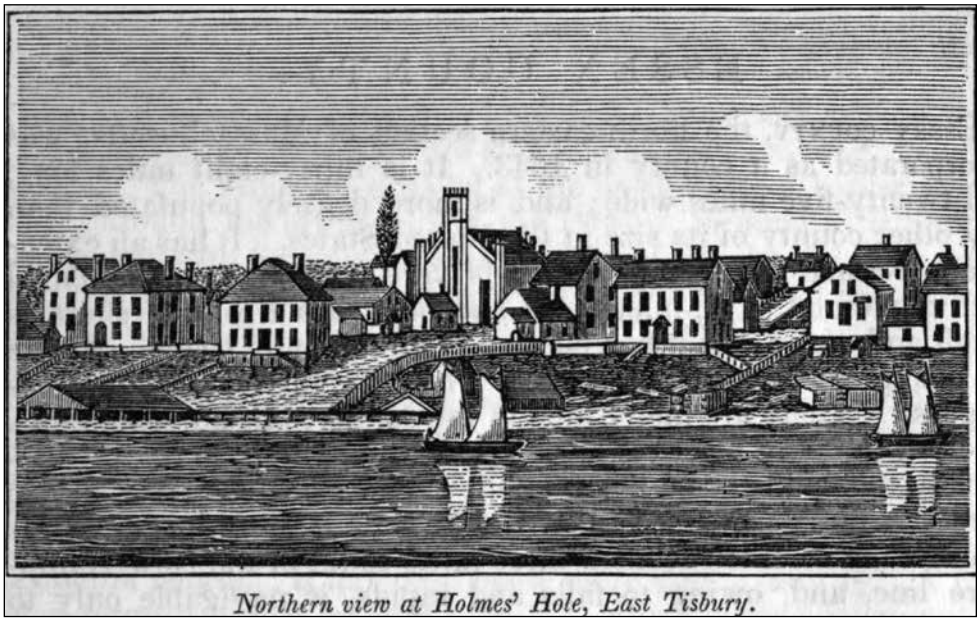
For more information on Edward Hitchcock, please visit www.EdwardHitchcock.com.

Author's note: I am indebted to the Amherst College Archives and Special Collections, Amherst, MA, for providing access to their collection of thousands of pages of Hitchcock's notes, letters, and sermons.



"Northern view at Holmes' Hole, East Tisbury." John W. Barber, Historical Collections (Howland & Co., 1839), pp. 155.

That man was the Reverend Edward Hitchcock, pastor of the tiny Congregational church in Conway in western Massachusetts. He had dedicated his life to preaching the word of God, to saving souls. But his mission on this spring day was not spiritual— it was geological.

Hitchcock hired a chaise, a horse-drawn carriage with a single seat, then set out to tour the Vineyard. It probably turned more than a few heads, the sight of that austere figure trundling along the island's rough and rutted roads, from Edgartown to Tisbury to Chilmark, stopping frequently to survey the landscape and collect rock samples. Along the way Hitchcock made notes for an article that would appear in the *American Journal of Science,* the first detailed geological study of the Vineyard ever to appear in print.[1]

As he traveled around the Vineyard, Hitchcock observed three distinct geological zones. To the south he found "a perfectly level, sandy tract, uninhabited and uninhabitable." He named it the "Alluvial Formation."[2] On the western end of the island he noted a second zone consisting of "alternating beds of variously coloured clays, sand, ferruginous sand, pebbles, clay and pebbles, and clay and sand intermixed" that he termed the "Plastic Clay Formation," borrowing a term from British geology of his day.[3]

1 Edward Hitchcock, "Notices of the Geology of Martha's Vineyard and the Elizabeth Islands." *American Journal of Science*, vol. 7, no. 2 (1824), p. 240-8.
2 Hitchcock, "Notices," 241.
3 Hitchcock, "Notices," 244.

