

THE DINOSAUR TRACKS OF DEXTER MARSH:
GREENFIELD'S LOST MUSEUM, 1846-1853

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Preface

Like fossils hiding in plain sight, the kind that stick out from an exposed formation of rock, Dexter Marsh has had to be disinterred from publications of the 1840s and 1850s by Edward Hitchcock and James Deane. They frequently listed him as the supplier of the fossil sandstone footprints they were writing about, but these mentions of his name left him immured in their records. It was toward the end of several years' study of Orra White and Edward Hitchcock that I realized the significance and the fascination of this astonishing laborer and quarrier who taught himself geology and founded his own museum. Along with the Hitchcocks' papers, Marsh's key documents are in Amherst College's Archives and Special Collections: his daybooks from 1830 to 1852 and the registers of visitors to his now forgotten museum from 1846 to 1853. As soon as I fastened on Marsh, about 2009, I found that Sarah L. Doyle had been gathering together some letters, documents, and biographical references to him. She was unstintingly generous, locating and copying these various documents for me and urging me to make good use of them. The present essay is therefore a collaboration in which her generosity has had no limits. She has carefully read the manuscript and made valuable suggestions.

It was Marsh himself who quite unwittingly left behind the traces of a life that otherwise would be impossible to uncover. And most of these, in turn, were saved by his youngest son, George E. Marsh, who communicated them to the Pocumtuck Valley Memorial Association in 1908 (see PVMA in the Bibliography). It's presumably he who gave Amherst College his father's daybooks and visitors' registers. Marsh's daybooks have virtually no prose, only entries of a few words that give minimal facts and events over two decades. "lumber for fence 12.08;" "went to Sunderland 4 days 1.12." A historian of economics would find them a bonanza for documenting the household economy of a country villager, but the biographer has rather little to grasp, mainly Spartan references to the costs of clothing, food, tools, furniture, and occasional travel, as well as some payments received for work he did for neighbors, the nature of which he hardly ever described. Fortunately this skeletal record is supplemented by the signatures of 3034 visitors to the registers of his short-lived museum, which alone tell us a great deal about his associations with the scientific world. In this study we make extensive use of these manuscripts, but they are too voluminous to reprint here. On the other hand, we are able to place in the appendices several texts that offer revealing insights into his work and his intellectual attainment. These include four surviving letters to professional men, one of them published (Appendix A-2); the memoir of a Scottish scientist's visit to him (B-1); two retrospects of his life by acquaintances (B-2 and B-3), and the auctioneer's summary of his museum sale (C).

I'm very grateful to my wife Eugenia W. Herbert for reading the manuscript with a professional historian's eye. Among other thanks, I'm thankful for the willingness of the staff of Amherst College's Archives and Special Collections, particularly Margaret R. Dakin and Peter Nelson, to welcome my hundreds of visits and my constant requests. At the Pocumtuck Valley Memorial Association in Deerfield, the librarian David Bosse has gone out of his way with help-

ful suggestions. Joel Fowler kindly supplied information from Greenfield town records. Sarah Goldstein, the director of Digital Assets and Preservation Services at Mount Holyoke College, has undertaken the publication online of this essay with an enthusiasm that has lifted Sarah's and my spirits.

R. L. H. November, 2012

Abbreviations used throughout this essay:

AJS: *American journal of science*.

Jefferson 1898: Mark S. W. Jefferson, "The postglacial Connecticut at Turners Falls, Mass.," *Journal of Geology* 6, 5 (July-Aug. 1898): 463-72.

Herbert 2012: Robert L. Herbert, ed. and intro., *The Complete correspondence of Edward Hitchcock and Benjamin Silliman, 1817-1863*. Amherst College, online publication, 2012.

Journal: the collective name for Marsh's daybooks and visitors' registers.

PVMA 1908: Pocumtuck Valley Memorial Association, Deerfield, *Proceedings of the Pocumtuck Valley Memorial Association*, 5 (1912), for the 1908 annual meeting.

For other short titles, see Bibliography.

Marsh's life and work, 1808-1853

From January 1846 to the spring of 1853, several hundred people a year came to Greenfield to see the fossil tracks and other curios in the museum ("Cabinet") housed in a special hall in the self-built home of Dexter Marsh. The sandstone tracks, at that time thought to be the marks of prehistoric birds, had been formed about two hundred million years ago by animals walking on soft mud that subsequently turned to slaty sandstone. Starting in 1835, Marsh, a Greenfield laborer and quarrier born in 1806, had made known these fossil footprints to Dr. James Deane of Greenfield (1801-1858). He in turn informed Edward Hitchcock (1793-1863), professor of natural sciences at Amherst College. Hitchcock published them in 1836, and news of this sensational discovery spread rapidly through scientific circles in America and Western Europe. Marsh was asked to package casts and specimens that were sent abroad in 1837, when they entered into the rapidly expanding new field of paleontology. By the time the first visitors came to Marsh's Cabinet nine years later, the Jurassic footmarks had been publicized in the popular press, and the upper Connecticut River Valley had become well known as the site of these marvels. Marsh's visitors included leading American scientists and a few people from Europe and the Near East.

Alas! Marsh's Cabinet was auctioned off after his untimely death on April 2, 1853. Some of his footmark slabs were bought for the collections of public institutions, including Amherst College and the Boston Society of Natural History, others by private collectors who were eagerly sounding the market for these specimens. With its dispersal, Marsh's museum was lost from sight even though it was recognized in its brief heyday as the country's best collection of sandstone impressions, superior even to that formed by Hitchcock at Amherst College. Although Marsh has been remembered in several valley town histories, not only Greenfield's, he has been omitted in the accounts of the first dinosaur footmarks to have been uncovered. Hitchcock and Deane, who published the sandstone tracks, did not mention Marsh until the mid-1840s although he had furnished their specimens. In 1842 to 1844 they publicly disputed who was the "discoverer" of the fossil impressions, but Marsh should be credited with that role.¹ Following his death, Roswell Field (1808-1882) of Gill took over the role of principal supplier of Connecticut River Valley sandstone tracks to collectors, scientists, and institutions. He did not have Marsh's breadth of interests, but he exploited the quarries on his own land; he will be the subject of a forthcoming study. The present essay will bring Marsh out of his quarries to show how this man stood at the base of the pyramid of paleontological revelations in New England.²

¹ In 1858, in a footnote in his *Ichnology of New England*, p. 4, Hitchcock acknowledged Marsh as "the first to notice these impressions." For a thorough rehearsal of the Hitchcock-Deane dispute, which involves Benjamin Silliman, see Herbert 2012.

² Marsh was born in Montague on August 22, 1806, the seventh child of Joshua and Mindwell Crosby Marsh. According to two who knew Dexter well (Appendices B-2 and B-3), he had a harsh upbringing and only a smattering

Marsh is not the only pioneer of fossil remains who has been neglected. Paleontology in Great Britain also had a supplier of fossils—fossil bones, not foot tracks—whose role was largely hidden for a long time behind the publications of the gentlemen scientists who were her customers. Mary Anning (1799-1847) began selling fossil bones when still a young girl, working with her father and brother in Lyme Regis. By 1826 she met clients in her own shop, Anning's Fossil Depot. She had only a Sunday school education, but she read current scientific papers and knew how to draw and classify her finds. Studying skeletons she unearthed, she was the first to identify the ichthyosaur, the plesiosaur, and the pterosaur. Many British geologists and collectors were among her clients. They all acknowledged her work and her learning but nonetheless treated her mainly as a supplier of fossils.³

Marsh had little education, not even completing grammar school;⁴ like her, he had a very modest place in society. In the language of the day he was a “mechanic” who cut wood, quarried and hauled stone, served as janitor and gardener, and did all sorts of odd jobs in Greenfield. He familiarized himself with geology and paleontology by diligent study of his fossils and wide reading in the scientific writings that he acquired by exchange and purchase. The sandstone tracks he uncovered cannot compare in significance with Anning's fossils, but he had a similar position in regard to the more learned men who published his findings. They also visited him and his Cabinet, conversed with him, bought specimens from him, and visited his quarries (see below).

Paleontology was still new in the 1830s when Marsh made his first discoveries. Its most important initiator was the Frenchman Georges Cuvier (1769-1832) who, at the end of the eighteenth century, was the key figure in applying comparative anatomy to fossil bones. His work bridged the fields of biology and geology, and also involved archeology. By the 1820s paleontology was increasingly recognized as a new science drawn off from these older disciplines. Fossils identified the relative ages of the strata in which they were found, and the new field of stratigraphy pointed to the vast scope of prehistoric time. This, in turn, greatly upset traditional Christian belief in a biblical chronology of only a few thousand years. Geology and paleontology were treated as enemies by biblical literalists, a conflict that was a vexing challenge to scientists like Hitchcock, who was a minister and devout Calvinist.

Hitchcock and Deane

Before Marsh's contributions can be evaluated, one must look at the publications of Hitchcock and Deane, his first clients, and the dispute that embroiled them when each claimed to be the discoverer of the fossil footprints. Just who first noticed the trace impressions of animals in slabs of sandstone is not entirely clear. Sandstone had been quarried in Greenfield, Montague, and Turner's Falls (a section of Montague) for some time, for use as paving stones there and in Deerfield, but only in 1835 was attention called to the fossil tracks. Credit as the first to do so

of school classes in winter months. Nothing is known of him until 1830 when he was living in Deerfield (daybook entry April 15, 1830). He moved to Greenfield by January 1, 1832, when he so headed the page of his daybook. In 1834 he married Rebecca Slate (1810-1838), and they moved into the house he had largely built himself. Their daughter Arabella was born in 1835 (still living in 1920), and son Frank two years later (1837-1915). In 1839, a year after Rebecca died, Marsh married Eunice Everett (1815-1906), and they had three children, George E. Marsh (1840-1928), Ella May Marsh (1849-1876), and Emogene Marsh Allen (1853-1905).

³ See Shelley Emling, *The fossil hunters: dinosaurs, evolution and the woman whose discoveries changed the world* (New York 2009).

⁴ See Langstroth 1894, p. 258.

has been variously given to Marsh, William W. Draper, and William Wilson,⁵ but it was Marsh whom Deane acknowledged, so those two are most reliably credited with the discovery. Moreover, Marsh was the only one of those named who was actually quarrying sandstone. Deane purchased two of Marsh's pieces and notified Hitchcock about them on March 7, 1835, noting the tracks' resemblance to birds "of the turkey species." Hitchcock was the logical person to be informed of the discovery because he had published his survey of the geology of Massachusetts two years earlier and was the state's best known geologist. In April, convinced by illustrations and casts of the trace impressions that Deane sent him, Hitchcock went to Montague and bought several of the sandstone specimens (probably from Marsh, but from whom is not known) and examined others in nearby quarries. In July, Silliman, the founder-editor of the *American journal of science*, wrote Hitchcock that he had received from Deane a plaster cast of the tracks and a description that he would like to publish if Hitchcock found them genuine.⁶ Hitchcock replied (7.30.35) that he had examined the tracks. They resembled those of living wading birds, he wrote, not turkeys. He proposed a paper for Silliman's journal and would give Deane credit for notifying him about the find, but asked the editor to publish his paper ahead of Deane's.

Before December (Silliman never published Deane's paper), when he sent his draft to New Haven, Hitchcock examined still more tracks in quarries and exposures north of Deerfield and southeast of Northampton on both sides of the Connecticut; some he found used as flagstones in Northampton and Deerfield. To locate sandstone sites, he must have consulted local people, including Marsh. Silliman was obviously eager to publish an account of the tracks because no fossils of birds had ever been discovered as deep as new red sandstone of the early Jurassic era, so it would be an epochal publication. The first fossil tracks (made by tortoise-like ancestors) to be discovered were found in Scotland in 1828. Then in 1834, in Hildberghausen, Saxony, fossil impressions of an unknown animal dubbed "Chirotherium" (the Triassic archosaur) were identified and published the following year. Silliman printed Hitchcock's article, accompanied by three fold-out plates, in July 1836. It was sensational and drew notice on both sides of the Atlantic.⁷ On the first page of his article, Hitchcock wrote that "My attention was first called to the subject by Dr. James Deane of Greenfield . . . Through the liberality of the same gentleman, I soon after obtained the specimens themselves . . ." By 1842 Deane felt aggrieved because Hitchcock hadn't written that he, Deane, from the first had said the tracks were made by birds. Doubtless Hitchcock, having found impressions of ancient wading birds, not the turkeys that Deane analogized, and having laboriously examined and described them in scientific terms, thought that he was far ahead of the Greenfield doctor who, he felt, had merely pointed to the

⁵ Thomson 1904, pp. 968-72. For Marsh's priority in discovering the foot tracks, see also John Collins Warren (1778-1856), *Remarks on some fossil impressions in the sandstone rocks of Connecticut River* (Boston 1854), p. 13, and Langstroth 1894. Hitchcock, in his *Report on ichnolothology, or fossil footmarks . . . from the valley of the Connecticut River*, AJS 47, 2 (Oct. 1844), named William Wilson as the "agent" who in 1835 procured flagstones for Greenfield and referred to tracks of the "turkey tribe," pointing these out to Deane. Deane, however, denied this. In a letter of May 16, 1859, to the *Springfield Republican*, Hitchcock included a letter to him from W. W. Draper, dated Greenfield, May 8, 1859 in which Draper said he and his wife saw a stone slab in front of the house of William Wilson. Draper told Wilson that "they were turkey tracks made three thousand years ago." Before night, Wilson "had many of the village people to witness the phenomenon. My impression is that Dr. Deane was among them, but I cannot assert it to be so." One modern publication refers to Marsh's initial discovery: Ralph M. Stoughton, *History of the town of Gill, Franklin County, Massachusetts 1793-1943* (Gill 1978), pp. 238-39. Stoughton writes that William Wilson, a Greenfield contractor, had engaged Marsh to lay flagstones in 1835.

⁶ For all Hitchcock-Silliman letters, see Herbert 2012.

⁷ Hitchcock, "Ornithichnology. -- Description of the foot marks of birds (Ornithichnites) on new red sandstone in Massachusetts," AJS 29, 2 (April 1836): 307-40.

tracks. He believed Deane to be a less qualified interpreter and, in his rush to take credit for the phenomenon, he exposed the flinthearted ambition bordering on arrogance that underlay the heady pace of his work.

Hitchcock's long article is an example of careful reasoning, with detailed descriptions of the bipedal tracks and their locations, leading to the conclusion that they were formed by birds (*Grallae*) wading in shallow water whose muddy or sandy soil was subsequently turned to slaty sandstone. This stone corresponded to European new red sandstone (which since then has been placed in the late Triassic-early Jurassic periods). He described the impressions with precision, down to the length and thickness of toes, the presence or absence of claws, the length of the feet, and the distances between footprints when aligned as if walking. It seemed to him, he wrote, "that the exigencies of the case require us to suppose them [the tracks] produced by birds, whose habits were those of the *Grallae*."⁸ He keyed his textual descriptions to the engravings Silliman authorized so that others could see the evidence and make up their own minds. One fold-out plate represented *Ornithichnites Giganteus*, a footprint sixteen inches long. Because no birds had ever been found at that great depth, Hitchcock felt justified in coining "Ornithichnology" (stony bird tracks) as a new branch of knowledge. He subdivided the "Ornithichnites" into two classes, thick- and thin-toed, and each of these into several species, giving each its own binomial. The footmark of *O. Giganteus* is sixteen inches long (excluding claws), far larger than the biggest extant bird, the ostrich. Much of Hitchcock's nomenclature, which he revised in subsequent years, has become the standard terminology in Ichnology, the new science which he founded.

