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# The Parallel Impacts of William Maclure and Amos Eaton on American Geology, Education, and Public Service

Markes E. Johnson\*

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Two independent centers of education were established simultaneously during the early part of the nineteenth century by William Maclure in southern Indiana and by Amos Eaton in eastern New York. Geology was only one of many sciences thereby promoted locally. A commanding role, however, was eventually played by these centers in shaping the intersection of public service and applied or practical geology that survives today under the authority of state and federal agencies responsible for geological exploration and survey work. Maclure was thirteen years senior to Eaton in age. Although from different generations and from different family backgrounds, both were attracted to geology as self-taught individuals. At best, these two geologists and educators shared only the most attenuated connections, but they both operated under the guiding influence of larger tendencies in American life to make science a public servant of humanity.

In his massive 1924 compilation on *The First One Hundred Years of American Geology*, George P. Merrill devotes the first two chapters to the “Maclurean Era, 1785–1819” and the “Eatonian Era, 1820–1829.”<sup>1</sup> The exploits of these two hardy pioneers are intellectually as well as physically monumental. Two of their achievements are particularly noteworthy. Maclure produced the first geological map and texts in 1809 and 1817 summarizing much of the eastern half of North America, an accomplishment derived from thousands of miles of personal exploration on foot. Eaton produced a geographically more constrained but more detailed geological cross section and synthesis in 1824 following the route of the Erie Canal across New York state.

Neither of these men was a “closet geologist.” That is, they were not content to think about geology while seated indoors surrounded by books as did many of their contemporaries. They were thinkers who

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<sup>1</sup>George P. Merrill, *The First One Hundred Years of American Geology* (New Haven, Conn., 1924).

not only filled their share of scholarly pages with theoretical notions on the classification of rocks—both men published on the topic in 1818<sup>2</sup>—but they also put their classification schemes into action in the real, out-of-doors world of geology. Both men also were dedicated educators, and the year 1825 stands as a landmark in the history of geological education, owing to the independent schools in New Harmony, Indiana, and Troy, New York, which they labored to establish. Geology was but one topic under consideration in their similar plans of education, but its practical utility also fueled a profound change in the way the natural resources of the country were explored and promoted under government aegis.

The argument of this paper is threefold. First, that there is a direct link between William Maclure and geologist protégé David Dale Owen, son of his New Harmony partner Robert Owen. Second, that the aftermath of Maclure's educational presence in New Harmony had profound effects on a rapidly emerging ethic of science and public service in government on a state and national level. And third, that there is an instructional parallel for the development of practical science in America between the careers of Maclure and his fellow geologist and friend Amos Eaton, whose link with his own disciples spread out from his Rensselaer school at Troy, New York, during the same period.

Although Merrill's *First One Hundred Years of American Geology* does not track the educational legacy of these two pioneering geologists, the detailed record he assembled covers all the geological survey projects undertaken in the United States through most of the nineteenth century as well as the careers of the geologists who performed them. The trail is easily followed by checking how the early generations of American geologists acquired their education. In part, this story is covered by Markes E. Johnson in "Geology in American Education," but further elaboration is provided here.<sup>3</sup>

How and why did William Maclure and Amos Eaton become enthusiastic converts to the geological sciences, and what role did geology play in their educational programs? An extensive biography of Eaton by Ethel M. McAllister with much documentation is available. Unfortunately, no comparable biography on William Maclure exists. A short memorial by Samuel G. Morton (1844) was written not long after Maclure's death. Most of what we know about Maclure must be extracted from his own published record of beliefs or the voluminous correspondence and travel diaries he left behind. Some of Maclure's letters on education are edited by Arthur Bestor, Jr.

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<sup>2</sup>William Maclure, "Essay on the Formation of Rocks," *Academy of Natural Sciences Philadelphia Journal*, I (1818), 261-76, 285-310, 327-45, and Amos Eaton, *An Index to the Geology of the Northern States* (Leicester, Mass., 1818).

<sup>3</sup>Markes E. Johnson, "Geology in American Education: 1825-1860," *Geological Society of America Bulletin*, LXXXVIII (1977), 1192.