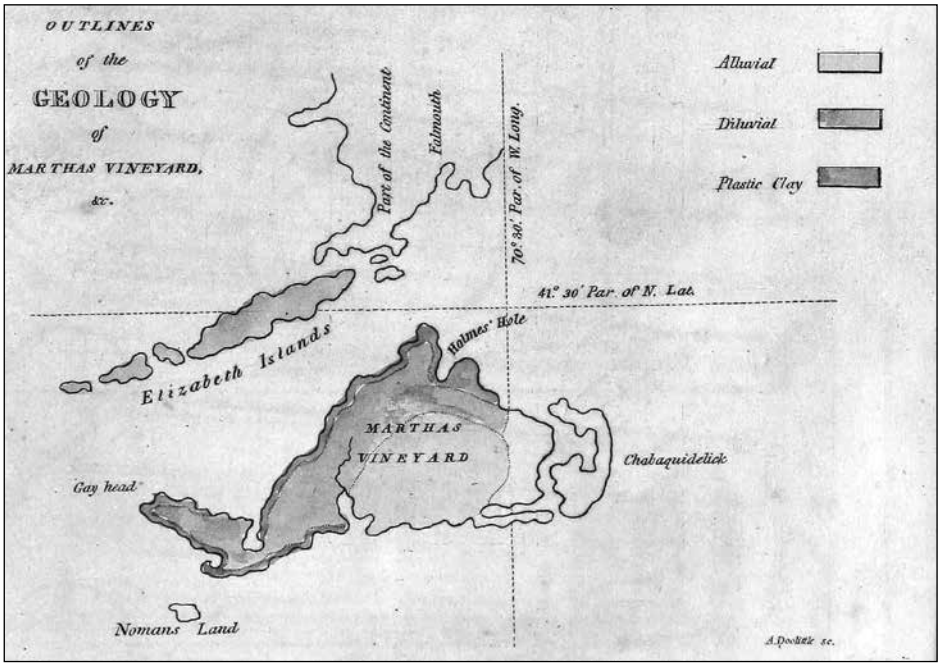
A scene from West Tisbury circa 1900. MV Museum Basil Welch Collection (RU 465).

But the feature that most attracted Hitchcock's attention on that first visit to the Vineyard lay atop the clay. "All the north western extent of the island is hilly and uneven," he wrote, "with no abrupt precipices…but rising into rounded eminences," some reaching three hundred or more feet above sea level.[4] Strewn across that rolling terrain he observed a jumbled mantle of pebbles and stones of granite, gneiss, quartz, and mica. He named this the "Diluvial Formation," the term "diluvium" in his day referring to material deposited by flood waters.

Most striking of all to Hitchcock was "the quantity of huge bowlder stones, scattered over these hills on every side," some over 50 feet in diameter.[5] From the outset he assumed these to be outcrops of the underlying bedrock. But the local inhabitants soon set him straight—there was, they assured him, no bedrock to be found anywhere on the island of Martha's Vineyard.

But if those huge "bowlders" were not derived from the underlying bedrock, where had they come from? Here Hitchcock made a telling observation, one that would resonate among geologists worldwide over the coming decades: those boulders, that diluvium, must have been "derived from the rocks that occur in place along the coast, on the mainland."[6] That conclusion was borne out some seventy years later when a distinctive boul-

4 Hitchcock, "Notices," 242.
5 Hitchcock, "Notices," 242.
6 Hitchcock, "Notices," 243.



Geological map of Martha's Vineyard by Orra W. Hitchcock. Hitchcock, Notices.

der of iron ore on Gay Head (now Aquinnah) was traced to Cumberland, Rhode Island, about fifty miles to the northwest.[7]

Near the end of the same article, Hitchcock made another point with profound implications. Those three formations he observed were not limited to the Vineyard. He wrote:

> …the Vineyard and Nantucket are a continuation of the extensive formation, hitherto called alluvial, of which Long-Island has been regarded as the north-eastern limit. If we prolong this curve still further, it will include within it Nova Scotia and at least part of Newfoundland.[8]

Edward Hitchcock, like most scientists of the early nineteenth century, regarded much of the surface geology of the earth as the result of a flood, the Great Flood of Genesis, the flood of Noah and his Ark. So, when he assigned the label "diluvium" to the detritus covering the northwestern portion of Martha's Vineyard, he was ascribing its deposition to that great biblical cataclysm, a conclusion with which most geologists of his day would concur.

Now Edward Hitchcock was a man of strict orthodox Christian faith,

7 Nathaniel S. Shaler, "The Conditions of Erosion Beneath Deep Glaciers, Based upon a Study of the Boulder Train from Iron Hill, Cumberland, R. I." *Bulletin of the Museum of Comparative Zoology*, vol. 16, no. 11 (1893), p. 185-225.
8 Hitchcock, "Notices," 246.

ill-inclined to trifle with God's word. But he was also a geologist, and that mixture of pebbles and stones, all apparently transported from the north and west—it clearly troubled him. And those huge boulders, some weighing 100 tons or more—what flood, however powerful, could move one of those, he asked.[9] And why would a flood carry all that material in one direction rather than dispersing it randomly over the sea bottom? In time those questions would lead him to a stunning conclusion, one that would overturn many long-held beliefs, both scientific and religious.