In the weeks following publication of "Ornithichnology," Hitchcock sent offprints to several British and French geologists. His revelations produced some negative reactions, especially from biblical literalists, but he was quickly consoled for that summer Silliman wrote him that William Buckland, prominent geologist (and minister!) had "communicated to the Ashmolean Society at Oxford a notice of your discoveries."⁹ In his "Bridgewater treatise," published at the end of 1836, Buckland gave prominence to Hitchcock's discovery, agreeing that the tracks were made by birds. In November 1837 the British geologist Charles Daubeny visited Hitchcock in Amherst and accompanied him up Mount Holyoke and along the nearby shores of the Connecticut River to study the trace fossils. "I went away, fully impressed with the belief that they could have been produced in no other way than by the treading of birds of various sizes upon a soft and plastic material."¹⁰

In 1836 and again in 1837, Hitchcock sent casts of the tracks to learned societies in London, where they attracted a lot of attention. Alexandre Brongniart saw them there and was much impressed; he volunteered to pay for copies for Paris's Musée d'histoire naturelle.¹¹ Most leading British geologists were also struck by the footmarks, although they wanted actual bones before they could accept definitively the ascription to birds. In 1839, when Richard Owen published news of the "Dinornis," the giant extinct bird of New Zealand (the Moa), Hitchcock's interpretation was given a boost. Even in 1843, when bipedal dinosaurs were known ("Dinosaur" was coined by Owen the previous year), Owen, Charles Lyell, Gideon Mantell, and Roderick Murchison still agreed with Hitchcock's birds. Murchison hoped for the discovery of the bones

⁸ Hitchcock, *Ibid.*, p. 336.

⁹ Silliman to Hitchcock, 8.19.35. See Herbert 2012.

¹⁰ Daubeny, *Sketch of the geology of North America* (Oxford 1839), p. 20.

¹¹ Brongniart to Silliman, 1.6.37, quoted in Silliman to Hitchcock, 4.15.37. See Herbert 2012. It wasn't until 1839 that Hitchcock sent casts directly to Paris (Hitchcock to Silliman, 7.20.39).

“of some fossil *Dinornis*,” but wrote that “in the meantime, let us honor the great moral courage of Professor Hitchcock in throwing down his opinions before an incredulous public.”¹²

By 1841, when he published his *Final report on the geology of Massachusetts*, Hitchcock had greatly expanded his knowledge of the trace fossils. He described twenty-seven species of footprints, and in 1842 added five more, including some made not by birds, but by quadrupeds. By this year, Deane felt that Hitchcock had unfairly usurped his role by repeatedly naming himself as discoverer of the sandstone tracks, and began a campaign to claim that honor for himself.¹³ He shipped to London some specimens that were crisper in detail than Hitchcock’s sent earlier, boosting his credentials among British geologists. Hitchcock in his turn felt slighted, so in 1844 Silliman orchestrated articles by both men in his journal that led to a vindication of Deane’s claim as first “discoverer” and Hitchcock’s as primary interpreter. Because Deane had accepted Hitchcock’s nomenclature and made no attempt himself to discuss geological age, the elaboration of the new science of ichnology was left to the Amherst professor, although Deane continued for several years to make valuable observations about newly uncovered stony tracks.

Dexter Marsh

The publications of Hitchcock and Deane through 1844 made no mention whatever of Dexter Marsh, although he had been their principal supplier of the fossil footprints. The following year, his name appeared for the first time in an article by Deane. He wrote that Marsh had provided him “from a locality thirty miles distant from Turner’s Falls, a specimen of *Ornithichnites giganteus* [he used Hitchcock’s terminology] of stupendous proportions, the impression being no less than eighteen inches in length.”¹⁴ That year also Silliman remarked on Marsh’s specimens. “A large slab full of very perfect impressions of the feet of these birds has been furnished to the British Museum by Dr. James Deane, who very recently, with his associate Mr. Marsh, has disintombed specimens still more extraordinary.”¹⁵ In 1847 Deane again cited Marsh, this time without mentioning Hitchcock. He related two newly uncovered sandstone specimens to “the Salamandrian, or tailed family of Batrachian reptiles.” Silliman added an editorial observation: The new species “was discovered by Mr. Marsh, and is now deposited in his magnificent collection of sandstone fossils.”¹⁶ This was the earliest published reference to Marsh’s Greenfield “Cabinet” (see below). As for Hitchcock, he first mentioned Marsh in 1848 when he brought up-to-date his work on the trace impressions. He credited nineteen of his specimens to Marsh, and several of his illustrations were from slabs from Marsh’s collection, including three “very recently discovered by Mr. Marsh.”¹⁷ One species, *Herpystezoum Marshii*, “was discovered at Turner’s Falls, by Mr. Dexter Marsh, who, by indefatigable industry and tact, has obtained a very rich and

¹² Murchison, addressing the London Geological Society Feb. 17, 1843, cited by Silliman, “Ornithichnites of the Connecticut River sandstones and the *Dinornis* of New Zealand,” *AJS* 45, 1 (Oct. 1843): 188.

¹³ For a detailed account of the correspondence and exchanges among Deane, Hitchcock and Silliman about the trace impressions, see in Herbert 2012, the section “Hitchcock’s controversy with James Deane, 1842-1845.” There all the relevant documents are dated and footnoted. The controversy is more succinctly summarized in George P. Merrill, *The first one hundred years of American geology* (New York 1924), pp. 553-63.

¹⁴ Deane, “Description of fossil footprints in the new red sandstone of the Connecticut valley,” *AJS* 48, 1 (April 1845), pp. 165-66. Deane notes that he had submitted to Hitchcock some of the tracks he analyzed, and he makes repeated references to Hitchcock’s classifications.

¹⁵ Silliman, “Notice of the Medals of Creation, or First lessons in geology, and in the study of organic remains, by Gideon Algernon Mantell,” *AJS* 48, 1 (April 1845): 130-31.

¹⁶ Deane, “Notice of new fossil footprints,” *AJS* n.s. 3, 7 (May 1847): 77.

¹⁷ Hitchcock, *Fossil footmarks*, 1848, p. 240.

valuable collection of the footmarks and other fossils of the Connecticut valley. Hence I have attached his name to this animal.”¹⁸

What were these pieces of sandstone, and where had they come from? They had been deposited some 200 million years ago when sand and silt, flooding or drifting into primeval waters, formed shallow layers of sandy mud along shorelines. Dinosaurs, other animals, worms, insects and occasionally plants, left impressions in the soft material. With seasonal exposure, this mud partially hardened. Subsequent flows of the same kind of sandy mud covered this substratum and filled in its sunken prints to form casts of that layer’s tracks. The underlying stratum would still be soft enough so that the tracks of heavier animals would push through the current walking surface to leave a somewhat lighter impression underneath. Over millennia these strata, often several one atop another, were transformed into slaty sandstone and could be pried apart because the layers did not adhere strongly to one another. Subsequent to their deposit and hardening into rock, these beds were often upheaved and tilted by the movement of other rocks. This exposed them to the air like so many large books lying on their sides. By tracing these slanted strata back into the ground, quarriers could uncover great lengths of the slabs, more or less easily pried apart by iron bars. Tectonic forces often produced cracks or joints at right angles to the bedding, so by pursuing these, quarriers could produce rectangular slabs.



Fig. 2. Rock Ledges, Lily Pond, 1898

Quarrying was seasonal work. Alternate freezing and thawing was ruinous, so quarrying had to await spring thaws and then cease before heavy autumn frosts. Rain and rising rivers

¹⁸ Ibid, p. 246.

could flood a quarry, thwarting work. Quarriers would season the slabs they extracted by covering them with soil. As the slab dried, dissolved silica or calcite worked to the surface, producing a thin protective coating. Men used picks and shovels (Marsh often used gunpowder) to expose the beds, then wielded wedges, iron chisels, crowbars, and sledgehammers to cut out individual slabs of stone. Stonemasons were the most qualified workers, but much of the quarrying was done by boys and men who learned on the job. The slabs were often brittle, so it's no surprise that Hitchcock, Deane, Marsh and Field all refer to frequent breakage. When gunpowder blasting was employed to remove soil and unwanted rock, accidental losses resulted. Once isolated, slabs of the dimension of flagstones could be wrestled into wagons or placed on wooden sleds dragged by horses or oxen to wagons or boats.

Marsh's daybooks

Just when Marsh began quarrying sandstone is not known, but he was using slabs of it for flagstones in 1835 when he made the momentous discovery of fossil footprints. He was then twenty-nine. Fragmented but intriguing information about his life is found in eleven small daybooks dating from 1830 to 1852.¹⁹ Most of his entries list the costs of food, clothing, wood, building materials, and the like, and occasional sums of money he received for work. No mention is made of the 1835 discovery of footprints, and only occasionally does he give glimpses into his life—bare glimpses at that. He refers to his first wife Rebecca Slate, only once: “Was Married to Rebecca. Paid expences &c, 5.50,” (4.21.34) and to his second wife Eunice Moselle Everett once also: “Mrs. Marsh confined.” (5.24.49). Nowhere does he remark on the death of Rebecca on March 15, 1838, or his subsequent marriage to Eunice on November 25, 1839, or to the births of any of his five children.

Typical daybook entries are like these:

For 1844:

April 1: “History for Arabella .67”
 April 13: “bonnet for Arabella .40”
 April 15: “hat for Frank .15”
 April 22: “first plumb tree blown”
 May 11: “shoes for Frank & George 1.42”
 May 24: “boards for fence .46”
 May 31: “Saleratus 10; pants 4.50; 6 yards cloth for pants 5.10”
 June 22: “Paid to Carles [sic] Baker for 2 1/2 months work 38.00”
 June 29: “Went to Leverett, horse & buggy 1.29”

For 1849:

May 3: “singing book .31”
 May 18: “dresses for Arabella, cloths for Frank & George &c 4.79”
 May 21: “Mrs. Marsh confined”
 May 24: “went to Amherst, expense 2.25”
 June 11: “Sent letter to St. Petersburg .31” [see Appendix A-1]
 June 9, 16 and 23: Paid Joseph Severance for 2 month's work, 30.00; 1 week's work, 4.50; 5 1/2 day's work 4.13”

¹⁹ No daybooks survive from 1836 and 1837, and in 1848 Marsh made entries only on six days.

July 9: “geography & pencil .42”

July 14: “valease 250; snuff box .17”

Aug. 11: “tickets to see the model of ancient Jerusalem .40”

Until August 1834, Marsh boarded in Greenfield for \$1.50 a week. On April 19th, 1834, two days before his marriage, he bought a plot of land in central Greenfield and began building his house.²⁰ Periodic entries mark progress. On April 30th he paid \$3.58 for “512 feet hemlock joice [joists],” and \$.25 for “team to get seder [cedar] posts.” The next day he gave \$4.04 to P. Severance “for laying stone,” and from May to August, various sums for clapboards, shingles, boards, bricks, and stone. On a cold May 15th, “Raised House. The wether very cold, some snow, & the mortices frose up with ice.” The next month his largest outlay was \$34.30 for “5900 Brick & for laying chimneys.” He and Rebecca moved into the house (he called it a “cot-tage”) in mid-August, and accelerated its completion by getting help. “Aug. 27. Paid Wait for finish house, 62.77.” The clapboarded house had a stone foundation, two chimneys, and probably two floors. In 1835, for \$1.50 a week, the Marshes took in boarders, who succeeded one another every few weeks. (*Journal*, folders 2 and 3). We have to guess what the home’s interior looked like. The only hints of its furnishings that the daybooks offer concerns pictures hung on its walls. On September 24th, 1842, Marsh wrote: “Pictures of Palestine .25,” and on August 4th, 1843: “Pictures .29 eyes .30.” Later, his will listed a “Mounted map of New England” and a “Steel engraving boats scene.”

Abbreviated though they are, Marsh’s daybooks tell us that he was a jack-of-all-trades, being paid for felling and chopping wood, digging ditches, fetching and laying stone, carpentry, and every sort of village labor. In 1835 he charged \$1.00 to \$1.25 for a day’s work (he usually writes “work” without specifying its nature), or \$.10 an hour for odd jobs. In April 1834 he worked four days for “Root & Wilson & Co.” at the rate of \$16 per month. When he used his “team” (either oxen or horses) he then charged an addition \$.25 an hour. In 1838, he earned more pay, working frequently for “H. Levett” [Leavit] at \$1.50 a day. This wage was comparable to that of a blacksmith or well-experienced factory worker.²¹ Leavit was his principal employer from 1836 to 1838, and here at last he lets us see what his work consisted of: picking apples, carrying water, sawing and carrying wood, shoveling snow, etc. “Carrying water” appears often, sometimes on successive days, leaving us to speculate on Leavit’s needs for so much water: household? animals? irrigation? commerce? Except for payments to Leavit, he doesn’t say what “work” consisted of.

By 1846 Marsh could ask for \$1.50 per day and \$.12 per hour. He often gardened for others but he probably had a garden and a few domestic animals for his own use. Because of planting and harvesting, he usually marked the onset of spring and fall. On April 15, 1830, in Deerfield, he wrote “Wether very warm. people begining to plant,” and on September 17th., “First frost. Indian corn nearly out of the way. Broomcorn seed cut of [off].” In most years he noted the first blossoms on “plumb” and apple trees in late April, and the first hard frosts in autumn. He was custodian of the town hall and janitor of the Congregational church, which paid him \$.50 for tolling funeral bells and an unknown amount for serving at weddings. Hauling other people’s goods was probably significant because in 1832 he paid \$80 for a pair of oxen, an

²⁰ The Greenfield Registry of Deeds, Book 88, p. 61, shows that he paid William Wilson \$200 for the land on April 19th, and \$400 for additional property five days later. He further enlarged his land in 1838 and 1848 (Registry of Deeds, Book 101, p. 279, and Book 152, p. 28).

²¹ Jenkins, *Conservative rebel*, p. 83.

enormous sum at a time when a rake cost \$.20 and \$.06 was enough to cut out a cord of wood. Tolls over the river bridge in these years were \$.20 and up, according to the weight of the wagon's content. If the tolls were modest sums (20 cents = two hour's work), as were all the purchases he made, it's nonetheless difficult to see how he managed to acquire enough income for all of his expenditures, especially those for his house. Of course he was extremely frugal, and may have saved enough from more than a decade's earnings to pay for work on his house that he didn't perform himself. Payments and receipts were often forms of barter in Marsh's day, in which produce or labor often substituted for cash. This helps explain the very modest annual cash outlays that he summarized at the end of most years, averaging \$290 from 1841 to 1843, rising to \$455 in 1846, dipping down in 1849 and 1850, but again reaching nearly \$450 in 1851.

Payments for food and clothing are the most common in Marsh's accounts. A barrel of flour cost \$6.38 in 1834, and ten pounds of pork, \$1. In 1840 a gallon of molasses cost \$.58, half a bushel of apples \$.25, and a lemon \$.03. In that year he bought several "goslin" [goslings] for \$.54 and "chickins" for \$.28. Shoes for Annabelle were \$.50 in 1841 but \$.88 two years later; shoes for Frank and George totaled \$1.42 in 1844. His wife presumably sewed clothing with the thirty-one yards of calico bought for \$2.17 in 1844 and in the same year, "6 yards cloth for pants" for \$5.10. A shovel cost him \$1.33 in 1834, and a "large drill" \$2.66 in 1849. For 1851, we'd like to know how much sugar he bought for \$1, and how many turnips for \$.17. On the average of once a month he mailed letters, paying six cents for postage, but only twice did he name the addressees: Benjamin Silliman and the New York geologist James Hall, both in 1845.