(1948), and his European travel journals are edited by John Doskey (1988). Many important letters are held by the Workingmen's Institute in New Harmony. Among these letters are 477 in a most revealing correspondence exchanged between Maclure and his New Harmony school administrator, Marie Duclos Fretageot, which has been edited by Josephine Mirabella Elliott in *Partnership for Posterity: The Correspondence of William Maclure and Marie Duclos Fretageot, 1820–1833* (1994).

A Scottish immigrant to America with a talent for international trade, Maclure became independently wealthy at a relatively early age. In an 1822 letter to Yale geologist Benjamin Silliman, he explained what attracted him to geology:

When I retired from commerce about twenty-five years ago, I looked round for some occupation that might amuse me always, convinced that a man had the choice of his amusements as well as of his profession, and that common sense dictated an amusement that would produce the greatest good. I adopted rock-hunting as an amusement in place of deer or partridge hunting, considering mineralogy and geology as the sciences most applicable to useful practical purposes.<sup>4</sup>

It is this notion of geology as a useful and practical tool of science to be exploited for the greatest good that most visibly characterizes Maclure's ethic of public service.

A very similar outlook on the sciences, in general, was cultivated by Amos Eaton, Maclure's contemporary. Although not of the same generation and not geographically close, Maclure and Eaton most assuredly knew each other. The younger Eaton, in fact, showed considerable admiration for the work of his elder. In 1830 he expressed the place Maclure had gained in his own mind and confirmed the rank he would gain in the history of American science. He asked a mutual friend whose son was then a student at his school in Troy, New York, "to be kindly remembered to the father of Geology and Mineralogy in the U[nited] States."<sup>5</sup>

Eaton was a native of eastern New York state who attended Williams College, Williamstown, Massachusetts, and graduated in 1799 at the age of twenty-three. His educational background was classical, and it included no formal training in science. A career combining the practice of law and land surveying in the Catskills of New York was Eaton's goal, but by 1810 he was already experimenting with science education through his efforts to found a botany school. McAllister's construction of the surviving record is sketchy, but Eaton was accused and subsequently convicted of a forgery related to his land

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<sup>4</sup>Quoted in Arthur E. Bestor, Jr., *Education and Reform at New Harmony: Correspondence of William Maclure and Marie Duclos Fretageot, 1820–1833* (Indiana Historical Collections, Vol. XV; Indianapolis, 1948), 368.

<sup>5</sup>George Robertson to an unnamed correspondent posted at New York, December 3, 1830. This extract, copied in an unknown hand, was sent to Maclure in Mexico where he docketed it himself. Workingmen's Institute, Series I, New Harmony Correspondence, I.25. 12.

speculation business. The punishment handed down by the court for his crime was life imprisonment in New York's Newgate prison. During his imprisonment, Eaton used his free time to read science books, and he soon became a geologist. Granted a pardon late in 1815 at the age of thirty-nine, Eaton went early the next year to Yale College to study geology and mineralogy under Benjamin Silliman.

By special invitation for a one-year appointment, Eaton returned to Williams College in 1817 to offer the school's first courses in field geology, mineralogy, and botany. His skills as a teacher became widely recognized. Following a year of what the college administration certainly viewed as the rehabilitation of a needy alumnus, the ex-convict moved on as an itinerant lecturer offering New England communities short courses covering a wide range of sciences. By 1824 Eaton had settled in Troy, New York, where he persuaded Stephen Van Rensselaer to equip a permanent school.

The school's mission is succinctly stated in a letter dated November 5, 1824, from its patron, Van Rensselaer, to Dr. Blatchford, a Presbyterian minister in Lansingburgh:

I have established a school at the north end of Troy, in Rensselaer county, in the building usually called the Old Bank Place, for the purpose of instructing persons, who may choose to apply themselves to the application of science to the common purposes of Life. My principal object is to qualify teachers for instructing the sons and daughters of farmers and mechanics, by lectures or otherwise, in the application of experimental chemistry, philosophy and natural history . . . to agriculture, domestic economy, and the arts and manufactures.<sup>6</sup>

Van Rensselaer's notion of guiding "the application of science to the common purposes of Life"—words surely influenced by Eaton himself—is a very democratic ideal, one clearly fostered by the free and exciting atmosphere of the young republic. It is this atmosphere ripe with potential for growth and change that simultaneously affected William Maclure and influenced his founding of a school in New Harmony, Indiana.