Seven years later, Edward Hitchcock returned to southeastern Massachusetts, no longer as a church pastor but now as Professor of Natural History and Chemistry at Amherst College, a position to which he had been named in 1825. He had received an appointment as the first State Geologist of Massachusetts with the goal of surveying the state's untapped mineral resources.[10]

In July 1830 Hitchcock set out on the first field excursion of the Massachusetts Geological Survey, traveling in a rickety horse-drawn wagon accompanied by one of his students. A month into their travels, they arrived on Cape Cod. His first observations, not surprisingly, harked back to his visit to the Vineyard seven years earlier:

> From Sandwich to Barnstable 12 miles diluvium all the way. In many places the bowlders are enormously large weighing 100 to 200 tons and very thick...In short the face of the country and its geological character appear to be precisely like those of Martha's Vineyard and the Elizabeth Islands. I doubt not but the same remark will apply to the whole of Cape Cod.[11]

Some of Hitchcock's notes from that first foray to Cape Cod read more like the random musings of a tourist than the methodical observations of a scientist:

> The roads are not as bad as we expected to find them. The scenery made up of sand hills— marshes—saltworks and here and there a copse of low trees is picturesque though generally dreary. The houses appear better than we had anticipated and there is an appearance of comfort and even thrift which we had not expected. The inhabitants also appear obliging and civil everywhere.

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9 Edward Hitchcock, *Report on the Geology, Mineralogy, Botany, and Zoology of Massachusetts* (J. S. and C. Adams, 1833), pp. 158.

10 Robert T. McMaster, "Edward Hitchcock's Geological Survey of Massachusetts, 1830-1833." *Earth Sciences History*, vol. 39, no. 1 (2020), p. 99-119.

11 Edward Hitchcock, Field notes, September 4, 1830. Unpublished manuscripts, "Diary and Observations," Edward and Orra White Hitchcock Collection, Amherst College Archives and Special Collections, notebook 1830 Jul-Sep, Series 5, Subseries C, Section 1, Box 11, Folder 7. The author's transcriptions of Hitchcock's field notes are available at www.EdwardHitchcock.com/transcriptions.html.

Professor Hitchcock had just a single complaint along the way, one that might well be heard from travelers to the region two centuries later: "*There is a great deficiency of guide boards and we are apt to get out of the way*."

As he traveled through Barnstable, Yarmouth, Dennis, and Brewster, Hitchcock observed salt works, salt marshes, and bogs. Cranberry cultivation on manmade bogs had barely begun at that time, but the bogs he saw were naturally occurring peatlands such as are still found in some places on the lower Cape, Nantucket, and the Vineyard. He wrote:

> Peat is very abundant in almost every town on the Cape and the white cedar swamps. Hitherto it has not been much dug - but we perceive the inhabitants frequently getting it out. It must prove an invaluable treasure. The Honorable John Reid of Yarmouth says he employs it for manure and it does well.[12]
>
> I cannot but regard the existence of so large quantities of peat, on Cape Cod and Nantucket, as a great blessing to the inhabitants.[13]

Hitchcock made particular mention of iron extracted from bog sediments on the Vineyard, commenting that iron was obtained from the island "during the last war," a reference to the War of 1812.[14]

Hitchcock reserved his most effusive descriptions of the Cape's scenery for its outermost extremity:

> …Truro is the most remarkable example of diluvial action that I ever saw. The whole town is scooped out and piled up in that peculiar manner which characterizes diluvium—the hills being from one to two hundred feet high and often very steep.[15]

Still farther up the arm of the Cape he observed,

> The appearance of Provincetown is exceeding picturesque—as we ride along the beach below the houses first stand the windmills then the houses in irregular order generally two or three rows and mixed with yards for drying fish and salt works…A semicircular bay is enclosed on the north and east by a sandy beach and low sand hills almost destitute of vegetation, which seem to threaten, and do in fact threaten, to bury the village, and to fill the harbor.[16]

Hitchcock was so enamored of Provincetown that he offered an accolade that many modern-day visitors would likely endorse:

> …a visit to Provincetown by land, would probably in most cases, be quite as effectual a remedy for ennui and other fashionable complaints, as a resort to Ballston and Saratoga.[17]

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12 The previous three quotes are from Hitchcock, Field notes, September 6, 1830.