Prying into his entries, always of Spartan brevity, we get some glimpses of his life. He bought two pounds of snuff for \$.38 in 1850, and "spittoons" for \$.40 (8.25.51), but he doesn't mention the purchase of tobacco. His most enigmatic entry (1.4.49) reads "Sold my rifle to Dr. Brown to carry to Central America 50.00," but we don't know what use he may have had for the rifle, and there are no clues to Dr. Brown or to his venture south of the border. Marsh was a regular church-goer, paying the substantial sum of \$40 for a pew in 1835 (2.9.35) and in the same year, \$1 for a "subscription for the support of preaching." He bought a Bible in 1833 for \$1.33, and ten years later "2 new testaments" for \$.16, and several Christian publications, varying from \$.20 for "Christians Cabinet (a small book)" in 1834 to \$2 "for Christian Workman" (1.13.35) the next year. Christian charity probably lay behind his sending butter to Constantinople on four occasions from 1849 to 1851; the last of these reads: "Sent butter to Constantinople 33 lb. cost 7.19." He also spent \$2.50 to send maple sugar there (4.30.50). Perhaps these shipments were destined to be sold by the Christian missionaries. Maybe he corresponded with missionaries like William Goodell, a minister of the First Evangelical Armenian Church of Constantinople who, upon revisiting Massachusetts after an absence of two decades, signed the register of Marsh's Greenfield Cabinet on September 18, 1851.²²

Although his life seems very circumscribed—even local and regional events are largely absent from his daybooks—Greenfield was a significant town, a crossroads of east-west and north-south commerce and travel. It was the third largest town in Franklin County, with 1,756 residents in the 1840 census; Colrain and Deerfield were only slightly larger. The comings and goings of boatmen and stagecoaches meant that the village wasn't isolated; news traveled quite swiftly. On December 17th, 1835, Marsh wrote "Great Fire at Newyork" on the day after this two-day conflagration began. He was abreast of the more pervasive cultural conflagration, the anti-slavery movement, and perhaps a participant, because in 1843 he paid \$2 for "Emancipation

²² Goodell's son-in-law later wrote that Americans sent goods to Constantinople to be sold on behalf of Christian churches: E. D. G. Prime, *Forty years in the Turkish Empire or memoirs of Rev. William Goodell* (New York 1876).

in advance” (6.2.43) and the same sum in 1844 for “Emancipation -- year ending next June” (9.21.44). He also owned one of George M. Stroud’s anti-slavery pamphlets.²³ His daughter Arabella, born in 1835, remembered that once in her girlhood her yard was full of black children.²⁴ Greenfield was a stop on the underground railway north to Canada,²⁵ and Marsh’s father Joshua was known as a leader of sympathizers of the anti-slavery movement in nearby Montague.

The citizens of Greenfield were also conversant with popular cultural occasions, in which Marsh had a modest role as janitor of the Congregational church and of the town hall. The church was host to numerous sermons from regional and nationally known clergymen. Secular events were frequently available in town and in neighboring cities. From the bills Marsh submitted to the village as custodian of the town hall, we know that events there included a “lecture on Arethmetick,” an “Abolition Lecture,” various “Indian Shows,” traveling circuses, and debates on magnetism, hypnotism, and phrenology. There were also concerts, cotillion parties and a dancing school.²⁶ For an event either in Greenfield or in a nearby town on August 11th, 1849, he paid \$.40 for “tickets to see the model of ancient Jerusalem.” Biblical Jerusalem in the form of three-dimensional models made the circuit of US cities and towns from the beginning of the century. (“Brunetti’s Model of Ancient Jerusalem” was exhibited at Boston’s Amory Hall in 1850.) On February 26th, 1851, Marsh wrote “see Panorama -- .45.” Panoramas of historic events and landscapes, huge paintings that required special housing, were moved by entrepreneurs from town to town, and were a popular feature in the middle nineteenth century. We can guess that these were family occasions, but Marsh’s reticence screens off such activities.

Marsh’s quarrying

Because our chief concern is Marsh’s quarrying, and occasional sales of sandstone impressions, it’s frustrating that his daybooks, with their often minute records of expenditures, reveal so little. Although we know he was laying sandstone paving on Greenfield streets in 1835, it was not until 1838 that he mentioned them. On September 19th that year, he received \$3 for “75 feet flaging stone for walk” which he had presumably fetched from a quarry, and \$1.50 for one day’s work installing them. He was often hired to work stone. In March 1844 he received \$1.25 for “one days work & use of tools splitting stone steps,” and in July and December that year, the same sum for “blasting rocks.” No entries before 1844 can be construed to refer directly to quarrying or to fossil impressions, nor is there any mention of the sums paid by James Deane for two sandstone footprints that we know he acquired from Marsh in 1835. The first daybook entry about the fossil tracks was made on September 14th, 1844: “Went to South Hadley after fossils.” Starting in 1845, there are occasional notes in the daybooks about stone foot tracks, but not about their costs because he quarried them himself and didn’t quantify his labor. He also fails to note the prices he asked for the many slabs he sold over the next seven years. Usually he had to pay landowners for the privilege of quarrying. In June 1845 and in July and August 1846 he dug for fossil fish in Sunderland, paying \$5 each time to the proprietor “Whitman.” Two years later

²³ Stroud (1795-1875) wrote several anti-slavery tracts, but the item in Marsh’s will, “Stroud’s sketch,” has not been identified.

²⁴ Arabella’s story was retold by Sophia Woodman, in a three-page typescript of June 17, 1953, addressed to the Historical Society of Greenfield, “A pre-Civil War anecdote.” For decades Arabella served as live-in housekeeper for the Woodmans, and frequently repeated the story of the black children.

²⁵ See Jill O’line. *The road to freedom: anti-slavery activity in Greenfield, Massachusetts* (Greenfield Historical Commission 2007).

²⁶ Jenkins, *Conservative rebel*, p. 112.

came his first documented work at Roswell Field's land in Gill. "Gill, July 18, 1848, Received of Dexter Marsh, twenty five dollars for the privilege of digging [sic] in the archasy [?] a specified distance understood between the parties. Roswell Field."²⁷

Marsh traveled up and down the Connecticut River Valley in search of minerals as well as fossil tracks and fossil fish. By 1844 he was regularly collecting minerals, which are frequently mentioned in his daybooks for the next eight years.²⁸ He bought and sold them but except for mining beryl in 1849 and 1852, he never names any of them. For these and his better-known excavations of sandstone tracks and fossil fish, he journeyed as far south as Wethersfield, Connecticut, and north to Royalton, Vermont, and Acworth, New Hampshire. He walked prodigious distances, thinking nothing of using shank's mare to go from Hartford to Wethersfield and back (7.7.47), from Greenfield to Brattleboro (7.16.49), or from Springfield to Northampton (9.23.50). With horse and wagon he travelled longer distances, while for quarries along the Connecticut, he used a flat-bottom boat he had made himself, sturdy enough to carry "drills, wedges, powder and provisions."²⁹ He could camp overnight under his boat, and in that fashion could stay away from home for two or three days.

Where were Marsh's quarries located? In an important article in 1848, Hitchcock mentioned several sites that were almost certainly Marsh's.³⁰ He used enough exactitude to permit modern investigators to pinpoint them—but only in an archeological fashion because the river's level, thanks to damming, is now well above that of Marsh's day, inundating many of the old quarries. Hitchcock located a number of his specimens in phrases like these: "Montague City, a few rods east of the canal, on the road to Boston"; "Horse Race, Gill; at the quarry, three miles above Turner's Falls"; "Turner's Falls, Gill, at the quarry, eighty rods above the cataract"; "Turner's Falls; below the Falls, on the Gill side." Several tracks, he wrote, "were very recently discovered by Mr. D. Marsh, a little below Turner's Falls, in Gill, where the highly inclined shales are laid bare."

None of these necessarily refers to Lily Pond, one of Marsh's principal quarries, and later Field's, but it's likely the principal source of some of Hitchcock's specimens. It was on land stretched along the river that Field had acquired in 1842.³¹

²⁷ Journal, folder 11 (miscellaneous receipts).

²⁸ Among such entries are these: Sept. 18, 1844: "case for minerals 1,75." June 21, 1845: "Recd. Box Minerals." Nov. 5, 1849: "freight on minerals ,50." July 24, 1852: "Went to Royalston for minerals."

²⁹ Thomson 1904, vol. 2, p. 97, and Marcy 1855, p. 269.

³⁰ Hitchcock, *Fossil footmarks*, 1848.

³¹ Information kindly supplied by Joel Fowler from Franklin County deeds, Book 119, page 209: Field, then living in Northfield, purchased David Henry's farm of 217 acres "in the nook of the Falls" on May 17, 1842.

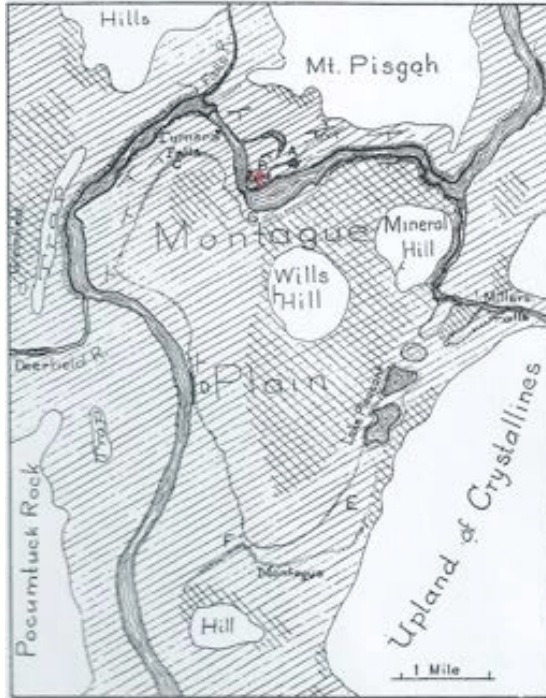


Fig. 3. Montague and Gill, 1898

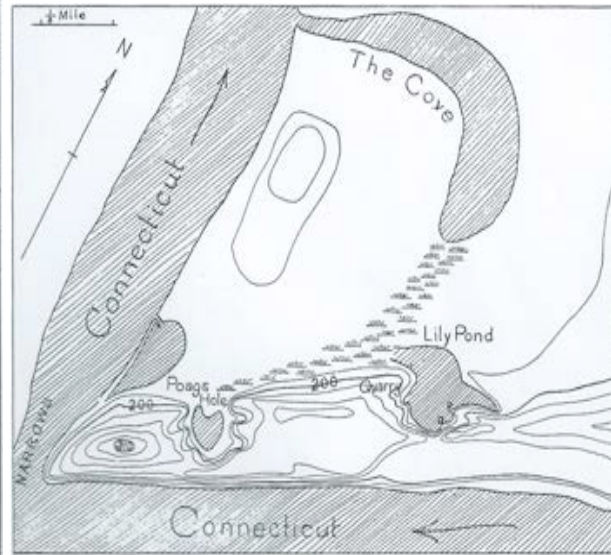


Fig. 4. Lily Pond site, 1898

Known for decades after Marsh's initial work there as the "Bird track quarry," it was on the northeastern bank of the Connecticut where the serpentine river dips elbow-like to the north around a rocky peninsula. It was best described in 1898 by the geologist Mark Jefferson.

The quarry is on the west shore of a little sheet of water known as the Lily Pond, which is steeply walled with rocks on three sides, opening on the north to a tract of marsh and a stagnant arm of the river called the Cove. . . . The Lily Pond is the pool of an abandoned waterfall made by the Connecticut some time since the last glacial epoch, and occupied long enough for it to cut back an eighth of a mile in the Triassic sandstone. When this path was abandoned the river was fifty feet above its present bed.³²

³² Jefferson 1898, the source of several illustrations in the present study.



Fig. 5. Lily Pond quarry, 1898



Fig. 6. Lily Pond, 2012, photograph by Steve Winter

Lily Pond was a “plunge pool,” formed ages ago when water plunging over a long fall routed out the stone below.

One can still look down upon the flooded quarry by scrambling over rocky paths along the peninsula, reached from Barton Cove in Gill, across the river from Turner’s Falls, and only a few hundred feet west of route 2 (locally the French King Highway). The name “Lily Pond” does not appear in Marsh’s daybooks nor in Hitchcock’s many references to the locations of his specimens until his *Ichnology* of 1858. There he wrote that several sandstone slabs came from Lily Pond, owned by Field; Hitchcock credits Field with the discovery of some of the slabs, but nowhere dates them. The key word in the receipt Field gave Marsh in July 1848 (“archasy” [?] see above) is unintelligible, but it might have been for work in the Lily Pond quarry, newly opened up that year.

Marsh’s wider world

Two years earlier, in October 1846, Marsh had spent four days in South Hadley “after bird tracks, expenses about 6.00.” As we saw, he was excavating fossil fish in Sunderland in 1845 and 1846, and probably in one of those years, he recorded that from June 16th to 20th (the year not given) he sent casts to Silliman, Hitchcock, James Hall, and “to Boston by Chapman.” On October 28, 1845, he wrote an intriguing entry: “marking bird tracks sent to London — .75.” He was probably referring to tracks sent to London by Hitchcock or Deane; “marking” them may mean packing and addressing them. At \$.75 it would have involved only a few hours’ work. In another note, “Sent box to Mr. Redfield, N.Y.” (10.12.49), we have a further token of his extended contacts with collectors. William C. Redfield (1789-1857), meteorologist and steamboat entrepreneur, was an avid collector of fossil fish and of Connecticut River Valley fossil footprints; he signed Marsh’s visitors’ book in 1847.

In January 1846, Marsh opened to the public his “Cabinet” of sandstone tracks, fossil fishes, minerals, and curios. Pride in his new achievement is the most likely explanation for an extraordinary gesture: he sent fossil footprints to the Emperor of Russia! On May 10, 1847, he wrote in his daybook: “Sent presents to St. Petersburg by Bark Paulina, Capt. Percival.” He got Charles U. Shepard, the scientist with whom he had done business, to write to Charles Cramer of the Imperial Mineralogical Society of St. Petersburg on his behalf.³³ “Mr. Marsh is a plain, self instructed man,” Shepard wrote, “by occupation a quarry-man, but at the same time of indefatigable perseverance and scientific curiosity; one who has advanced himself to a position among us very similar to that held by the distinguished Hugh Miller of England, author of ‘New Walks in Old Fields.’” The comparison with the Scotch geologist Miller (1802-1856) was very apt, for he had begun as a stonemason and quarrier. (The comparison was repeated subsequently by most commentators on Marsh.) This means that Shepard recognized that Marsh was far more than a mere quarrier of sandstone tracks. He also said that Marsh had formed his collection into “a public museum (which also contains other objects of Natural History) in his native town, for the public free of charge.” Marsh’s own letter to Cramer, dated May 5, 1847 (Appendix C-1), stresses analogies of the tracks with those of living birds.³⁴ He describes the slabs enclosed in three cases, one slab being “the largest and most perfect specimen of the gigantic imprints I ever beheld,” and another whose “superior face is traversed with several lines [of tracks] of various

³³ PVMA 1908, pp. 278-79.