On December 8, 1825, William Maclure and a party of Philadelphia educators and naturalists embarked from Pittsburgh for New Harmony, Indiana. The journey by keelboat down the Ohio River was later referred to as the "Boatload of Knowledge." Maclure's group was responsible for the organization of a school system for Robert Owen's communitarian experiment in New Harmony. In addition to a staff in charge of the children's school, Maclure attracted several scientists including Gerard Troost, mineralogist and chemist; Thomas Say, zoologist; and Charles-Alexandre Lesueur, naturalist artist. The aspirations of Maclure were as bold as those of Eaton. One year later in 1826, Maclure wrote the following in an announcement to the *American Journal of Science*, "The schools here will be on such a

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<sup>6</sup>Quoted in E. M. McAllister, *Amos Eaton: Scientist and Educator, 1776-1842* (Philadelphia, 1941), 368.



AMOS EATON

Reproduced from George B. Merrill  
*The First One Hundred Years of American  
Geology* (New York, 1969), 56.

scale, as to location, men of talent, and perfection of machinery, as to constitute them the first in the Union for every species of useful knowledge.”<sup>7</sup>

Although the schools he envisioned never matured, the New Harmony Workingmen’s Institute survives as a manifestation of Maclure’s dream. That dream is clearly described in another published letter of Maclure to Silliman:

Already part of the boy’s school is so far organized that they make shoes for themselves, and will soon do it for the whole community. They will likewise have workshops for tailors, carpenters, weavers, ect in the school, all of which trades will be alternately practiced, by the way of recreation from their mental labour of Arithmetic, Mathematics, Natural History, etc., as a useful substitute for gymnastics, to which will

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<sup>7</sup>Quoted in Johnson, “Geology in American Education,” 1192.

be added agriculture and gardening. We have nearly 400 children belonging to the society, besides strangers from the different parts of the Union. The girls are taught the same things as the boys . . . and are classed, alternately, to work in the cotton and woolen mills and in washing, cooking, etc.<sup>8</sup>

Further elaboration as to the importance of geological topics in general education were given by Maclure in his visionary work *Opinions on Various Subjects*:

Mineralogy, or the properties of the different substances that cover the surface of our part of the globe ought to be the first and perhaps the only subject, of children's instruction. The properties of the different kinds of clay, which are fit for brick-making, furnaces, crucibles, potters, etc, with the mode of testing them; the properties of the different kinds of limestones when burned, for manure, mortar, etc; of the different kinds of rocks for building, road-making, etc., and the mode of trying them; and the properties and uses of the different kinds of metals, etc; the limiting all those researches to substances within their reach, and which they will probably have to work or use in the course of some necessary occupation, are the proper subjects of investigation for the young student. For this purpose I would recommend a cabinet to be collected by the youth themselves; in proportion as they are taught the names and qualities of minerals, gathering a few during every ramble they may take, and learning how to break specimens, accommodated to the drawers of their cabinet. They should then test their hardness, ect. to render them familiar with all their external properties, and this should be so often reiterated that they could not possibly forget them . . .<sup>9</sup>

On January 3, 1825, six students enrolled for the inaugural term at the Rensselaer School in Troy. Eaton, senior professor, was in charge of chemistry, experimental philosophy, geology, and land surveying. The junior professor, Lewis Beck, was responsible for mineralogy, botany, and zoology. A summer and winter term of fifteen weeks each led to a bachelor of natural science degree. Expectations were high for the "Rensselaerean Plan of Education." Today, the Rensselaer Polytechnic Institute stands as a proud tribute to Eaton's industry.

Eaton, in a notice published in Silliman's *American Journal of Science* in 1831, described the regimen of the Rensselaer School:

The most distinctive character in the plan of the School, consists in giving the pupil the place of teacher, in all his exercises. From schools or colleges, where the highest branches are taught, to the common village schools, the teacher always improves himself more than he does his pupils. Being under the necessity of relying upon his own resources, and of making every subject his own, he becomes an adept as a matter of necessity. Taking advantage of this principle, students of Rensselaer School learn by giving experiments and demonstrative lectures.<sup>10</sup>

His reflections on the teaching of geology are outlined in his *Geological Textbook*, and they differ not much from Maclure's emphasis on having students work with raw materials.