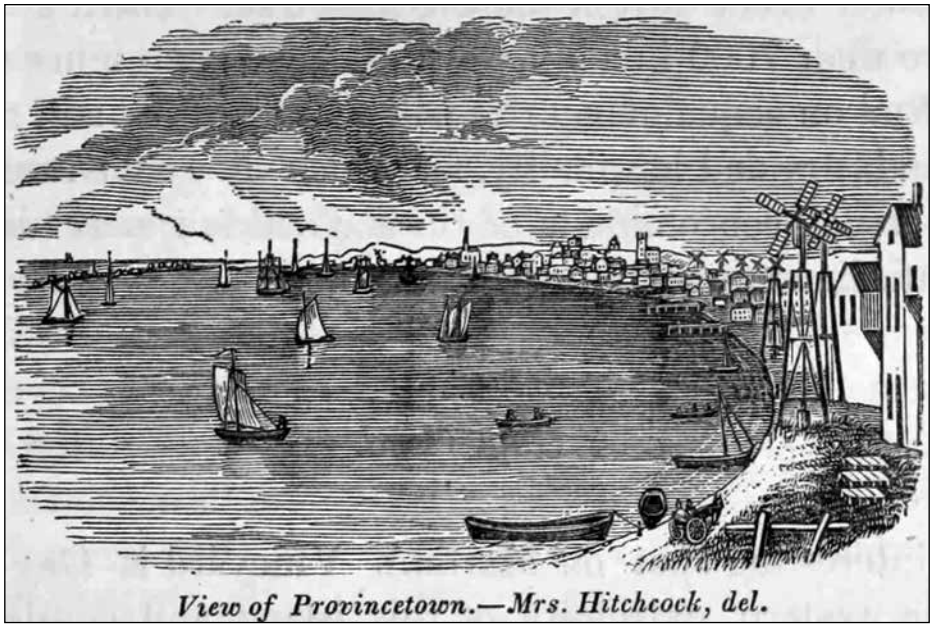
13 Hitchcock, *Report*, 40.

14 Hitchcock, Field notes, September 13, 1830.

15 Hitchcock, Field notes, September 6, 1830.

16 Hitchcock, Field notes, September 7, 1830.

17 Hitchcock, *Report*, 97-98.



Woodcut of Provincetown by Orra White Hitchcock. Hitchcock, Final Report, 273.

Traveling south once again, Hitchcock described an odd sensation that he termed a "mirage," an experience this writer recalls from his childhood vacations to the Cape long ago:

> A curious deception was noticed by myself and two companions… in the sandy regions of the Cape particularly in Orleans. We seem even on level ground to be ascending in other words to be placed in a basin. We observed this mirage so frequently and it was so striking that it could not have been a mistake. Frequently the road seemed to have an ascent of two or three degrees before us and on passing forward and looking back an elevation equally great appeared in that direction. This phenomenon seems to be of the nature of what the sailors call looming but I cannot explain it and especially why it should appear in a sandy rather than any other region.[18]

He reported similar experiences on Nantucket and Martha's Vineyard.

Hitchcock's description of that "mirage" may have been the first ever to appear in print, but it would not be the last. Some thirty years later another astute observer of the natural world, Henry David Thoreau, wrote of a similar experience as he traveled from Truro to Provincetown:

> On our way thither we had occasion to admire the various beautiful forms and colors of the sand, and we noticed an interesting mirage, which I have since found that Hitchcock also observed on the sands of the Cape.[19]

18 Hitchcock, Field notes, Sept 8, 1830.

19 Henry D. Thoreau, *Cape Cod* (Ticknor and Fields, 1866), pp. 176-177

Gay Head, lithograph from a drawing by Orra White Hitchcock. Hitchcock, Final Report, 275.