³⁴ The history of the attempted gift to Russia was recounted by Marsh’s son George in PVMA 1908, pp. 278-81; he gives the text of the letter to Cramer.

birds, and the inferior face is also diversified with several lines in relief, or is an exact cast of the stratum beneath. To bring both surfaces into view, I have mounted the specimen so as to give it a revolving movement.”³⁵ His gift, however, got bogged down in Russian bureaucracy and had to be reclaimed. On November 10, 1849, Marsh wrote in his daybook: “Bird tracks arrived from St. Petersburg, expences 8.22.” This was the same month when he first sent butter to Constantinople, a supplementary indication of his reaching far beyond Greenfield. So, too, is his receipt for \$1.25 for “freight & expenses on a box from Smyrna” (*Journal*, folder 11), probably a box of minerals. Marsh, a steady contributor to his church, was probably in communication with Christian missions in Constantinople and Smyrna; certainly he knew about them.

Laborer though he was, Marsh accumulated a significant library. On December 2, 1841, he noted in his daybook: “geography .25.” He owned the Bible, of course, and subscribed to Christian literature, including “Christian Workman.” On March 9, 1842, he recorded his purchase of “History Deerfield .20.”³⁶ He expanded his library by acquiring books on geology in 1843 and 1844; on August 13, 1851, he bought Hitchcock’s *Religion of Geology*. His will in 1853 listed several scientific books, including three more of Hitchcock’s geological publications, seventeen volumes on the natural history of New York, and books on conchology, chemistry, and ornithology. He owned Lyell’s famous *Elements of geology*, George F. Richardson’s *Geology*, and several treatises on mineralogy, including those by James Dwight Dana and C. U. Shepard.³⁷ That he owned these books doesn’t necessarily mean that he read them all, but at a minimum they prove that he was familiar with the scientific literature.

By the mid-1840s, Marsh was enjoying the proofs of his growing reputation. Hitchcock, Deane, Redfield, and Shepard knew him well, and others were aware of his prowess in sandstone tracks and fossils. We don’t know how many other scientists were among his clients, but we can guess there were more than a few. The geologist Charles T. Jackson wrote him a flattering note on May 17, 1845: “I received your two specimens of bird tracks and a cast of the Giganteum, discovered by you.”³⁸ In 1845 he attended a geological meeting in New York,³⁹ and in 1846 he was elected a member of the American Association of Geologists and Naturalists. The next year Hitchcock wrote him that he had named a specimen after him, *Herpystozoum Marshii* (“Marsh’s creeping animal.”)⁴⁰ In 1847 also, word of his collection had reached Scotland. Had he known about it, Marsh would have been pleased. The *Glasgow Herald*, in its issue of October 18, reported on a letter dated August 9 received from Greenfield. The article quoted the unnamed correspondent who talked with Marsh and marveled over his Cabinet.

Hundreds of visitors, a few from abroad, came to Marsh’s house-museum each year from 1846 to early 1853. Hitchcock and some of his family came more than once. At last Hitchcock gave abundant thanks to Marsh in a major paper given to the American Academy of Arts and Sciences in 1847, published the next year.⁴¹ He credited Marsh with many of Amherst’s tracks, and several times wrote that his plates were derived from sketches of specimens in Marsh’s Cabinet. In referring to two specimens, he expanded his remarks: “The first specimen of

³⁵ This slab was sold as no. 96 in Marsh’s auction (Appendix C).

³⁶ This was David Willard’s *History of Greenfield* (Greenfield 1838); Greenfield was often still considered part of Deerfield.

³⁷ Greenfield’s probate records, Dexter Marsh will, no. 3026.

³⁸ George Marsh in PVMA 1908, p. 283.

³⁹ Sept. 8, 1845: “breakfast ,12; forenoon attended Geological Meeting.” It’s not known which meeting this was. The Association of American Geologists and Naturalists met in New Haven that year.

⁴⁰ George Marsh in PVMA 1908, pp. 282-83.

⁴¹ Hitchcock, Fossil footmarks, 1848.

this species [*Macropterna divaricans*], discovered by Mr. Marsh and now in his cabinet . . . , is a copy of the slab above referred to in Mr. Marsh's cabinet When, however, I discovered the small tracks connected with the large ones of *Macropterna recta* (*S. pabmatus*), I hastened to Greenfield to re-examine Mr. Marsh's specimen, in the hope of finding there also the fore foot. To my surprise and gratification, I found that he had obtained from a new locality, below Turner's Falls, most beautiful specimens of this species." In the case of another specimen, he gave gracious thanks: "The tracks of this species [*Xiphopeza triplex*], and also those of the *Macropterna divaricans* and *Harpedactylus gracilis*, were very recently discovered by Mr. D. Marsh, a little below Turner's Falls in Gill, where the highly inclined shales are laid bare. Mr. Marsh has generously allowed me to take sketches from his specimens, and to give the species scientific names; although he expects to give a popular description of them, in the American Journal of Science, before the publication of this paper."

Indeed, in 1848 Marsh's own words reached the scientific community. George Marsh, in his gathering of documents (PVMA 1908), reprinted two letters his father wrote to Benjamin Silliman (Appendices A-2 and A-3). The first of these, dated May 20, 1848, was published verbatim by Silliman six months later.⁴² Marsh's first publication, it allowed him to exhibit that he had learned a lot from his geological books, and to demonstrate his observational powers and his discoveries. The misspellings and odd phrasing in his daybooks might make us surprised at the literate quality of his letters, but notes to oneself allow an informality that disappears when one writes for others. Moreover, two men who knew him well testified to his intelligence. Langstroth (Appendix B-3) called him "one of the strongest thinkers and closest reasoners with whom I ever became conversant," and Marcy (Appendix B-2) praised "his forcibly stated arguments." In his published letter, Marsh told Silliman about a new quarry he had recently found on the Connecticut near the mouth of Fall River. His description of this discovery shows just how careful he was in analyzing the trace impressions.

I succeeded in obtaining two or three hundred footprints of various birds and quadrupeds, many of them entirely new. I only forward you a sketch of the footprints of one of the quadrupeds; you will see that this is a walking, and not a leaping, animal, the forefeet are very small in proportion to the hind ones, the toes are very slim and tapering, terminating in a point, with a sharp claw which is very distinct, the toes are wide spread and curve outward very much, which is not the case with any of those I have heretofore obtained; the fore foot shows the impression of a very long heel (or it may be part of the leg); though it is not as deep as the toes, it is the deepest at the part near them, and extends back an inch or inch and a half, showing no joint back of the connection of the toes with the heel.

He also mentioned the broad range of his quarrying, which included Turner's Falls, the south part of Montague, South Hadley, the eastern slope of Mt. Tom, and Wethersfield, Connecticut.

On September 6, 1848, Marsh wrote a second letter to Silliman (Appendix A-3), copied by his son but never published in the *American journal of science*. Here Marsh described the two largest slabs of tracks he ever found, in a new quarry he opened in Gill. (Subsequently they were

⁴² "Fossil footprints, by Dexter Marsh," AJS ns 6 (November 1848): 272-74. Silliman reproduced on one plate Marsh's drawings of four linear footprints. In Exeter, England, *Trewman's Exeter Flying Post* on Dec. 7, 1848, published a substantial paragraph drawn from Marsh's article; the same article appeared in the *Glasgow Herald*, Dec. 8, 1848.

purchased from the auction of his estate by the Boston Society of Natural History and by Hitchcock for the Amherst collection). Pursuing indications on the surface, he used gunpowder and the services of several quarrymen to blast away ten feet of rock.

I had to blast some ten feet deep to get to the point I wished; the upper layers were in many pieces, there being many joints and fractures. The slab directly above the track (showing them in relief) is about one inch thick, which I removed safely without breaking; the one containing the impression is three inches thick, ten feet long by six or seven feet broad, . . . containing more than sixty beautiful footprints of different birds, from three to four inches long to ten or twelve inches, and the whole surface covered with beautiful raindrops.

Although this second letter to Silliman was not published, the Yale editor saw fit to print another piece by Marsh, this one about black ants being revived from frozen blocks of wood.⁴³ Marsh contributed this after hearing about hibernation of animals at the meeting of the Association of American Geologists and Naturalists held in Boston in September 1848. Such articles conveying minor pieces of information frequently appeared in Silliman's journal, several of them by Hitchcock. Marsh must have been pleased that he was now accepted among the professional men who wrote for Silliman, many of them scientists whom he knew or with whom he corresponded: Hitchcock, Shepard, Dana, Redfield, Hall, Henry I. Bowditch, H. D. Rogers, C. T. Jackson, and J. W. Webster. He was also known to Francis Alger and Thomas Bouvé, collectors and prominent members of the Boston Society of Natural History.

With a modest but growing reputation, Marsh received in 1852 the unexpected accolades of election to membership in the Lyceum of Natural History of New York and of being made a corresponding member of the Academy of Natural Sciences in Philadelphia.⁴⁴ It was a reward for having supplied many institutions and collectors with the sought-after sandstone tracks and fossil fish. His letter of thanks to John Cassin (Appendix A-4), the Philadelphia Academy's correspondence secretary,⁴⁵ is known only because son George included it among the documents he communicated to the Pocumtuck Valley Memorial Association in 1908. Cassin's letter, dated November 23, 1852, reached Marsh in Acworth in southern New Hampshire where he was digging for beryl. The well-known site had already been quarried. Shepard and Hitchcock had visited it in 1829, and Marsh's Boston client Alger had removed a large piece of beryl there in 1837. The site near South Acworth was called "William's Ledge" or "Beryl Hill"; feldspar and quartz were also mined there.⁴⁶ Because many feet of hard quartz covered the beryl, the mine had been abandoned for several years before Marsh arrived there. He was not daunted by the quartz, and in his letter to Cassin, he gave witness of his joy in wielding gunpowder to blast through twenty-five feet of quartz. "The echo of our blasts was delightful; it would come back from the surrounding mountains as if they were blasting in every part, first in one direction and

⁴³ Marsh, "Tenacity of life in black ants," *AJS* n.s. 6 (Nov. 1848): 292.

⁴⁴ Marsh's membership card, kindly communicated by Megan Gibes, archivist of the Academy, reads: "Dexter Marsh, Greenfield Mass. 1852 Aug 31. C [corresponding member] Proposed: A.L. Elwyn, R. Bridges." It's not known how those two members knew about Marsh. Bridges left no trace; Elwyn (1804-1884), a philanthropist and classical scholar, was a physician who never practiced. Marsh's original letter has not been found in the Academy's archives.

⁴⁵ Cassin (1813-1869) was a leading ornithologist.

⁴⁶ John L. Merrill, *History of Acworth* (Acworth 1868), p. 119.

then in another and another, until it would seem to die away in a northwest direction, a long time after the discharge of our blast.”

Marsh was in Acworth from October 4th to the 26th, 1852. Some measure of his blasting the rocks is given by the amount of gunpowder he used. From his daybook we learn that he took three “keggs” of powder with him when he left home, bought four more on the 14th, and seven more on the 23rd. At about \$2.50 per keg, this was a considerable expense, augmented by other costs detailed in his daybook (folder 7): “cash paid for hammer and steel, 2.47; fixing tools 1.75”; “sharpen drills, 5.00”; for help hired to remove rocks for fourteen days, \$16.83, and for other help, \$4. His board was at the standard rate of \$1.50 a week. Huge loads of beryl and other minerals cost him \$6 for two teams to take them to Bellows Falls; from there they went by rail to Greenfield (costs not stated).⁴⁷ Taken altogether, these expenses and presumably others not named, amounted to a significant sum. Perhaps he anticipated selling some of the beryl, but he reserved a lot for his own cabinet. His worsening health made him worry about supporting his family, and it’s likely that he was quarrying the beryl so as to provide a valuable legacy. In the auction of his museum, five beryl crystals a foot or more in diameter, were individually appraised, along with several smaller ones (Appendix C).

For Marsh, nearly a month’s quarrying at Acworth was an unusually long absence from Greenfield, but he had been traveling regularly from 1845 onward. Often his father and mother visited Greenfield, and sometimes his brothers and his father-in-law; perhaps they helped care for the children, although this is not stated. He rarely mentions working for others after 1844, so it’s not known how he raised the funds for travel, let alone for his Cabinet. In addition to his expensive month in Acworth, he traveled from September 7 to 29, 1845, to New York City, New Jersey, and upstate New York where he visited his brother Orasmus. Expenses for this trip, including minerals he bought, totaled \$34. Other trips away from home involved twelve days in Boston in February 1845, returning with “shels, toys &c” for the children (he spent \$51 on this visit), and nine days in New Jersey in July 1850, where he paid \$6 for “help to dig [fossil] fishes.”⁴⁸ For unknown purposes, he spent six days in Pennsylvania in the fall of 1851.

For most of his travels, Marsh stayed within the state. He often went to Springfield, sometimes by rail, and seven times over the decade of the 1840s he went to Halifax in southern Vermont, the birthplace of his second wife Eunice. Even more often he went to Boston, usually for three to five days. At times he wrote about taking there some packages (“bird tracks” on July 5th, 1846) and fetching “freight.” On June 19, 1851, he returned home with a rocking chair. In Boston he also visited clients for his sandstone tracks, but only once did he name an individual: Francis Alger, an important figure in the Boston Society of Natural History (July 8, 1850). In 1848, as we saw, he attending the annual meeting of the Association of American Geologists and Naturalists in Boston, the historic meeting when the group changed its name to the American Association for the Advancement of Science.

Marsh’s museum, 1846-1853

The Cabinet that Marsh opened to the public on January 31, 1846, was a phenomenal success. 752 visitors wrote their names in his register before the end of the year. A like number came in 1847, and by the time of its closing in early 1853, a total of 3,034 signed the visitors’

⁴⁷ George Marsh wrote that his father brought home nearly three tons of crystals from Acworth: PVMA 1908, p. 271.

⁴⁸ Sites of Jurassic fish are still advertised in Pompton NJ.

books. Marsh's museum closely rivaled Hitchcock's Cabinet in Amherst, but because of its dispersal after Marsh's death, and because it had only fleeting published references, it largely disappeared from history. Like the fossil tracks Marsh collected, impressions of it have to be excavated from local memoirs and historical societies. Fortunately, the detailed inventory of the Cabinet's auction in September 1853 (Appendix C) gives us a good idea of what was on view. Although the chief interest (and highest prices) lay in the sandstone fossils, the collection displayed curios of all sorts, including Native American artifacts. It was a *Kunstkammer*, a descendent of the Renaissance Cabinet of Wonders that so many American and European gentlemen assembled. In his modest way, Marsh was inviting comparison to them, and making himself into one of the most cultivated residents of Greenfield.

Marsh was familiar with Hitchcock's college museum, having supplied many of its exhibits, but we don't know if there was a specific event that inspired him to open his own Cabinet. Work began sometime in 1845, and perhaps "paid for work" in several daybook entries means that men were engaged on the extension to Marsh's house that would display his collections. The only daybook entries documenting the work that year were several for glass and nails in December 1845. On January 9th, 1846, just three weeks before the Cabinet's opening, Marsh wrote "Pd to Platt for work on Cabinet, 36.00." Later that year, in November, he made the only other entry about the work: "to Wait for mak. doors Cabinet, 88." No photograph or engraving of the house has been discovered, but two years after Marsh's death, Oliver Marcy described it charmingly.