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<sup>8</sup>William Maclure, "Notice of Mr. Owen's Establishment, in Indiana," *American Journal of Science*, XI (1826), 189-92.

<sup>9</sup>William Maclure, *Opinions on Various Subjects, Dedicated to the Industrious Producers* (3 vols., New Harmony, Ind., 1831-1838), I, 49-52.

<sup>10</sup>Amos Eaton, "Traveling term of Rensselaer School, for 1830, with a notice of the nature of the Institution," *American Journal of Science*, XIX (1831), 151-59.

Teachers will never succeed without specimens sufficient for illustrating the essential characters of all strata. Lay the whole suit on a log table or board, before giving the first lecture, in order of superposition in which they are found in the earth. Define the classes and strata, and name them over, until all the specimens become familiar to the eye and their names to the ear. Question the students around frequently on the synopsis and essential parts of the definitions or cause them to give lectures or dissertations by turns, each referring to specimens while answering or lecturing. Illustrate all parts of the Textbook with specimens, and familiar references. But students should not be confined to reading, to specimens, and to lectures, longer than ten days. They must then be shown the nearest rocks, from day to day, and taught to apply the proper definitions and descriptions.<sup>11</sup>

One of the most innovative teaching devices used at the Rensselaer School was the forerunner of the geology or biology summer field camp. During the summer of 1826, Eaton and a party of students made a tour on the Erie Canal. This field experience was so successful that an annual summer "traveling term" was instituted. A notice written by Eaton in the *American Journal of Science* gives a prospectus for one of these trips:

The acting officers of the Rensselaer School, have issued notice of a Summer Term of Travelling Instruction in this Institution. It commences on the 23rd of June, 1830 and continues ten weeks. All persons who have previously belonged to this school, or who shall enter at Troy or Albany three days before the term commences, will be conveyed by a flotilla of towed canal boats to Lake Erie and returned at the end of the term in the same manner. The instruction will be conducted by professors and assistants of the school, and will consist of lectures and examinations on the following subjects; viz. Mineralogy, Geology, Botany, Zoology, Chemistry, Experimental Philosophy, and Practical Mathematics, particularly Land Surveying, Harbor Survey, and Engineering. Applications will be made by direct inspection of rocks and minerals in place, plants and minute animals in their native localities, the works of the engineer in actual operation, the labors of the agriculturist, etc. One of the largest boats belonging to the flotilla is to be furnished with suitable chemical and philosophical apparatus, and cabinets in mineralogy and geology. A reading room, also is intended to contain such scientific books as are deemed requisite for the course. Students of the course will be required to make collections of whatever is interesting upon the route.<sup>12</sup>

A journal kept by George Clinton and published in 1910 records a lively account of the first canal trip in 1826.<sup>13</sup>

At this point, it is necessary to develop the relationship between Maclure and David Dale Owen in order to show the educational continuity between Maclure's enterprise and the renewed impetus for practical geology brought to New Harmony by the younger man. During the last year of his life while living in Mexico, Maclure received a letter (written January 22, 1840) from members of the Workingmen's Institute, which he had founded as the successor to his School of Industry in New Harmony. In part, the letter reads:

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<sup>11</sup>Amos Eaton, *Geological Text-book, for Aiding the Study of North American Geology* (2nd ed., Albany, 1832), 5.

<sup>12</sup>Amos Eaton, "Rensselaer School Flotilla," *American Journal of Science*, XVIII (1830), 200-201.

<sup>13</sup>George W. Clinton, "Journal of a tour from Albany to Lake Erie in 1826," *Buffalo Historical Society Publications*, XIV (1910), 275-305.