At Falmouth Hitchcock boarded a steamer, intent on studying the Gay Head Cliffs. For what he witnessed on that excursion he spared no superlatives:

> The most interesting spot on Martha's Vineyard is Gay Head; which constitutes the western extremity of this island, and consists of clays and sands of various colors. Its height cannot be more than 150 feet; yet its variegated aspect, and the richness of its colors, render it a striking and even splendid object, when seen from the ocean… Every lover of natural scenery would be delighted to visit this spot. There is nothing to compare with it in New England.[20]

He was fascinated by the clay formation at Gay Head, spending three days collecting over 100 specimens. His catalog from that visit lists red, green, yellow, white, and brown clays, partially carbonized wood known as lignite, fossilized leaves of willow and elm embedded in iron ore, and an unidentified seed pod. Animal remains include two species of bivalves, a sea snail, several crabs, vertebrate bones, shark teeth, and a crocodile tooth.[21] Based on the size of one of the shark teeth he found at Gay Head, Hitchcock estimated the length of the shark at thirty-six feet, commenting, "Such was one of the animals that swam in the ancient seas of this latitude!" Of the crocodile tooth he wrote:

20 Hitchcock, *Report*, 99.

21 Edward and Orra White Hitchcock Collection, Amherst College Archives and Special Collections, Published Writing, Edward Hitchcock, *Catalogue of the Massachusetts State Cabinet,* Series 6, Box 17, Folder 23.

> "The tooth of the crocodile at Gay Head, as well as the great size of some of the shark's bones, show, also, that when these animals swam in the waters of our continent, the climate must have approximated to a tropical character…"[22]

In his 1833 report of the geological survey of Massachusetts, Hitchcock showed particular interest in the several sources of iron found at Gay Head and their potential economic value for the Indigenous peoples of the Island.

> It is well known that the preceding are valuable ores of iron for smelting; and at Gay Head, particularly, they may be obtained in abundance. That spot is still in possession of the descendants of the Indians of Martha's Vineyard: and it is to be hoped that the Government of the State will take measures to prevent their being defrauded of this ore, which may prove of considerable value.[23]

Whether the Commonwealth ever took such measures on behalf of the Indigenous peoples of the Island is not known, but the iron deposits at Gay Head and elsewhere across the state proved of little economic value once the vast iron resources in the western regions of the expanding nation were tapped.

Back on the mainland, Hitchcock traveled north from Falmouth toward the mainland. Once again, he was perplexed by the many huge boulders scattered over that sandy peninsula:

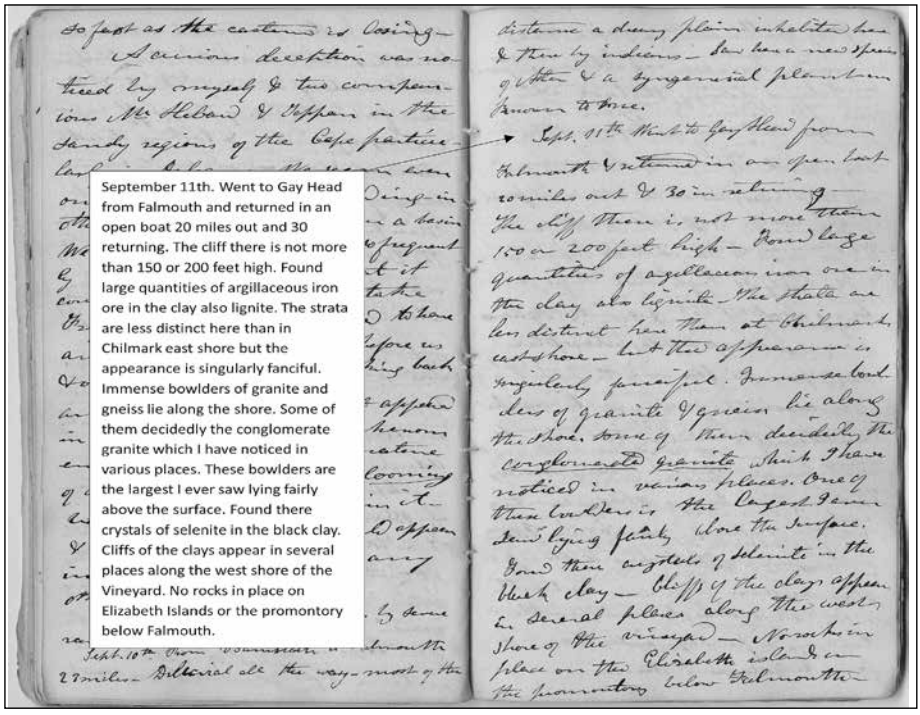
> From Falmouth to Plymouth 36 miles diluvium all the way. But in the west part of Falmouth and Sandwich the bowlders are so large and thick and so numerous and the hills so high that there can be no doubt that granite and gneiss are in place a little below the surface [by "in place" he means bedrock].[24]