Previous to the year 1853 the traveler on leaving the cars at the depot, in the pleasant village of Greenfield, Mass., and ascending the hill toward the main street, would observe, on the right side of the way, a cottage, simple, rustic and unique, hidden among the trees. The piazza is covered with vines, and the dooryard is densely filled with shrubs and flowers, while leaning against the side of the cottage, and in every noticeable position, are slabs of stone, with curious configurations upon their surfaces, and specimens of abnormal vegetable growth and Indian antiquities. . . . Let the traveler pass into the yard, and enter the door from beneath the piazza, into a sort of hall, on the north of the cottage, and he is in the best cabinet of fossil footprints in the world.⁴⁹

The historian Francis M. Thompson, using local memoirs and records, added more details: "An addition to the original house had been built, extending almost to the sidewalk, and about its door and leaning against the building were large and small slabs of the new red sandstone of the Connecticut valley. Inside, the room was filled with a motley collection of curiosities of various kinds, in great part received by the owner in exchange for specimens of his 'bird tracks.'⁵⁰ Marsh also purchased curios from Stephen Emmons of Boston: In 1847, a whales' tooth, "fossil coral, conch shell, and one spondylus" (a bivalve mollusc), and in 1850, "2 large snake skins \$5; 1 each flying fish, coral, left-handed snail, 1 nautilus shell, etc.," two "albatros," one "Hippocrampus," and one "Nav [?] instrument."⁵¹ In a letter that a visitor to Marsh's Cabinet sent to the *Glasgow Herald* (see above) we read "he has many beautiful specimens of fossil fish, very perfect indeed, the head and tail, and even the fins and scales, appearing perfectly natural. Among the other curiosities in Mr. Marsh's cabinet, is an ancient piece of American coin, called the 'Pine-tree Sixpence,' being the first money coined in this country. It is about the size

⁴⁹ Marcy 1855, p. 266.

⁵⁰ Thompson 1904, vol. 2, p. 970.

⁵¹ Dated receipts are in Marsh's daybooks, folder 11).

of a common sixpenny-piece. On the one side is stamped ‘Massachusetts,’ in a circle, with a picture of a pine-tree in the centre. On the other side is stamped ‘New England,’ in the same manner, with the date at the bottom, ‘1652.’”

Most of the visitors to Marsh’s Cabinet listed their home towns; couples were common, but husbands often signed for several family members. Many were from Greenfield, Deerfield, Montague, Amherst, and large numbers from elsewhere in Massachusetts. Prominent local and regional figures came: James Deane and Lorenzo L. Langstroth of Greenfield (and other Langstroths from New Orleans); Samuel P. Avery of Halifax, Vermont; Lucius M. Boltwood of Amherst; Nathaniel Wilder of Wendell, and Austin Dickinson of Amherst (Emily’s brother). Fewer, but nonetheless a goodly number, came from Vermont and New York. Occasionally people named home towns further afield, among them Milwaukee, Baltimore, and Philadelphia. A few arrived from abroad: A. Herniser [?] from Warsaw, Poland, on September 7, 1847; Casimir Otto Licht, Germany, on January 26, 1848; George Henry Derwort, Germany, on August 17, 1848; Edwin E. and Isabella H. P. Bliss, Trebison, Turkey, on August 2, 1849, and William Goodell, Constantinople, on September 18, 1851. Bliss, Amherst class of 1837, and Goodell were both missionaries. For some visitors the curios on exhibit may have had special appeal, but it’s fair to assume that most came to look upon the famous sandstone impressions. These included Edward Hitchcock, Amherst College’s president; F. G. Tuckerman the poet, Oliver Wendell Holmes, Roswell Field, and the collectors and scientists Alger, Bouvé, Dana, Shepard, Redfield, the Rogers brothers, Silliman, and Bowditch.

James F. W. Johnston, the Scottish chemist and agronomist, signed Marsh’s register on March 27, 1850. His account of his visit is more detailed than any other (Appendix B-1). Accompanied by H. D. Rogers, he began by visiting Hitchcock in Amherst, where he looked at the sandstone slabs and the minerals in the college museum. Then in Greenfield’s “straggling, and unfinished” country town, he marveled at Marsh’s perseverance and acumen, regretting that the quarrier was not properly rewarded by science. He and Rogers went with Marsh to visit the prime sandstone sites in Turner’s Falls, which Johnston describes with a geologist’s perceptiveness.

. . . the break caused by the eruption of the trap has exposed the edges of the lower beds of the red-sandstone formation below Turner’s Falls. Many of these beds are dark-coloured; bear the impressions of plants; and more resemble some of the thin shale beds of our coal measures, as they would be altered by the near contact of trap, than any of the beds which the upper new red sandstone exhibits in England. . . . It is among these beds, inclined at an angle sometimes as high as 80°, that the bird-tracks and the footprints of small reptiles occur; and in this and a few other places along the river, where the same beds have been observed, Mr. Marsh has obtained his most valuable specimens. Among the fragments thrown aside along the foot of the bank, we found many fragments of footprints of all sizes, and, in the living rock, saw others remaining still untouched.

This is the best contemporaneous description of Lily Pond, the quarry upstream from the falls. Perhaps Hitchcock accompanied them that day but, in any event, Johnston recalled the Amherst professor's belief that upsurged basalt pushed the sandstone layers up to their steep angle.⁵²

Despite Marsh's known pride in his collection, his son George wrote that in 1851 his father, fearing his poor health would forbid further work, inquired of H. D. Rogers and Dana about the sale of his collection.⁵³ "My health is still poor," he wrote Rogers, "and if I am not able to labor I must sell it. I do not suppose it will bring the money it would if owned by some learned society or by some rich man. I hardly know what to say. It has been estimated at all prices, from four thousand to ten thousand dollars; but I will sell it in this country for a sum not exceeding five thousand, nor less than three." He was willing to sell it to Greenfield with a deduction of \$500 if the town would provide a suitable building. This came to nought, so in September 1853, five months after Marsh's death on April 2nd, the Cabinet's contents were put into auction.

Shortly after Marsh's passing, at a meeting of the Boston Society of Natural History, "a motion was made by Mr. Bouvé and adopted, that a committee be appointed to take measures, if deemed expedient by them, for the purchase of the collection of Ornithichnites, so called, belonging to the estate of the late Mr. Marsh, of Greenfield. The committee, consisting of Mr. James M. Barnard, Mr. Francis Alger, Dr. Brewer and Mr. Bouvé, to be present at the sale. Bouvé reconnoitered the collection; he signed the visitors' register on May 25th. A last chance to see the Greenfield collection was taken by others that May, among them Massachusetts senator John W. Loude and his wife. The Boston committee attended the sale "and bought a large part of the whole for about \$1400. Thus the Society became the possessor of several of the large and valuable slabs covered with footprints, which now adorn the entrance hall of the Museum, and of many other specimens contained in the Cabinet. One of these, Prof. Hitchcock of Amherst College pronounced he best and largest slab of footprints ever found, or that in his opinion ever would be found."⁵⁴

Marsh's contacts with scientists, collectors, and institutions guaranteed an eager attendance, as did the large number of visitors to the Cabinet since 1846. The auction circular listed many curios, but it gave first place to the famous fossil footprints, "appraised by President Hitchcock, and Dr. Deane."⁵⁵ There were over two hundred numbered items. Twelve of these are described in the circular which regularly gives estimated prices. "Ornithichnites.—No. 92. A Slab, 10x6 feet, literally covered with Footprints of Birds, at least 70 distinct impressions, arranged in determinate lines or transits. In two of these transits the Footstep is 10 inches in length, and the stride 3 feet and 8 inches. The surface is very bright and smooth, and the impressions are without blemish, showing in the most distinct manner the phalangeal, tarsal, and ungual depressions of the foot. Appraised at \$350." No. 93 is listed as "the counterpart or cast of the foregoing, very fine. Appraised at \$150." Other slabs ranged in price from \$75 downward to \$1. A surprisingly low estimate of \$25 was given for "No. 97. Two Colossal Footprints,, each 16 inches in length; stride 3 feet 67 inches." This was *Ornithichnites giganteus*, featured by both Hitchcock and Deane in their publications.

⁵² Hitchcock realized that the footprints had to have been made on a level surface. Despite their achievements as geologists, the Rogers brothers clung to the idea that the prints could have been made on a slant and then preserved in stone.

⁵³ PVMA 1908, pp. 271-72.

⁵⁴ Thomas T. Bouvé, *Historical sketch of the Boston Society of Natural History, with a notice of the Linnaean Society, which preceded it* (Boston 1880), p. 59.

⁵⁵ Detailed in a circular of July 1853 by Marsh's executor, Lewis Merriam. It is reprinted verbatim in the *AJS* n.s. 16 (April 1853): 298-301. PVMA also has an original poster.

Following the footprints of birds came the group of “Quadrupedal Footprints.” These indicated “animals of diminutive size, probably of the Batrachian order of Reptiles, or the Tailed or Salamandrian species. The slabs containing these footprints are small, and are appraised from \$10 downward.” Next in order were 200 specimens of “Ichthyolites, or Fossil Fishes . . . derived from the localities of Sunderland, Mass., Middletown, Conn., and Pompton, N. J.,” available for \$25 down to \$1. Following these were 100 Beryl crystals from Acworth, appraised by Hitchcock and Shepard. Eleven of them were separately listed by Merriam. The highest appraisal, \$20, was for a piece “11 in. diam., 38 in circum., 12 in length.” Others varied from \$15 to \$3. Added to these were “other choice minerals,” including lead, silver, and tin ores, “Spectacular Iron Ore,” fossil woods, malachite, tremolite, geodes, etc., and quartz crystals “some containing water and other objects.”

The next-to-last category in the auction circular reveals Marsh’s veritable cornucopia of curios: “1118 Pieces Copper Coins, including duplicates,” as well as “85 very rare Coins and Medals.” “Miscellaneous Objects -- Illustrating Aboriginal Arts. 225 specimens Indian Relics found in the Valley of Connecticut River.” “Eleven pieces Pottery and Discoidal Stones from the Mounds of Mississippi, very interesting.” “Stuffed Birds, Alligator, Boa Skins, Roman Lamp, Ancient Mosaic, English Minerals and Fossils, Limestone and Chalk Fossils, Coal Fossils, Mastodon remains, Fossil Corals” These objects reveal the breadth of Marsh’s curiosities, but we only have their names because no comments by him have survived. It’s intriguing that he sought out artifacts from the native American mounds of the Mississippi valley, evidently an extension of his collecting large numbers of “Indian Relics” along the river where he was excavating sandstone fossils. We’d love to know what he thought of these remnants of a culture that once lived nearby and how, in turn, they related to the prehistoric animals who made the sandstone tracks. The last items in the auction were shells and corals (not described), and “Valuable Books,” including “Hitchcock’s Geology of Massachusetts.”

Five days after the auction, a Greenfield weekly reported the sale, whose prices “about \$3000” exceeded the appraisal’s estimate by \$500.⁵⁶ The highest price, \$375, was paid for the large slab No. 92 (described above) by Alger for the Boston Society of Natural History. Its relief counterpart (the successor stratum which filled in the original’s depressions) was bought for \$160 by Hitchcock for the Amherst collection. Competition was keen, because Alger had to bid \$25 more than the estimate for No. 92, and Hitchcock \$10 above the estimated price for No. 93. Other successful bids had to rise above the estimates. Alger paid \$100 for “a single impression of an enormous foot” appraised at \$25. Among the purchasers named by the newspaper were Deane, “Bouvé of Boston, Gebhardt of Albany, William C. Redfield of New York, Cobb of Portland, and Chase of Natchez.” Also listed as principal competitors were the Boston Society of Natural History, “and those of Portland, Albany, and New York.”

Edward Hitchcock gave a disarmingly frank account of his role in the auction.⁵⁷ It represented “the largest collection in the world. . . . if we take into account the quality of his [Marsh’s] specimens.” Hitchcock knew prices would be high “for I was one of the appraisers [with Deane] and we marked them high.” He went to the auction with promise of \$2000 from “benevolent gentlemen”; he assured them that in exchange he would give his own collection to the college. At the auction he bargained with “several naturalists” from Boston to share the purchases (theirs for the Boston Society of Natural History). That is, he connived with them to keep

⁵⁶ *Greenfield Gazette and Courier*, Sept. 26, 1853, “Sale of Dexter Marsh’s Museum.” (Photocopy in the PVMA Library, file for Dexter Marsh).

⁵⁷ Hitchcock, *Reminiscences of Amherst College* (Northampton 1863), pp. 81-85.

the prices low. "My bill went as high as \$700, and theirs higher." His three receipts from the auction show \$45 for a number of footprints, two Beryl, one box of fishes; \$570.40 for dozens of footprints, raindrops, fishes, some coral, some shells; and \$5.50 for one "Birds in Case."⁵⁸

Hitchcock's own reputation was a liability. "I found that whenever I expressed any particular interest in a specimen, the presumption was that it was rare, and the price went up accordingly. I was obliged, therefore, to exercise a good deal of prudence, and show much *sang froid*, or I could not, with my small means, make much headway. I worked as quietly as possible . . . looking constantly to God for help. I felt that such a collection would illustrate a curious chapter of his Providence towards our globe, and that the larger the collection, the more full the illustration. . . ." This reflection prompted Hitchcock to make a charming avowal. The minister and professor who was willing to have God's oversight was reluctant to expose himself to his neighbors. "Whenever I could, I have myself gone to the quarries and dug out the specimens. When not too large, also, I have transported them on my own business wagon. Again and again, have I entered Amherst . . . preferring not to arrive till evening, because, especially of late, such manual labor is regarded by many as not comporting with the dignity of a professor. I have not, however, in general, paid much attention to such a feeling, except to be pained by seeing it increase, because its prevalence would change the character of the College, by driving away those who are obliged to do their own work." Nowhere is there better evidence of the gap between Hitchcock, the middleclass professor so protective of his dignity, and Marsh, the village laborer and rural savant.

Marsh's heritage

Seven months after his death, Marsh's estate was inventoried for probate by Deane, Franklin Ripley, and William Elliott.⁵⁹ Five minor children were named, one only seven months old: Emogene, born January 16th, 1853. Annabelle, eighteen, and Frank Slate, sixteen, were Rebecca's children; George Everett, thirteen, Ella May, four, and Emogene Dexter were Eunice's. On January 1st, 1853, Marsh wrote in his daybook that his savings and notes due him amounted to \$2600. When inventoried in July, his personal estate was \$4198.83, including ten shares of "Connecticut R.R. Road stock" worth \$600; his real estate was valued at \$4400. It's not known how the value of his museum was counted in those figures, but the proceeds of the auction in September, approximately \$3000, when added to cash on hand and the eventual sale of his home, left Eunice and the children quite well off by the standards of that time. Lewis Merriam, to whom Eunice signed over the role of the estate's "administrator," granted her \$500. The rest of the estate was held for the children, from whose fund \$32 was to be paid to Eunice each year.

Because of the paucity of information from Marsh himself, we can hardly guess at the life of this extraordinary quarrier. We don't know how he related to his two wives and his five children. The eldest was eighteen, the youngest three months old when he died. We wonder how Eunice Marsh managed the household during her husband's absences, frequently for two or three days but sometimes for several weeks. Tantalizing hints of activities at home are found in the objects that son George gave to the PVMA in 1908. One is a "child's green silk dress," perhaps made by Eunice, and another is an "old-time willow work basket" which was probably hers. Marsh was good with tools, and even repaired his household's shoes, to judge from the "Shoe maker's bench & tools" that was listed in his will. George Marsh gave a particularly charming object to the Memorial Art Museum, an unusual baby cradle with its rockers running lengthwise.