David Dale Owen has lately returned from an expedition appointed according to an act of Congress, to make a geological survey of the mineral lands of the United States in Iowa and Wisconsin. Some of our members accompanied him as assistants and they have presented some fine specimens of ore and minerals to the Institute. Will you allow us to arrange some of yours that are lying in the room we occupy, as the study of any part of nature generally tends to arouse thought of these subjects?<sup>14</sup>

The letter attests to the influence Maclure still retained over affairs in New Harmony and to the reputation of David Dale Owen as a rising geologist. David Dale Owen (1807–1860) was twenty years old when he came to the United States with his famous father, industrialist and communitarian Robert Owen. He subsequently studied chemistry at London University before returning to the United States for the remainder of his life.<sup>15</sup> He expanded his knowledge of geology working with Gerard Troost, one of Maclure's former associates, and then earned a medical degree from the Ohio Medical College in Cincinnati. The letter refers to a very successful federal survey project of lands newly opened for settlement around the lead-mining district in the Upper Mississippi River valley.<sup>16</sup> The project was completed under Owen's leadership in little more than three months late in 1839 by utilizing a task force of 139 field assistants. Twenty of these assistants were recruited in New Harmony from among Owen's neighbors.<sup>17</sup>

A degree-confirming school was never successfully established in New Harmony, although David Dale Owen pursued an organized program of scientific research and public lectures using the town as his headquarters. He not only followed in Maclure's path as a geologist dedicated to public service, but he also clearly considered himself a disciple. Owen executed a faithful reproduction of Maclure's portrait, originally painted in 1797 by the English painter Thomas James Northcote, and gave it a prominent place in his New Harmony home. More important, he also trained several other geologists who rose to successful careers of their own as survey geologists.

Table 1 lists those individuals associated with New Harmony who assumed leadership roles in state or federal survey projects. Of the ten projects represented, only one was led by a contemporary of William Maclure. This was Gerard Troost, who became the state geologist of Tennessee. Six major projects were led by David Dale Owen. Table 2 lists the New Harmony associates who served in subordinate roles in various state and federal survey projects. Owen himself gained valuable experience working as an assistant for Troost.

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<sup>14</sup>Quoted in Johnson, "Geology in American Education," 1197.

<sup>15</sup>N. G. Lane, "New Harmony and Pioneer Geology," *Geotimes*, XI (1966), 18-22.

<sup>16</sup>David Dale Owen, *Report of a geological exploration of part of Iowa, Wisconsin, and Illinois*, in U. S., House of Representatives, 28 Cong., sess. 1, 1840, Executive Document 239, p. 161.

<sup>17</sup>William B. Hendrickson, *David Dale Owen: Pioneer Geologist of the Middle West* (*Indiana Historical Collections*, Vol. XXVII; Indianapolis, 1943), 180.

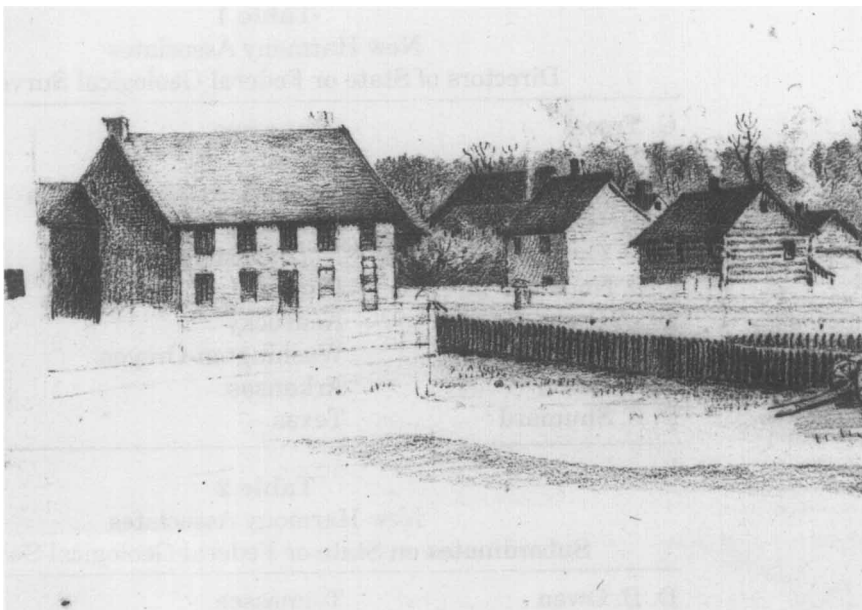


**Table 1**  
New Harmony Associates  
Directors of State or Federal Geological Surveys

G. Troost	Tennessee	1831
D. D. Owen	Indiana	1837
D. D. Owen	Iowa-Wisconsin & Illinois	1839
D. D. Owen	Chippewa District	1847
D. D. Owen	Northwest Territories	1849
J. G. Norwood	Illinois	1851
D. D. Owen	Kentucky	1854
J. Evans	Washington-Oregon	1854
D. D. Owen	Arkansas	1857
B. F. Shumard	Texas	1858