In his 1833 report, Hitchcock reiterated his belief that the "bowlders" of Cape Cod were derived from bedrock, and his geological map for that report indicated as much. Nevertheless, he seemed to leave the subject open to further discussion:

> The map will show…that I have extended a strip of granite from Plymouth into Barnstable county as far east as Brewster, and carried another branch into Falmouth…Others must judge, whether the evidence of the existence of granite in place in the region under consideration, is probable enough to justify me in the course I have taken.[25]

But in his 1841 revision of that map, the granite bedrock of Cape Cod had been removed. In his explanation he hedged a bit on the question: "…as the entire surface is diluvium, I thought it better to color it as such;

22 Hitchcock, *Report*, 194.
23 Hitchcock, *Report*, 190.
24 Hitchcock, Field notes, September 13, 1830.
25 Hitchcock, *Report*, 470.



Two pages from Edward Hitchcock's field notes for September 10-11, 1830, including his first visit to Gay Head. Courtesy of Amherst College Archives and Special Collections.

thus representing what I know exists there, instead of something about which I am not certain."[26]

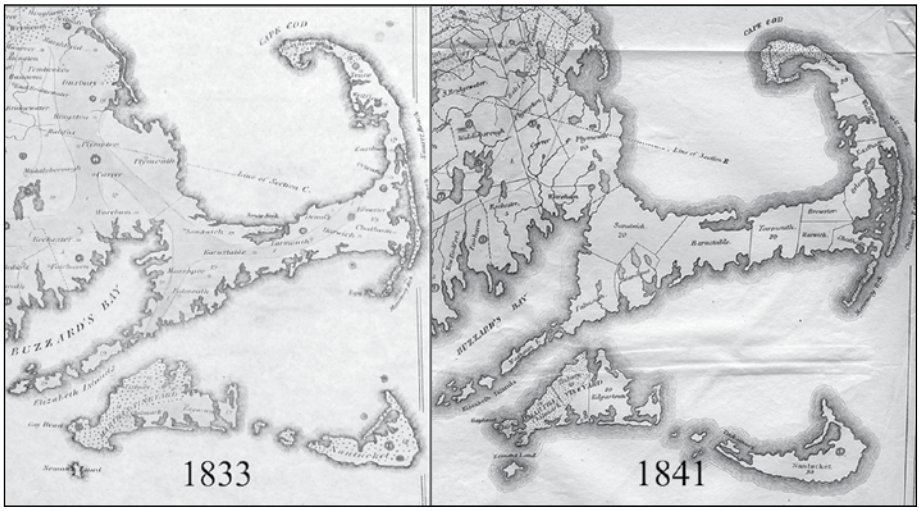
Hitchcock may be forgiven his equivocation on this point. Not until the mid-twentieth century would the matter be resolved when geophysicists determined the depth of the bedrock beneath the region. It ranged from 80 feet at the Cape Cod Canal to over 1600 feet at Nantucket. A map from that study shows the highest elevation of the bedrock extending from Bourne eastward to Barnstable and southward to Falmouth, comparing favorably with Hitchcock's map of more than a century earlier.[27]

Hitchcock received yet another hint about the region's geological history in his travels to the Cape and Islands in 1832:

> …a pilot told me that on the west side of the harbour [Holmes Hole] he had seen what looked like a swamp or marsh and another man said he believes some cedar stumps had been found formerly

26 Edward Hitchcock, *Final Report on the Geology of Massachusetts* (J. H. Butler, 1841).

27 Robert N. Oldale, "Seismic Investigations on Cape Cod, Martha's Vineyard, and Nantucket, Massachusetts." In *Geological Survey Research 1969: United States Geological Survey Professional Paper 650-B* (United States Geological Survey, 1969, B122-B127).



The granite bedrock underlying parts of Cape Cod shown in pink in Hitchcock's 1833 map was removed in his 1841 revised map. Hitchcock, Geological map of Massachusetts, 1833. Courtesy of the Hudson Institute of Mineralogy, Keswick, VA; Hitchcock, Geological map of Massachusetts, 1841. Courtesy of the Jones Library, Amherst.