⁵⁸ Edward and Orra White Hitchcock papers, Amherst College Archives and Special Collections, box 2, folder 21.

⁵⁹ Greenfield's probate records, Dexter Marsh will, no. 3026.

Also there is a sturdy trunk Marsh made and initialed DM in brass nails and, most curiously, “a pair of nondescripts resembling coat-hangers.”⁶⁰ Five volumes of Patent Office reports were among books listed in Marsh’s will, so perhaps he contemplated the patenting of one or more of the devices he made. Among the son’s other donations were objects that are poignant remnants of his father’s once famous Cabinet: “1 fossil footprint, 3 fish impressions, 2 sections Pearly Nautilus, 19 shells,” a few minerals, and a “large univalve shell.”

Although Marsh’s will offers only the faintest traces of family life, it lists a surprising range of books. His library included eight volumes of Shakespeare’s work, works by Byron and Bunyan, “Clark’s Caesar,” eight volumes on the Reformation, a history of England, an encyclopedia, a dictionary, and several books on travel in the American west, the arctic, the Pacific, and the Near East. He needn’t have read all of these, but possessing them put him on a par with many better-educated contemporaries. Several books on geology and mineralogy, mentioned earlier, were the underpinnings of his professional attainment. Shepard’s comparison of him with Hugh Miller, who also began life as a stonemason, was very apt. He didn’t rise to the Scotsman’s scientific level, but he developed acute powers of observation and deduction. His two articles published in Silliman’s journal and his letters to Cramer and Cassin (Appendix A) have the content and style of the professional men whose company he sought, and who admired him. Miller’s Scotch compatriot Johnston, and two erudite men who knew him at close hand, Langstroth and Marcy (Appendix B), were struck by Marsh’s “native force as a rare observer and an able reasoner on the results of his own observations and those of others” (Langstroth). Recognition came late in the brief life of this gifted provincial, when several learned societies made him a member, as we have seen. He attended their meetings, and in one instance, according to Marcy, he corrected an error in a paper Hitchcock gave at the Boston Society of Natural History.⁶¹

Overshadowed by Hitchcock, and also by Deane, Marsh has virtually disappeared from the historical record. True, two years after his death a regional historian lamented the loss of Marsh’s Cabinet and the man himself. “The loss of this man to science was very great, since he combined in himself the rare qualities of a persevering and untiring laborer in whatever he undertook, a very respectable acquaintance with science for a man of his circumstances, and the skill to remove from the quarry, and prepare for examination, large slabs of rock containing tracks and fishes, which are the most difficult specimens to collect for a cabinet.”⁶² However, after this publication Marsh fell down into the historical oubliette in nearly all publications dealing with fossil tracks. Fortunately Greenfield remembers him. On April 19, 1997, the Historical Society of Greenfield held a celebratory day which included a homage to Marsh, when “a life-size Marsh mannequin, constructed by Rebecca Tippens, presided over the museum dinosaur display and T-shirts bearing his face were on sale.”⁶³ Then on April 2, 2008, there was a graveside ceremony with comments honoring him. Beyond his hometown, nevertheless, Marsh has remained unknown. The dispersal of his Cabinet, which rivaled Hitchcock’s, and the modest two articles he published, meant that he left only a faint imprint despite his contributions to paleontology. The objects inventoried in the auction of his Cabinet are like so many trace impressions of the life of a singular man eclipsed beneath the opaque strata of history.

⁶⁰ Georges Sheldon, notes in PVMA 1908, pp. 230-31; some of these objects are found in the unindexed *Catalogue of the collection of relics in Memorial Hall*, published in 1908. No books presently in the library of the PVMA have notes attributable to Dexter Marsh: information kindly supplied by David Bosse, the librarian,

⁶¹ Marcy 1855, p. 268.

⁶² Josiah Gilbert Holland. *History of Western Massachusetts* (Springfield, 2 vols., 1855), vol. 1, p. 350.

⁶³ *Greenfield Recorder*, April 22, 1997, “A classic Classic Day.”

Dexter Marsh was a curious man—“curious” in two meanings of the word. To us he is a curious resident of mid-nineteenth century Greenfield, a man we cannot know very closely but whose activities mark him out as an individual of rare appeal. And he was himself curious by nature, intrigued not only by the fossil traces that scientists and collectors sought out, but by minerals, native American artifacts, and tangible remains of animal and human history: the skin of a boa, a Roman lamp, an ancient mosaic. Above all it was his curiosity that led him to wonder about the makers of the footprints he saw on a stone slab he quarried for a pavement in 1835. He was not a scientist but he was endowed with two of a scientist’s attributes, a power of precise observation, and a constant urge to uncover yet another previously unknown object.

Bibliography

Herbert, Robert L., ed. and intro., *The complete correspondence of Edward Hitchcock and Benjamin Silliman, 1817-1863*. Amherst College, online publication, 2012.

Hitchcock, Edward. *The fossil footmarks of the United States and the animals that made them*. Memoirs of the American Academy of Arts and Sciences, 1848, n.s., v. 3, pp. 129-256, reprinted as book bearing same page nos.

_____. *Ichnology of New England. A report on the sandstone of the Connecticut Valley, especially its fossil footmarks, made to the government of the Commonwealth of Massachusetts*. Boston 1858.

Jefferson, Mark S. W. (1863-1949), "The postglacial Connecticut at Turners Falls, Mass.," *Journal of Geology* 6, 5 (July-Aug. 1898): 463-72.

Jenkins, Paul. *The conservative rebel, a social history of Greenfield, Massachusetts*. Greenfield 1982.

Johnston, James F. W. *Notes on North America, agricultural, economical and social*. Edinburgh and London, 2 vols., 1851.

Langstroth 1894. Lorenzo. L. Langstroth, "Personal recollections of Dexter Marsh by L. L. Langstroth, December 1894," in PVMA 1908, pp. 258-64.

Marcy 1855. Oliver Marcy, "A geologist among the people—Dexter Marsh, by Prof. Oliver Marcy [from the 'National Magazine,' 1855," in PVMA 1908, pp. 265-72.

PVMA 1908. *Proceedings of the Pocumtuck Valley Memorial Association*, 5 (1912), for the 1908 annual meeting. Contains editorial notes by George Sheldon, and several texts edited by Dexter Marsh's son George E. Marsh, including Langstroth 1894, and Marcy 1855. George Marsh himself introduced several sentences, not clearly separated from the texts by others whom he quotes. "PVMA 1908," followed by a page number, indicates those sentences.

Thompson, Francis M. *History of Greenfield, 1682-1900, Shire town of Franklin County Massachusetts*, vol. II, Greenfield 1904.

Appendix A. Letters written by Marsh.

A-1. Marsh's letter to Charles Cramer of the Imperial Mineralogical Society of St. Petersburg. Greenfield MA, May 5, 1847. From PVMA 1908, pp. 265-73.

“Dear Sir:—Accompanying this is a letter of introduction from my friend, Prof. C. U. Shepard, who has politely put me in correspondence with you. My object, as you will perceive, is to solicit you to become the medium of communication with the Emperor of Russia, who, I understand and believe is the ardent patron of science. I herewith send by one of Messrs. Ropes' ships from Boston, three cases containing slabs of New Red Sandstone from the valley of the Connecticut river, upon which are impressed beautiful footprints of various birds. These remarkable fossils have been the object of my particular attention for several years, and by laborious explorations among the rocks in place, I have collected many interesting examples of these beautiful mementos. Their perfection, the extraordinary magnitude of some of the animals indicated by them, and above all, their important bearing upon geological science, induces me to believe that they may not prove an unacceptable offering to your sovereign, to whom, through you I respectfully dedicate them.

The truths revealed by these inscriptions of nature, teach us, that animals whose organization was perfect, that is, air-breathing, warm-blooded animals, existed in a period of our earth's history which was, geologically speaking, immensely remote. They carry backward the period by an immense stride, through many successive formations of the earth's rock crust, throughout which it has been hitherto supposed that no living creature higher in the scale of organization than the reptile, existed. But these relics prove that birds, beyond the lapse of countless eras walked over the earth, and silently inscribed their history upon it, and the imperishable record has not until our own time been unsealed.

The discovery was made by me in the village where I live, twelve years ago, and its announcement was received with singular interest, both in this country and in Europe, and with singular caution too, as it removed the limits assigned to fossil birds to a point so vastly remote. But objection finally gave way to the force of truth and it is now admitted by all whose opportunities render them competent to judge, that the impressions are authentic vestiges of birds who flourished during the era of sandstone deposition. They existed in vast numbers and were included in many families and species. It is impossible to settle the specific differences of the footprints exactly, but they are extremely diversified. In point of dimensions they range through a scale of magnitude from one inch to seventeen inches in length, with a corresponding stride of four inches to forty-eight inches; some of the birds were therefore diminutive and others were of stupendous size.

You will perceive that by severe analogy, these fossil footprints are identical with those of living birds; the feet are planted and succeed each other in the same manner, the short toe innermost

and the long one outermost and the toes bear the same number of respective joints and are terminated with similar nails.

The examples which I transmit are tridactylous, but others occur with additional toes. In all things in fact, analogy is complete, and no phenomenon has yet occurred to disturb the surprising harmony between the extinct and existing varieties; the footprints invariably occur upon the superior surface of the stratum, while the cast or relief impression as invariably is upon its lower face. The explanation of the phenomena of these footprints involves no difficulty. The ancient birds frequented such places as were alternately dry and submerged, and in the intervals left their impressions to be closed up by the succeeding overflow. Rain also fell abundantly, suggesting the agent that caused the variations of level in the waters.

One of the cases contains a beautiful and rare example of the footprints of colossal birds, impressed doubtless by the monarch of his race. It is the largest and most perfect specimen of the gigantic imprints I ever beheld. The example contains two consecutive imprints.

Another case contains a large slab which indicates facts of the highest interest; its superior face is traversed with several lines of various birds, and the inferior face is also diversified with several lines in relief, or is an exact cast of the stratum beneath. To bring both surfaces into view, I have mounted the specimen so as to give it a revolving movement. [Description of the other slabs and specimens follow, nine in all.]

I trust these remarkable relics, remarkable for their origin and remarkable for their excellence, will be useful in conveying to the votaries of science, some adequate idea of the inhabitants of our earth who ruled it long, long ere it came under the dominion of man. The subject is one of intense interest to the paleontologist, and as these members only exist upon a very limited region, I believe they will be acceptable, where access to them is impracticable. They cannot fail to promote accurate views of this most interesting subject and it affords me sincere pleasure to be the humble instrument of diffusing these eloquent remains.”

A-2. Letter of May 20, 1848, to Benjamin Silliman, From PVMA 1908, pp. 273-76. Published by Silliman as “Fossil footprints, by Dexter Marsh” in the *American journal of science*, n.s. 6 (November 1848): 272-74.

“I have for a long time thought of sending you some account of my explorations in the rocks of this valley, and my success in obtaining fossils, but have hesitated from reasons unnecessary for me to state, knowing as you do, that I am an unlearned, laboring man.

You will recollect that the first specimen of fossil footprints of birds ever brought into public notice in this country, was the slab I discovered among the flagging stone, while laying the sidewalk near my house, which Dr. Deane first described to President Hitchcock as the footprints of birds. Since that time I have felt an increasing interest in the subject and have spent much time each year in searching for these interesting fossils, and you will be able to judge of my success when I tell you that I have in my collection more than 800 footprints of birds and quadrupeds, besides having furnished specimens to many individuals and institutions in this and other countries. I have some very perfect tracks of a quadruped so small that a five cent piece will more than cover the entire impression of the foot, and the tracks of a bird that measures more than half a yard from the heel to the point of the longest toe, with the foot very thick and heavy in proportion to the length.

The most perfect specimens I have been able to obtain are from Turners Falls or its immediate neighborhood; they not only show the joints of the toes, but in some specimens per-

fectly exhibit the impression of the skin. I have obtained also valuable specimens at other places; for instance, a very interesting slab at South Hadley found in the highway leading to Amherst, a mile and half north of the seminary. It is in a coarse gray sandstone, cut and used for building purposes; the quarry was opened for that purpose and a few tracks discovered before my attention was called to it; the beds containing the tracks lie some three feet deep and are nearly horizontal. I quarried a small section and turned up a slab seven or eight feet in length by one and a half in breadth, having on its under surface 15 or 20 beautiful footprints of a number of different birds in relief. I then thought by taking up a large section, I should obtain all the tracks I desired; but to my disappointment, after several days' labor in getting down to the same layer, not the slightest appearance of a footprint was to be seen. I then examined the location more particularly, and to my mind it was easily explained; the material of which this rock is composed, was deposited by running water, which accounts for its being so coarse, all the finer particles being carried away; but after the water had subsided, there seemed to be a depression, or small basin, but a few feet in diameter, where the water was left to evaporate, depositing a thin layer of fine light colored clay, over which the birds walked.

The impressions in this layer were very beautiful, but they could not be preserved, as the matter did not harden into rock but was easily removed with the shovel. This is precisely like what we often see by the roadside after a heavy rain, where the water is left in small ponds to settle and evaporate, leaving a fine deposit, on which we often find the footprints of birds. I have obtained at the south part of Montague some hundreds of footprints of birds, and some species that I have not seen at any other location, but have met with no quadrupeds. This location is more than half a mile from the river, and nearly two hundred feet above it; the tracks at this place are not as perfect as those I have obtained at the Falls, in consequence of the surface over which the birds walked being destitute of that smooth polished appearance that is necessary to receive fine impressions, though I have some specimens that are good. But some of the largest (and most perfect for large ones) I have ever seen, I obtained on the eastern declivity of Mount Tom, near South Hadley Falls. If the height of these birds was in proportion to the length of their feet, when compared to some existing birds, they must have stood some twenty feet high. But the rocks of this place are too coarse to have retained fine impressions of small birds or quadrupeds, for when the matter was deposited, the water was in continual motion, so as not to leave smooth surfaces to the strata.

I have one slab containing two footprints of a large bird, the surface being very rough and uneven; but the great weight of the bird (probably a thousand pounds or more), pressed the sand so hard that it is perfectly smooth, showing distinctly the structure of the foot.

I have many specimens from Wethersfield, Conn., which show very plainly that they are tracks of birds; still I consider them imperfect because they do not show where the bottom of the foot rested. The deposit seems to have been a fine reddish clay, so soft that the bird settled down a number of inches, the mud closing up again when the foot was withdrawn, leaving no depression on the surface; the tracks are seen only by splitting the strata, through which the foot passed.

I have at some localities traced the tracks of a single bird thirty or forty feet, when the bird went into the water; this I know from the fact, that the first tracks would be very slight indeed, being pressed on hard sand or clay, and each successive step would be deeper and deeper, until the mud closed over the impression; and when he got into the water, though he settled deep in the mud, the motion of the water entirely obliterated all appearance of the track on the strata, over which the bird had walked.

But by removing a thin layer we find the impression. This has oftentimes enabled me to ascertain how high the water was at the time, or how much of the layer was out when the impressions were made. I have one slab four or five inches thick, containing two footprints of a bird, which I split into five layers, the impression being distinct in each layer, although on the upper surface, it only shows a straight mark three or four inches long over each impression, the mud having been so soft as to close up, leaving no depression, while the lower slab shows where the foot rested. I have spent many days the past season searching for these interesting relics of olden time. I have traversed the valley from the north line of this state (Massachusetts) to Wethersfield in Connecticut and had almost despaired of finding anything new, but in January I spent a few days more in my favorite amusement of quarrying the rocks. I opened a new quarry on the bank of Connecticut River, near the mouth of Fall River, and after seven or eight days' labor, I succeeded in obtaining two or three hundred footprints of various birds and quadrupeds, many of them, are entirely new.