**Table 2**  
New Harmony Associates  
Subordinates on State or Federal Geological Surveys

D. D. Owen	Tennessee	1836
J. C. Norwood	Chippewa District	1847
B. F. Shumard		
R. Owen	Northwest Territories	1849
J. Evans		
F. B. Meek		
J. G. Norwood		
B. F. Shumard		
H. Pratten		
J. G. Norwood	Missouri	1853
B. F. Shumard		
F. B. Meek		
E. T. Cox	Kentucky	1854
S. T. Lyon		
B. F. Shumard	Oregon-Washington	1854
E. T. Cox	Arkansas	1857
E. T. Cox	Illinois	1858
E. B. Meek		



In turn, he provided “on-the-job” training for others like Joseph G. Norwood, J. Evans, and B. F. Shumard, who eventually commanded leadership roles in other state or federal survey projects.

Maclure was able to watch the unfolding career of David Dale Owen from afar in Mexico through letters from his brother Alexander Maclure in New Harmony. A letter dated October 18, 1836, for example, provided the following information:

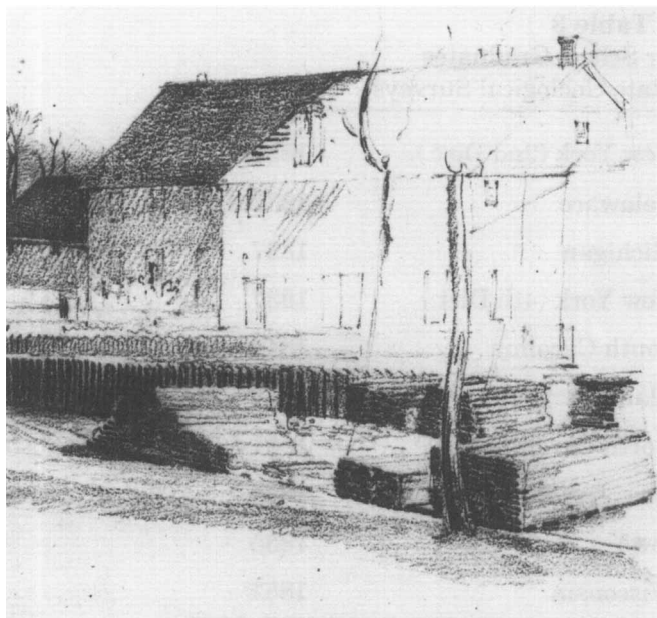
The science of geology has advanced so far in this country that many of the states have now got their Geological Survey and all of them will doubtless have them soon. Even the State of Indiana and David Dale Owen I think is likely to be appointed the first Geological Surveyor of the State of Indiana, and perhaps he is as well if not better qualified for it than any other person in the state. At present he is on a Geological Tour with Doctor Troost, who is Geologist Surveyor for the State of Tennessee.<sup>18</sup>

Indeed, in 1837 Indiana confirmed David Dale Owen as her first state geologist. In his first survey report he wrote the following passage in a style strongly evocative of Maclure’s ethic of practical science for the common good.

In older states, and more thickly settled countries, Science, going hand in hand with Commercial Enterprise, has already seized upon all the mineral riches that more immediately present themselves. Here, in our young State, comparatively untrodden by the footsteps of inquisitive Science, we have a rich and productive field, on which to imitate their enterprize and rival their discoveries. I have considered it my duty, while surveying a country as new as ours, to remember, that a State just settling, is like a young man starting in life, whom it behooves to secure to himself a competency, before he indulges in unproductive fancies. I have considered it the most impor-

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<sup>18</sup>Quoted in Johnson, “Geology in American Education,” 1196-97.