> toward the lighthouse in shallow water. Mr. Allen of Chilmark tells me that cedar stumps have been found on the northwest shore of the Vineyard near Gay Head.[28]

He received similar reports on Nantucket, at Yarmouth on Cape Cod, and elsewhere along the Atlantic coastline. In his 1833 report he wrote,

> Geologists are not a little perplexed satisfactorily to account for submarine forests…in general it has been supposed that these forests have subsided in consequence of earthquakes, or other internal movements of the earth.[29]

Submerged tree stumps off the New England coast continue to interest scientists to this day, providing important insights into Earth's climate, past and present. Two recent environmental paleontology studies examined the age of Eastern red cedar stumps on beaches in Mashpee[30] and Duxbury, MA.[31] Radiocarbon-dating of the stumps show that the trees

28 Edward Hitchcock, Field notes, May 19, 1832. Unpublished manuscripts, "Diary and Observations," Edward and Orra White Hitchcock Collection, Amherst College Archives and Special Collections, notebook 1832 May-1833 Jan, Series 5, Subseries C, Section 1, Box 11, Folder 9.

29 Hitchcock, *Report*, 118.

30 Christopher V. Maio, Allen M. Gontz, Christopher R. Weidman, and Jeffrey P. Donnelly, "Late Holocene marine transgression and the drowning of a coastal forest: Lessons from the past, Cape Cod, Massachusetts, USA," *Palaeogeography, Palaeoclimatology, Palaeoecology*, vol. 393 (2014), pp. 146-158.

31 Allen M. Gontz, Christopher V. Maio, and Laura Rueda, "The Duxbury Sunken Forest—Constraints for Local, Late Holocene Environmental Changes

were inundated between 300 and 2500 years before present, suggesting that sea level has been rising steadily for nearly three millennia due at least in part to melting of the polar ice caps.

Edward Hitchcock seems to have accepted the idea that those "submarine forests" once stood well above sea level before the land subsided and the trees were inundated with sea water. He never suggested the possibility of rising sea level from glacial meltwater. After all, in 1833 the idea that a vast glacier once covered most of New England was the stuff of science fiction, even to Professor Edward Hitchcock. But not for long.

On the mainland Hitchcock observed two other important features that reinforced his doubts about the origin of that so-called diluvium. Gouged in bedrock across New England he noted deep furrows, nearly all with the same orientation, from northwest to southeast. In addition, he observed sinuous trains of large boulders, many extending tens of miles from their origin, all with similar orientations.[32]

By 1833 Edward Hitchcock had seen more than enough evidence to make him skeptical of the "diluvial hypothesis," that notion that the Great Flood was the force responsible for most of the sculpting of the earth's surface. In his report he wrote:

> Making every allowance for the reduction of the gravity of these bowlders when in water, I confess I cannot conceive how such a work could have been effected by this agency [i.e., water].[33]

Then he broadened the point:

That a transient deluge, like that described in the Scriptures, could have produced, and brought into its present situation, all the diluvium which is now spread over the surface of this continent, will not, it seems to me, be admitted for a moment by any impartial observer. It has obviously been the result of different agencies, and of different epochs.[34]

But what were those "different agencies?" That question continued to bedevil Hitchcock. Then in 1841 he received a copy of a geological treatise entitled *Études sur les Glaciers*.[35] The author was a Swiss scientist named Louis Agassiz. Agassiz advocated the radical notion that ice, not water, was the primary agent responsible for sculpting much of the surface of the northern hemisphere; that a huge ice cap had accumulated in the northern polar regions, gradually expanding southward over hundreds of

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Resulting from Marine Transgression, Duxbury Bay, Eastern Massachusetts, U.S.A," *Journal of Coastal Research*, vol. 29, no. 6A (2013), pp. 168-176.

32 Robert T. McMaster, *All the Light Here Comes from Above: The Life and Legacy of Edward Hitchcock* (Unquomonk, 2021), pp. 149-165.

33 Hitchcock, *Report*, 158.

34 Hitchcock, *Report*, 142.

35 Louis Agassiz, *Études sur les Glaciers* (Jent et Gassmann, 1840).

thousands of years. It was a glacier, or series of glaciers, of massive extent, and it gouged, scraped, and bulldozed the earth's surface as it advanced. It should be noted that the concept of continental glaciation originated with other European scientists at least twenty years earlier, and Agassiz became embroiled in a number of disputes over priority and failure to cite the writings of German-Swiss geologist, Jean de Charpentier and others.[36]

When Edward Hitchcock read Agassiz's treatise, he was an immediate convert. In an address to the Association of American Geologists in Philadelphia in April 1841, he described the theory of the glacial origin of those effects with evangelical fervor:

> While reading this work…I seemed to be acquiring a new geological sense; and I look upon our smoothed and striated rocks, our accumulations of gravel, and the tout ensemble of diluvial phenomena, with new eyes.[37]