I only forward you a sketch of the footprints of one of the quadrupeds; you will see that this is a walking, and not a leaping, animal, the fore feet are very small in proportion to the hind ones, the toes are very slim and tapering, terminating in a point, with a sharp claw which is very distinct, the toes are wide spread and curve outward very much, which is not the case with any of those I have heretofore obtained; the fore foot shows only the impression of the toes, while the hind foot shows the impression of a very long heel (or it may be part of the leg); though it is not as deep as the toes, it is the deepest at the part near them, and extends back an inch or inch and a half, showing no joint back of the connection of the toes with the heel."

A-3. Letter of September 6, 1848, to Benjamin Silliman, from PVMA 1908, pp. 277-78. Not published by Silliman.

"Since I last wrote you, I have made some valuable and interesting discoveries among the sandstone rocks. The location is in the south part of Gill, some three-fourths of a mile from the Connecticut River, where, in my rambles my attention was arrested by what appeared to me, the footprint of a bird; this was in a farmer's orchard; the whole orchard stands on a sandstone ledge, covered with one or two feet of earth. A small stream of water passes through the orchard some parts of the year, washing the rocks quite clean, and as the rocks have a dip of some thirty degrees, I could see a little of the surface of each layer. The showing induced me to open the quarry, but I worked two or three weeks with a number of quarrymen with little success, finding only now and then a straggling track. As I opened the rock a number of rods in length on the strike, I saw by the direction of the different tracks that they centered towards a certain point. I was determined to pursue them, though some persons pitied me for my foolishness; others sneered, and one man asked if there was another so big a fool in Greenfield; but I had got on the track and was set upon having the game.

I had to blast some ten feet deep to get to the point I wished; the upper layers were in many pieces, there being many joints and fractures. The slab directly above the track (showing them in relief) is about one inch thick, which I removed safely without breaking; the one containing the impression is three inches thick, ten feet long by six or seven feet broad, remarkably fine and truly wonderful, containing more than sixty beautiful footprints of different birds, from three to four inches long to ten or twelve inches, and the whole surface covered with beautiful raindrops.

Two large birds passed over this slab in the same direction; the largest has a foot measuring eleven inches and a stride of three and one-half feet, the impressions showing every joint in the foot; the smallest having a foot measuring four inches in length with a stride of two and a half feet, and there is not a track on the slab that does not show plainly the impression of the claws.

When I had loosened up this splendid slab, the neighbors kindly turned out and gave a helping hand to raise it from the pit. I regret that I am not able, for lack of time, to send you a sketch of this slab. For anyone to have an idea of its beauty, they should see it standing up in my cabinet, with the slab that came off from it (showing the tracks in relief) standing by its side. Besides these slabs, I obtained many others of less magnitude and some new species, and among them, one small one that shows ten successive steps within the space of eight inches.

A-4. Letter of Nov. 23, 1852, to John Cassin, correspondence secretary of the Philadelphia Academy of Natural Science. From PVMA 1908, pp. 281-82.

“Greenfield, Mass., Nov. 23, 1852

Dear Sir: It is with a grateful heart that I acknowledge the receipt of your letter informing me that I have been made a member of the Academy of Natural Sciences of Philadelphia. To say I thank you and the members of the society is not enough, but if I am able to visit Philadelphia the coming winter and examine your collections in natural history, I shall then be able to judge whether I can contribute anything that will add interest to either branch of it, which I hope to be able to do.

When your letter arrived, I was at the Beryl quarry in Acworth, N. H., where the Acworth beryls are obtained, so well known to mineralogists for their large size. It is situated on a hill, 12 miles east of Bellows Falls, half a mile south of Cold river, which empties into the Connecticut one mile south of the falls. The hill, some 400 feet above the river and 200 feet above the tableland around it, is mostly composed of a very hard coarse granite, resting on hornblende slate.

The quartz vein (or rather bed, for it is not walled in by the granite on the right or left) commences on the northeast part, about 100 feet below the top of the hill and occupies a space, some four or five rods wide extending up the slope to the top. Near the top it is precipitous, some cliffs of 10 or 15 feet. This quarry was opened some 20 years ago, about 50 feet from the top, on the slope, where the crystals showed themselves on the surface. It has been visited and worked by many people from abroad, from time to time, until they had worked so far up that the quartz was some 12 or 15 feet thick above the crystals. At this point a cliff rose 10 or 12 feet higher, and it was abandoned. Such was the situation when I went there.

I commenced on the top and blasted down 25 feet through the solid quartz, (there were no crystals nearer the surface than 20 feet), so hard that it cost a dollar a foot to drill it, and when I got down to the beryl, unfortunately, the rock was seamy and bad, therefore the crystals were more or less jointed and imperfect; still I obtained some very interesting specimens, one about a foot in diameter and a foot long, standing in a block of quartz (its original bed). Getting through the quartz, I came upon a vein of feldspar that was very rich with crystals, some as small as a knitting needle, but generally from half an inch to two inches in diameter. I obtained many blocks of the feldspar with these crystals running through them.

The echo of our blasts was delightful; it would come back from the surrounding mountains as if they were blasting in every part, first in one direction and then in another and another,

until it would seem to die away in a northwest direction, a long time after the discharge of our blast. I suppose this is owing to the peculiar locality of the hill; when seen from the valley below it looks like a high peak and from the top we have a view in every direction, but there is but one point we can see more than two or three miles, and that is down the valley of the river, across the Connecticut into Vermont, their own view being cut off by one of the high peaks of the Green mountains.”

Appendix B. Excerpts from eyewitness accounts.

B-1. James F. W. Johnston. *Notes on North America, agricultural, economical and social*. Edinburgh and London, 2 vols., 1851. Vol. 2, pp. 495-503. Johnston (1796- 1855) was a Scottish agricultural chemist and co-founder of the British Association for the Advancement of Science. While visiting the U.S. he was taken by the American geologist Henry D. Rogers to Amherst and Greenfield.

[March 27, 1851] “Greenfield is a small town, new, straggling, and unfinished, as all these country towns are. It is the county town, and the seat of the courts of the County of Franklin. One of the persons of whom we were in search, Mr. Marsh, was in attendance as doorkeeper at one of the courts then sitting. He is, besides, only a common mason and gardener, but he has, nonetheless, spent more time and money in searching for and digging up the bird-tracks of this region, and possesses a larger and finer collection of them, than any other person or institution in the United States. Whoever takes the trouble to ascend the valley to Amherst, to see the very interesting collection contained in the museum of that College, and brought together by the labours of President Hitchcock, will find himself not unrewarded for the additional journey to Greenfield by the inspection of the collection of Mr. Marsh. This collection is less rich in slabs impressed by the consecutive footsteps of the most gigantic of the ancient birds—that which had a step of six feet, a length of leg of nine feet, and a height of eighteen feet. But it is richer than that of Amherst of somewhat lesser size, and in many as yet unfigured impressions both of reptile and of birds.

In looking at this collection made by a working man, dug up either with his own hands, or by men working along with him—at his expense, under his direction, and in spots which his own sagacity indicated as likely to reward research—I could not refrain from admiring the enthusiasm and perseverance of their owner, and regretting that, even in this intellectual State, science was too poor, not only to engage such a man wholly in its service, and to add to its treasures by employing him unremittingly in his favorite pursuit, but that it was unable even to purchase the fruits of his past labours, and add them to the public collections already accumulated in so many localities. Should American patrons of science, and the owners of University and State collections continue unwilling to purchase the large slabs of Mr. Marsh, those of European countries—I hope of Great Britain— may secure the best he possesses for a little more than a thousand dollars, or two hundred pounds. I must add, however, what all collectors will well understand, that Mr. Marsh looks upon these slabs of stone as so many children, and that he professes—as I am sure he feels—a great unwillingness to part with them. But, like Dr. Deane of Greenfield—whose name is connected with the first discovery of these tracks, and who has been obliged to discontinue collecting—Mr. Marsh has living feet gathering now in plenty around his daily table; and his friends may prevail upon him to consent that, for their sake, these great stones should be converted into bread.

I owe Mr. Marsh this acknowledgment for the civility he showed to Professor Henry Rogers and myself, not only in exhibiting his collections, but in accompanying us to Turner's Falls, and spending half a day in pointing out the localities in which his more successful explorations had been made. Turner's Falls are formed by an artificial dam, supported about the middle by two small islands, over which the waters of the Connecticut river fall from a height of thirty feet. With the adjoining, for the most part, wild, elevated, and wooded scenery, these artificial falls form the most striking object of the kind in New England. Immediately below the falls, the river rushes against an elevated ridge of trap, by which it is made to turn nearly at right angles to its former course. Against this trap ridge the edges of the new red-sandstone strata abut at a high angle, —turned up, as President Hitchcock thinks, by the elevatory movements which forced the trap ridge through them—in the angle at which they were naturally deposited, according to the Professors Rogers.

However this be, the break caused by the eruption of the trap has exposed the edges of the lower beds of the red-sandstone formation below Turner's Falls. Many of these beds are dark-coloured; bear the impressions of plants; and more resemble some of the thin shale beds of our coal measures, as they would be altered by the near contact of trap, than any of the beds which the upper new red sandstone exhibits in England. The lower new red, in the county of Durham, in its fish bed and in some other parts of its thickness, exhibits dark-coloured shales, which, when altered by heat, might assume the dark and micaceous aspect of the beds near Turner's Falls. It is among these beds, inclined at an angle sometimes as high as 80°, that the bird-tracks and the footprints of small reptiles occur; and in this and a few other places along the river, where the same beds have been observed, Mr. Marsh has obtained his most valuable specimens. Among the fragments thrown aside along the foot of the bank, we found many fragments of footprints of all sizes, and, in the living rock, saw others remaining still untouched."

B-2. Oliver Marcy, "A Geologist among the people—Dexter Marsh." PVMA 1908, pp. 265-71, there said there to be from the *National Magazine*, 1855. Marcy (1820-1899) taught natural sciences at Wilbraham Academy, then in 1862 moved to Northwestern University in Evanston IL. In 1870 he founded the school's Museum of Natural History, a distant echo of Marsh's Greenfield museum.

"Previous to the year 1853 the traveler on leaving the cars at the depot, in the pleasant village of Greenfield, Mass., and ascending the hill toward the main street, would observe, on the right side of the way, a cottage, simple, rustic and unique, hidden among the trees. The piazza is covered with vines, and the dooryard is densely filled with shrubs and flowers, while leaning against the side of the cottage, and in every noticeable position, are slabs of stone, with curious configurations upon their surfaces, and specimens of abnormal vegetable growth and Indian antiquities. This was the home of the man whom we honor. Let the traveler pass into the yard, and enter the door from beneath the piazza, into a sort of hall, on the north of the cottage, and he is in the best cabinet of fossil footprints in the world. Here he sees, on tablets of stone, the record of an age which was never known or read till the scrutinizing eye of Dexter Marsh rested upon it.

Dexter Marsh, the Hugh Miller of the New Red Sandstone, was the son of Joshua Marsh of Montague, Mass. The circumstances of his parents compelled him to labor at an early age and deprived him of a good common school education; but with a manly heart and a strong constitution, he seems to have accepted the necessity of his situation, and rejoiced 'to eat his bread by the sweat of his brow.' [. . .] But though to be a hard working man, and to be a good

Christian man, are valuable characteristics, challenging the esteem of a community, yet we have many such men in New England, and it was not for these characteristics that the name of Dexter Marsh escaped beyond the borders of the village of his residence, and became familiar to the learned in every land.

Most of the mature life of Mr. Marsh was spent in the village of Greenfield. There, about the year 1835 or 1836, while laying some flagging stone into a sidewalk near his house, he discovered in one the footprints of a bird. This was an hour of perplexity, but soon to be followed by triumph and honor. To that time he was wholly ignorant of geology, and possessed only the common notion of the formation of the earth; but being a man of accurate observation and logical order of thought, he was convinced that the print before him was a print of a bird's foot. But the print was in a solid rock, quarried from several feet beneath the surface. How it came there he could not decide. 'In this perplexity,' says Mr. Ingersoll, 'he called to it (the discovery) the attention of a friend [Dr. James Deane], whose reading was extensive, and received from him the first seeds of what afterward grew into a stately tree.'

With eagerness he grasped the truths of geology, and was thus suddenly introduced into a new world of thought. [. . .] He was soon able to present irrefutable reasons for believing the prints to be the footprints of birds, and his reasons and his arguments are those still relied upon by geologists to prove the same position. [. . .] Drs. Deane and Hitchcock brought the results of his labors into public notice; described, named and classified the animals which made the prints; and the latter especially reaped merited honors the world over. [. . .]

To the uncommonly accurate and extensive observations of Mr. Marsh, and to his forcibly stated arguments, other gentlemen owe something at least of the honor of their laurels. He at first set them right and corrected them when they fell into error. Dr. H[itchcock] was once lecturing in Boston, and Mr. Marsh was in attendance. The doctor announced that he had discovered the track of a lame bird, one whose leg had been broken, and the foot turned part of the way round, the toe inward. Mr. Marsh saw his error; but awaiting a time when the doctor visited his cabinet, he set him right by showing him that any two tracks of the bird taken alone would present the same appearance as the two from which the doctor had inferred the lameness of the bird; but when more tracks were considered (and Mr. Marsh had slabs containing several), the error of the inference was apparent. The fact of the case was that the bird, in walking, directed the middle toe of one foot to the heel of the next, and the doctor had taken the line of one foot for the course of the bird, while a line from heel to toe of the other foot made a large angle with it; whereas, both toes inclining inward, and each making a small angle with the course of the bird, there was no necessity of breaking either leg.

After the discovery of the track in the flagstone near his house, others were discovered already laid into sidewalks in the same village; and these, which before were thought only imperfect flags, were taken up as valuable. The quarry from which they came was visited, and others found.

Mr. Marsh built him a boat, which he could carry around the rapids of the river, and taking with him powder and drills, and provision, he would row from place to place, sometimes 30 miles a day, searching along the river bank for fossil footprints. When night came he would turn his boat bottom side up upon the flat rock, and beneath it sleep secure from the dews of heaven. At early dawn, without the jarring of gongs, or vexatious delays of servants and hotel breakfasts, he would set out again upon his search. Thus he surveyed the whole Red Sandstone deposit in the valley of the Connecticut River. He visited also the deposits in New Jersey.

He was soon enabled to detect the fossil tracks with a facility that resembled instinct. In the river bed, and in the river bank, under the cliff, or on the side of Mt. Tom, and beneath the soil of Wethersfield, his uncommon ken traced them out. A friend in Gill invited his attention to a footprint in that town. On examining it he found the impression to have been made in sand or gravel, which did not give a well-defined outline; but he concluded that beneath a cliff near by the case would be otherwise, and that there he might obtain good tracks. So at the cliff he went to work. His leisure hours for the whole summer, some money, and much powder were consumed. At length he reached the stratum; he lifted a slab containing 50 as beautiful tracks as had ever been found. They were of various sizes, and crossed the stone in every direction. Four of these tracks were 12 inches long. The dimensions of the slab were ten by six feet. It was split in two, giving the relief prints on one side, and the intaglio on the other. We think this is the same that was sold, after his death, to Mr. Alger, of Boston, for \$375.