SOUTHEAST VIEW FROM FRAME CHURCH  
SHOWING SHOE FACTORY (LATER DAVID  
DALE OWEN'S SECOND LABORATORY)  
SKETCH BY CHARLES-ALEXANDRE LESUEUR

Muséum d'Histoire Naturelle du Havre,  
Le Havre, France (#46114).

tant object, to search out the hidden resources of the State, and open new fields of enterprise to her citizens. That object effected, time enough will remain to institute inquiries (which a liberal policy forbids us to overlook) of a less productive and more abstract character; inquiries which are interesting in a scientific, rather than a commercial, point of view.<sup>19</sup>

Announced at the beginning of his professional career, this strong ethic of public service through government-sponsored science was entirely typical of Owen's remaining active career and the way he influenced others working with him.

Table 3 lists those graduates of Eaton's Rensselaer School who went on to lead state or federal surveys. Eight different survey projects were entrusted to a half dozen individuals who had undergone the same training in Troy, New York. The best known of these is James Hall (1811–1898), who led a long and very productive professional career mostly associated with New York state but also with Iowa and Wisconsin.<sup>20</sup> In contrast to the New Harmony “students,” however, only one of the Rensselaer graduates who served in a subordinate role on a survey project (see Table 4) later rose to a higher position of authority. This is probably partly because of Hall's proclivity to retain the service of his field assistants over a long period of time, some of whom were Rensselaer graduates.

<sup>19</sup>David Dale Owen, “Report of a Geological Reconnaissance of the State of Indiana; made in the year 1837,” in *Indiana Senate Journal* (1837–1838), 132.

<sup>20</sup>J. M. Clark, *James Hall of Albany: Geologist and Palaeontologist, 1811–1898* (Albany, N.Y., 1921), 276, 286.

**Table 3**  
 Rensselaer School Graduates  
 Directors of State Geological Surveys

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E. Emmons	New York (2nd Dist.)	1836
J. C. Booth	Delaware	1837
D. Houghton	Michigan	1837
J. Hall	New York (4th Dist.)	1837
M. Tuomey	South Carolina	1844
M. Tuomey	Alabama	1848
E. Emmons	North Carolina	1851
W. K. Kitchell	New Jersey	1854
J. Hall	Iowa	1855
J. Hall	Wisconsin	1857

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**Table 4**  
 Rensselaer School Graduates  
 Subordinates on State Geological Surveys

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C. Briggs	Virginia	1835
J. C. Booth	Pennsylvania	1836
C. Briggs	Ohio	1836
E. S. Carr	New York (3rd)	1837
G. W. Boyd		
E. S. Carr	Wisconsin	1857

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On April 5, 1841, in Philadelphia, Edward Hitchcock addressed the one-year old Association of American Geologists on the subject of the phenomenal growth of state geological surveys throughout the United States. He was not an alumnus of either the Rensselaer School or the New Harmony movement, but he was one of those rare, self-taught individuals who arrived at the crossroads of education and survey work as a professor of geology at Amherst College and the sole agent of the Massachusetts geological survey, which was founded in 1830. He observed that a total of nineteen state funded surveys were initiated during the nineteen years from 1823–1841. The astonishment over this unusual expansion of government science had not gone unreported to William Maclure, again informed by Alexander Maclure in New Harmony.

Hitchcock proudly regarded the rush of the states to form active geological surveys as something “peculiarly American.” Indeed, the only other country to have previously considered such a public program was France, whose Ministry of Mining oversaw the division of that country into 214 districts for potential geological mapping in 1766. There was never any clear agreement on how the maps should be made or their information utilized, and the ambitious project floundered. The initial government surveys in the United States were strictly state sponsored, the first being undertaken in North Carolina from 1823–1827 and the second being undertaken in South Carolina from 1824–1826.<sup>21</sup> These projects were poorly funded, however, and the results were marginal. The movement to fund adequately geological survey work from tax revenues did not really begin until 1830 when Hitchcock’s Massachusetts survey was initiated.