Hitchcock's ringing endorsement gave Agassiz's theory wide exposure and credibility among American scientists, although there remained a good deal of resistance in some quarters— Hitchcock himself backpedaled and equivocated on the idea repeatedly. But the evidence was strong and compelling. By the 1860s the concept of continental glaciation had been accepted and embraced by most scientists in America and worldwide.[38]

As to nonscientists, particularly theologians, members of the clergy, and other people of faith who were suspicious of new ideas in science, the fact that Reverend Edward Hitchcock, well known as a devout man of orthodox Christian views, was comfortable with such a notion may well have given them license to accept the theory.

At the time of his ordination, the twenty-eight-year-old Reverend Edward Hitchcock adhered to Calvinism, a strict form of Christianity similar to Christian fundamentalism of today. Central to that creed was a literal understanding of the Holy Scriptures as well as belief in God as the Grand Designer of the universe, as the cause of all the forces that changed the earth, and as the Creator of all living things including, of course, our own species. Soon many of those views were tested by Hitchcock's astute powers of observation and induction, particularly his evolving understanding

36 Christoph Irmscher, *Louis Agassiz: Creator of American Science* (Houghton Mifflin Harcourt, 2013), pp. 67-68; Edward Lurie, *Louis Agassiz: A Life in Science* (University of Chicago, 1960), pp. 102-106.

37 Edward Hitchcock, "First Anniversary Address Before the Association of American Geologists." *American Journal of Science*, vol. 41, no. 2 (July-Sept 1841), pp. 232-275, on p. 253.

38 Jordan D. Marché II, "Edward Hitchcock, Roderick Murchison, and Rejection of the Alpine Glacial Theory (1840-1845)." *Earth Sciences History*, vol. 37, no. 2 (2018), pp. 380-402, on p. 233; McMaster, All the Light Here Comes from Above, 161-163.

of geology and paleontology. In the end his scientific views always prevailed—Edward Hitchcock could not and would not deny the evidence that he found all around him.

The greatest challenge to people of faith in Hitchcock's time came in 1859 with the publication of Charles Darwin's *On the Origin of Species.*[39] Darwin asserted that the diversity of life on earth was not a result of the creative impulses of a supreme being, but of arbitrary, impersonal forces such as variation, mutation, and natural selection. For a time Hitchcock, like most scientists of his day, strenuously opposed Darwinism on both scientific and religious grounds. But in the last year of his life, he conceded that even the Darwinian paradigm of the evolution of life might all be part of God's grand plan.[40]

Edward Hitchcock has been called the last of the "Christian geologists," a term often used to describe geologists of that period who allowed their religious beliefs to intrude upon and influence their science.[41] But Edward Hitchcock found ways of bridging the gap between science and faith, of reconciling those two worldviews. Far from the last of the Christian geologists, he may have been one of the first of a new breed of scientist, men and women possessed of a strong religious principle while remaining true to science.

Edward Hitchcock's life was a dual journey of faith, faith in God and faith in science. It led him to question some of the basic tenets of his religion as well as some of the fundamental scientific ideas of his day. And that journey began with a visit to Martha's Vineyard in 1823 and the sight of those huge "bowlders" scattered over a sandy Chilmark plain.

In a sermon delivered to his congregation in 1822, Reverend Hitchcock warned his parishioners to pay heed to the world around them. "Let the unbeliever then remember that as he passes over our hills the very stones cry out against him."[42] The stones did cry out to Edward Hitchcock that day on Martha's Vineyard, and the message they bore was truly a revelation in stone.

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39 Charles Darwin, *On the Origin of Species by Means of Natural Selection* (John Murray, 1859).

40 Edward Hitchcock, "The Law of Nature's Constancy Subordinate to the Higher Law of Change." *Bibliotheca Sacra and Biblical Repository*, vol. 20 (July 1863), pp. 489-561.

41 Philip J. Lawrence, "Edward Hitchcock: The Christian Geologist." *Proceedings of the American Philosophical Society*, vol. 116, no. 1 (1972), pp. 21-34.

42 Edward Hitchcock, Sermons. Unpublished manuscript, Sermon No. 128, "Noachian Deluge," II Peter 2:5, 1823 Jan, Edward and Orra White Hitchcock Collection, Amherst College Archives and Special Collections, Series 3, Subseries A, Box 7, Folder 7.