He could not only tell the direction of a bird, but its comparative speed, the condition of the mud, whether the weather was rainy or not, whether the bird making the track was walking on shore or in the water, and when the bird passed from shore into the water. He came at very definite conclusions concerning the weight and height of the birds. Indeed, he lived in the era of the New Red Sandstone, as the historian lives in the age of Xenophon or Herodotus. 'I have,' he says, 'one slab containing two footprints of a large bird, the surface being very rough and uneven; but the great weight of the bird (probably a thousand pounds or more) pressed the sand so hard that it is perfectly smooth, showing distinctly the structure of the bottom of the foot.' Again he says, 'I have many specimens from Wethersfield, Conn., which show plainly that they are the tracks of birds; still I consider them imperfect, because they do not show where the bottom of the foot rested. The deposit seems to have been a fine reddish clay, so soft that the bird settled down a number of inches, the mud closing up again when the foot was withdrawn, leaving no impression on the surface; the tracks are seen only by splitting the strata through which the foot passed.'

Mr. Marsh collected a valuable cabinet. He made exchanges with many scientific men in this and foreign countries. In 1851 his cabinet contained from 400 to 500 slabs of stone upon which were 1,000 tracks of birds and quadrupeds, some of these slabs weighing less than an ounce, and others two tons and containing from one to 50 tracks each, from one-half inch to 19 inches in length; also, 200 fossil fishes, 3,000 sea shells, 2,600 rock crystals, and 200 specimens of Indian antiquities, besides specimens in zoology and botany, minerals and fossils from foreign countries.

Uneducated though he was, Mr. Marsh could not remain in obscurity. In 1846 he was elected a member of the American Association for the Advancement of Science; in 1852 he was elected a member of the Lyceum of Natural History in New York, and, in August of the same year, a corresponding member of the Academy of Natural Science in Philadelphia. The notice of this last-mentioned honor was received while he was at Acworth, N. H.

In reply [letter to John Cassin, Appendix A-4], he gave the society a very full account of the celebrated beryl quarry in that place. Very large crystals had formerly been obtained with ease at that place; but the bed which at first cropped out of the ground had been worked till there were 20 feet of solid quartz above it, and then abandoned. But Mr. Marsh stopped not where other men are accustomed to stop. He obtained a lease of the quarry and went to work. He spent 100 days' labor and burned 400 pounds of powder, digging through the 20 feet of solid quartz. He did not succeed in obtaining what he hoped for, the best crystal in the world; yet he was amply rewarded. He obtained a crystal, one foot in length and 13 inches in diameter, standing in a block of quartz, its original matrix, very fine. He brought home with him nearly three tons of crystals,

most of which were very good specimens. This was in the autumn of 1852. For some time it had been evident that incessant toil had made inroads upon the vigor of his constitution, his daily labor was interrupted, and as this resource was cut off, it became necessary for him to negotiate for the sale of his cabinet.”

B-3. Lorenzo L. Langstroth, “Personal recollections of Dexter Marsh,” December, 1894, from PVMA 1908, pp. 258-62. Langstroth (1810-1895) taught in Greenfield and for a time was pastor of the Second Congregational Church there, but is best known as a published expert of honeybee culture.

“In the spring of 1839 I became principal of the high school for ladies in Greenfield, Mass. Living a few rods from the premises was a common, or rather a very uncommon laboring man named Dexter Marsh. Finding him to be an expert gardener, I employed him in that capacity and soon became acquainted with all the circumstances connected with his discovery of the footprints or tracks in the new red sandstone. By frequent conversations with him, I found that he was a man of great force and originality, one of the strongest thinkers and closest reasoners with whom I ever became conversant.

He gave me the full particulars of his discovery, but before I narrate these, I wish to give the account that came from his lips, of his early training. His father, although he was not in affluent circumstances, if he had only appreciated the rare mental gifts of this son, would have undoubtedly given him at least what we call a fair common-school education.

The knowledge that he derived from schools was meager indeed; it was only in the winter months that he had any schooling at all, and before he started for the schoolhouse he was obliged to attend to the “chores,” rising very early to get through with his task. He was not furnished with those books which are essential even to the very humblest kind of common education.

Dictionaries and geographies were believed to be unnecessary. I have heard him say, that until he was of age, Fourth of July was the only real holiday that he ever knew. He received not a cent of spending money, and to supply some of a boy’s necessities, he made wooden traps for catching rabbits, which he sold to the teamsters who then carried the produce of the country to the Boston market. These traps were fastened together by wooden pegs, as he had not the pittance to buy nails. As an illustration of his energy and ambition, he yoked the oxen when he was so small that he had to stand upon a block to do it. When he came to Greenfield the house in which he lived with his wife was built mainly by his own hands on land purchased by the savings of his daily labor. After the usual day’s work he could always be secured of an evening for nailing down carpets, or anything by which he could earn an honest penny.

In the year 1835 he was employed to lay a flagstone sidewalk from the courthouse down the hill near his own premises. The stones were quarried by him and his attention was struck by what seemed to him to be, evidently tracks or footprints of birds in these stones. Some of the best specimens he propped up against the side of his fence, calling to them the attention of citizens, who he thought would take an interest in such things. At first he called them turkey tracks, as in size they resembled the footprints of this bird, more than any other. When laughed at for his ideas, he defended their correctness by pointing out the right and left tracks made in some of the stones; the wrinkles in the skin of the foot, and indeed, the peculiarities which are those the scientists now rely on to show that they are the footprints of once living animals.

A person who took great interest in these was Dr. James Deane. Dr. Deane was of a scientific turn of mind and he was not long in appreciating the discovery that the unlettered man had made. He communicated with Professor Silliman of Yale College and Prof. Edward Hitchcock of Amherst College.

The facts were so new and so entirely unexpected by the scientific world, they both replied to him in substance; that the resemblance of these impressions to footprints made by once living creatures was entirely fortuitous, as nothing of the kind could be expected in the new red sandstone formation. Not at all rebuffed by such high authority, Dr. Deane took plaster casts of these impressions and sent them to Professor Hitchcock. Seeing, with the professor was believing, and he came at once to Greenfield to make examinations for himself. The results of these examinations were soon given to the scientific world and the chief glory of them was given to Professor Hitchcock.

I had, from frequent conversations, the amplest opportunity to know that the humble man to whom the merit of the first discovery so clearly belonged, felt, as every man of originality and force always feels under similar circumstances, that very brief and unsatisfactory notice had been given to the world of his share in the discovery, and I have always intended at the proper time to leave on permanent record the facts which I learned from Mr. Marsh.

That his discovery was not what some would call mere accident, or one which anyone might have made who noticed the stones, will be quite obvious from the fact that after these tracks had excited public attention, he obtained a number from the flagging around the eaves of the Congregational church, some of which had been in plain sight for many years, as one side of this church faced on the premises of the high school for young ladies and the other upon a lane. After these footprints claimed his attention, he spent as much time as he could command in obtaining specimens; especially did he prosecute his researches during the hot season when he had fewer calls for employment and when the stage of water of the Connecticut River allowed him to do so most advantageously. Being skillful in the use of quarrying tools he was able, at a comparatively trifling expense, to make large additions to his collection.

He used repeatedly to speak to me of his intense delight in prosecuting these researches; having a boat of his own construction, his expenses were small, and after his severe labors in the hot sun he would sleep under the cover of his upturned boat, full of happiness and anticipation of the next day's labor. [. . .] While engaged in such pursuits and still laboring with extraordinary energy in doing whatever as a gardener, wood-sawyer, quarryman or anything by which money could be earned, he was constantly reading and studying on the subject of geology and acquiring those rudiments of a good education, of which the short-sightedness of his father had denied him.

At last, with his own hands he built as an addition to his house, a room of considerable size, which he called his cabinet, and which contained not only the large collection of footprints which he had made but specimens and curiosities which he obtained by way of exchange from almost every quarter of the scientific world. [. . .]

Intimately acquainted myself with prominent intellectual men, I do not hesitate to say, that I have scarcely known one of more native force as a rare observer and an able reasoner on the results of his own observations and those of others. It was his earnest desire in his last illness that his cabinet should not be divided, but if possible be sold for a moderate sum to be a nucleus of a permanent cabinet in the town of Greenfield. I was with him frequently in his last illness, which he bore with the resignation and fortitude of a Christian martyr. [. . .]

Scientific bodies in Europe and America were represented at [his auction] and quite a large sum of money was realized. [. . .] he had left his family a name, which would always be mentioned with profound admiration, honor and respect by the scientific world, to be associated with that of Hugh Miller, as “the Hugh Miller of America.”

Appendix C. The auction of Marsh’s museum, September 21, 1853.

From the *American journal of science* n.s. 16 (1853): 298-300.

“Notice to Naturalists. — The cabinet of the late Dexter Marsh will be offered at public auction on Wednesday, the twenty-first day of September next. It embraces a great variety of natural objects, but its peculiar value consists in its unrivaled collection of Fossil Footprints of Birds and Quadrupeds, and the Impressions of Fishes, from the new red sandstone of the Connecticut River. The collection of Minerals embraces an immense number of Crystals of Beryl, some of vast size, from the celebrated locality of Acworth, N. H. Particulars will be sent upon application to the subscriber. Among the specimens of this collection are the following, appraised by Professor Hitchcock and Dr. Deane.

Ornithichnites.— No. 92. A Slab, 10x6 feet, literally covered with Footprints of Birds, at least 70 distinct impressions, arranged in determinate lines or transits. In two of these transits the Footstep is 10 inches in length, and the stride 3 feet and 8 inches. The surface is very bright and smooth, and the impressions are without blemish, showing in the most distinct manner the phalangeal, tarsal, and unguis depressions of the foot. Appraised at \$350.

No. 93. Is the counterpart or cast of the foregoing, very fine. Appraised at \$150.

No. 94. A slab in two pieces, about 8x4 feet in dimensions, from the same stratum as No. 92. 17 fine impressions. Appraised at \$75.

No. 96. About 5x3 feet. 9 rows of tracks on its superior surface, and several in relief on its inferior. The impressions are very fine. The specimen is mounted to take a revolving motion. Appraised at \$150. [This is one of the slabs returned from Russia. See Marsh’s letter to Cramer, Appendix A-1.]

No. 95. About 7x4. Literally covered with perfect impressions, at least 40 in all, arranged in determinate lines. Appraised at \$75.

No. 97. Two Colossal Footprints, each 16 inches in length; stride 3 feet 6 inches. Very fine. Appraised at \$25.

No. 100. Two Colossal Footprints, each 14 inches long; stride 3 feet 4 inches. Appraised at \$25.

No. 99. A slab 6 feet 4 inches in length. One row of consecutive footprints, and others, very fine. Appraised at \$30.

No. 98. Slab 7 feet 6 inches long. Footprints and Raindrops in relief. Appraised at \$20.

No. 101. Four splendid impressions. Appraised at \$20.

No. 102. Six imprints. Appraised at \$10.

No. 103. A single Colossal Footprint, 18 inches in length. Appraised at \$25.

Besides the foregoing, are a very great number of specimens, 100 of which are enumerated, appraised from \$10 to \$1. They are mostly from the celebrated localities of Turner’s Falls, and South Hadley Falls, and embrace a large number of species; and the individual impressions are all so perfect as to display the anatomical configurations and phalangeal markings of the foot. It is a magnificent collection. These specimens will be sold singly, or in lots, as may be desired, to the highest bidder, starting from the appraised value.

Quadrupedal Footprints.— The Footprints of Quadrupeds are quite rare in the Sandstone Formation, yet they are very interesting. The collection embraces all the known species, and the specimens are truly beautiful. They indicate animals of diminutive size, probably of the Batracian order of Reptiles, or the Tailed or Salamandrian species. The slabs containing these footprints are small, and are appraised from \$10 downward.

Ichthyolites, or Fossil Fishes. — The collection of American Fossil Fishes is very extensive, and is derived from the localities of Sunderland, Mass., Middletown, Conn., and Pompton, N.J., and embraces eight or ten species of the Genera Paleoniscus and Catopterus. The specimens enumerated, amounting to 200, are entire and remarkably fine, and are appraised at \$25, \$20, \$15, \$10, \$5, down to \$1. Taken altogether, this collection offers a rare opportunity for acquiring these elegant fossils, which are otherwise so difficult to obtain, especially in a sound condition.

Minerals. — The collection of Beryls from Acworth, N. H., is large, and was obtained by Mr. Marsh, as were the foregoing fossils, by his personal exertions, and at great expense. It is very valuable, and was appraised by Prof. C. U. Shepard and Dr. Edward Hitchcock, and among the principal specimens are the following:

No. 240.	11 in. diam.	38 in. circum.	12 in. length.	Apprais'd at	\$20.
No. 235.	8 " "	26 " "	24 " "	" "	\$15.
No. 234.	7 ^{1/2} " "	24 " "	9 " "	" "	\$10.
No. 239.	9 " "	32 " "	19 " "	" "	\$10.
No. 237.	9 " "	29 " "	14 " "	" "	\$3.
No. 253.	15 " "	39 " "	16 " "	" "	\$15.
No. 255.	12 " "	40 " "	10 " "	" "	\$4.
No. 251.	8 " "	28 " "	13 " "	" "	\$4.
No. 265.	13 " "	" "	12 " "	" "	\$6.
No. 274.	9 " "	30 " "	22 " "	" "	\$7.
No. 279.	12 " "	38 " "	13 " "	" "	\$8.

Besides many others at \$10, \$8, \$5, \$3, \$1, of which more than 100 specimens are enumerated. They are also arranged into suites, and will supply very desirable collections for mineralogists.

There are other choice minerals; among them are various specimens of Fossil Woods; of Dog Tooth Spar; of Fluor Spar; Galena; Barytes; Hematite; Specular Iron Ore; Calcite; Celestine; Troostite; Malachite; Tremolite; Lead and Silver ores; Tin Ore. A large number of Quartz Crystals, some containing water and other objects; and a great number of other specimens, Geodes, Septaria, Rain Drops, &c.

Miscellaneous Objects. — Illustrating Aboriginal Arts. 225 specimens Indian Relics, found in the Valley of Connecticut River.

Eleven pieces Pottery and Discoidal Stones from the Mounds of Mississippi, very interesting. Stuffed Birds, Alligator, Boa Skins, Roman Lamp, Ancient Mosaic, English Minerals and Fossils, Limestone and Chalk Fossils, Coal Fossils, Mastodon remains, Fossil Corals, Show Cases, &c.

Coins. — 1118 Pieces Copper Coins, including duplicates. 85 very rare Coins and Medals.

Shells. — A valuable collection of Shells and Corals.

Valuable Books. — 17 Quarto Volumes Geological Survey of New York; Owen's Geological Survey, Hitchcock's Geology of Massachusetts, &c.

--> The sale will be continued from day to day until it is completed, and it will probably afford the only opportunity that will occur for a long time, if ever, of acquiring the beautiful fossils of Connecticut River. They can only be obtained by skillful prospecting at great risk and expense. All the localities have been exhausted for several years, and the only source from which they can now possibly be obtained is this extraordinary cabinet. The collection of these fossils is so extensive that several complete series can be formed from it; for beauty, extent, and interest, it far surpasses any other collection ever made, in fact, all other collections combined ever made. L. Merriam, *Administrator*. Greenfield, Mass., July, 1853.”