In his 1841 address Hitchcock estimated that “our favorite science is now in this country 20 years in advance of what it would have been, if left to individual efforts.” What was the motivating spirit behind this historically unusual turn of events? The year 1825 is not only a landmark year in terms of the educational experimentation undertaken by Amos Eaton and William Maclure, but it is also notable for the remarks on the role of government in the promotion of science made during President John Quincy Adams’s first annual message to Congress. In part, President Adams said,

Roads and canals, by multiplying and facilitating the communications and intercourse between distant regions and multitudes of men, are among the most important means of improvement. But moral, political, intellectual improvement are duties assigned by the Author of Our Existence to social no less than to individual man. For the fulfillment of these duties governments are invested with power, and to the attainment of the end—the progressive improvement of the condition of the governed—the exercise of delegated powers is a duty as sacred and indispensable as the usurpation of powers not granted is criminal and odious.

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<sup>21</sup>Markes E. Johnson, “Early Survey Work and the Roots of Geological Education in the Carolinas,” *Earth Sciences History*, IV (1985), 3-9.

In inviting the attention of Congress to the subject of internal improvements upon a view thus enlarged it is not my design to recommend the equipment of an expedition for circumnavigation of the globe for purposes of scientific research and inquiry. We have objects of useful investigation nearer home, and to which our cares may be more beneficially applied. The interior of our own territories has yet been very imperfectly explored.<sup>22</sup>

The strong spirit of public service exhibited by the rapid growth of the survey movement reflects first and foremost the developing needs of commerce in a free and expanding society. These needs benefitted from the strong moral example set independently in 1825 by William Maclure in New Harmony and Amos Eaton at the Rensselaer School in stressing the practical applications of science education to the common good. A fainter echo reverberates from President John Quincy Adams's address before Congress in 1825, in which he advocated a liberal policy of internal improvements based solidly on federal sponsorship of the sciences.

The most productive and continuous burst of geological survey work occurred through a period of thirty-one years between 1830 and 1860. During that interval, fifty-six separate projects were conducted in thirty-three states or territories. The New Harmony and Troy establishments provided leaders and participants for nearly half (48 percent) of these projects.<sup>23</sup> Training received by students at the Rensselaer and New Harmony establishments followed a simple maxim born of Eaton's and Maclure's educational idealism: learn by doing. David Dale Owen from New Harmony and James Hall from Rensselaer were the most prominent geologists of this tradition.

No other educational institutions come close to the record achieved by these two pioneering schools during this particular period of time. Modeled on the example of the German research university as a means of producing an elite core of scientifically trained professionals, Harvard's Lawrence School was not founded until 1847, and Yale's Sheffield School was not founded until 1856.

During the early nineteenth century when newly professional geologists were being attracted to survey projects, only nine of the fifty-six projects (16 percent) were federally sponsored; four of the projects (7 percent) were actually private affairs; all the rest (77 percent) were state-sponsored survey projects.<sup>24</sup> Federal largess on a scale dreamed of by President Adams was not to be realized until after the Civil War when expansion prompted four great western surveys under the Army Corps of Engineers. The United States Geological Survey with its responsibilities for "classification of the public lands,

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<sup>22</sup>Quoted in Henry S. Commager, ed., "The Nationalism of President John Quincy Adams," *Documents of American History* (6th ed., New York, 1958), 242-43.

<sup>23</sup>Johnson, "Geology in American Education," 1192-98.

<sup>24</sup>*Ibid.*

DAVID DALE OWEN'S THIRD  
AND FOURTH LABORATORIES



New Harmony Workingmen's Institute,  
New Harmony, Indiana.

and examination of the geological structure, mineral resources, and products of the national domain" was not established until 1879.<sup>25</sup>

Both the New Harmony and Rensselaer establishments independently developed outdoor laboratories that allowed their students to gain valuable field experience. Amos Eaton pioneered a style of field camp instruction still broadly imitated today. David Dale Owen, emulating Maclure's style of education in the short-lived School of Industry, employed a method of on-the-job training through his extensive enlistment of survey assistants. A thorough science curriculum in American education was very rare when William Maclure and Amos Eaton began their educational enterprises in 1825. As economic pressures made government sponsorship of geological survey work feasible, a core of professional field geologists was prepared to begin professional service to a nation eager to realize and utilize the full potential of its natural resources.

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<sup>25</sup>M. C. Rabbitt, *The United States Geological Survey: 1879-1989* (United States Geological Survey Circular 1050, Washington, D.C., 1989), 52.