Curriculum Units by Fellows of the Yale-New Haven Teachers Institute
1984 Volume VI: Geology and the Industrial History of Connecticut

# The Geologic History of the Earth and Connecticut: Effects it had on our State

Curriculum Unit 84.06.02
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Why would one want to undertake the task of teaching a unit on Geology and Industrial Growth in Connecticut when computermania has invaded the schools? A very good question, indeed! One that sixth grade Social Studies teachers have been asking themselves for years. We, who are charged with teaching Connecticut History, must find new and innovative ways to ensure that our students are getting an exposure to the many interesting facts that dot our state's history. In trying to locate books that are suitable to use in the classroom that detail geologic history, industrial growth and natural resources to a particular state, we find ourselves scratching our head in frustration, for they are very rare.

It is for this reason that I have embarked on this journey through the geologic forces and early industrial growth of our state so we can share with our students the rich history that surrounds us. The unit that follows has a major goal of providing teachers with a general overview of the basic geologic history of the Earth. The major emphasis and impetus for the unit will be the detailing of the Earth's geologic history while in subsequent sections (which will be brief but should be expanded and used on their own) discussing Connecticut's geologic features, industrial growth in the Town of Farmington (Unionville), Collinsville and the iron industry.

This unit is intended primarily for grade six students in Social Studies, but can be interspersed with other disciplines such as Science, Math, Art, etc. The unit used, as is, will last approximately six weeks, and can be taught in lieu of the stated curriculum or as a supplement to it.

You will find, after examining the curriculum and texts available, that the areas covered in the unit are sparsely mentioned. With this information and unit, the teacher will be able to fill in the gaps in geology and greatly expand the industrial growth sections, through the study of the Town of Farmington. The unit can be used as a whole, with each section's topics that can be covered as a distinct mini unit in conjunction with the curriculum used or in parts as is needed to fill in gaps.

It must be kept in mind that all of the sections other than the basic geology one, is just a guide and further research should be done to fill in the full information you would want to provide for your class. (see bibliography)

When the unit is completed, the children will have a background in the geologic forces and history of the Earth and Connecticut spanning its formation, making of the continent and finally the shaping of Connecticut. Also,

in illustrating one particular city, the children can gain a sense of a city in Connecticut far removed from New Haven and learn about its geologic, industrial, and commercial history.

It is our task to challenge and stimulate the children into exploring and examining the varied aspects of Connecticut History. It is for this reason that field trips, films, filmstrips and lectures are an intricate part of this unit and can be used as a highly successful motivational tool.

(Use Winchester School Library)

## *GEOLOGIC BEGINNINGS*

In the beginning . . . sounds like a fairy tale yet is the point that we must start our discussion and interestingly enough is the source of many questions asked by the children. Children walk to school every day and see the results of geologic activity, yet either ignore it completely or take it for granted. The children at our school can see a major geological representation of this activity, West Rock, yet would be hard pressed to discuss or detail specific information about it.

However, just to say here is Connecticut with its Western and Eastern Highlands, Central Valley and Coastal Lowland would leave a tremendous void of information necessary to draw conclusions and make inferences. It is with this in mind that I do start, In the beginning . . . , and delve into our geologic history. In this section the children will gain a knowledge of the many facets involved with the formation of the Solar System, specifically the Earth. During the unit of study the children will be able to discuss the continental drift theory, the formation of volcanoes, valleys and the mountain building theories. All of these events and theories discussed will provide an excellent mechanism to help the children develop the higher level thinking processes of critical and deductive reasoning and extrapolation based on evidence supplied. The children will then be able to use these skills in discussing the formation of Connecticut.

As we narrow down the scope of our discussion and center on the geologic activity relevant to Connecticut, the children will be able to list and describe these geologic forces of glaciation, erosion and volcanic and mountain building. The children will be able to provide information of the types of rocks native to Connecticut, how they were formed, their location and finally the importance they had in forming the industry of the state.

## *HOW IT ALL BEGAN*

As video games have become popular and voluminous, so too, have scientists with the number of theories they have on the formation of our Solar System. Many theories they have overlap each other with common elements that date back to the 1700's with Kant and Laplace. [1] Two that might be used for discussion in class are the "close encounter" and "collision" theories [2] which have many flaws but share in their failure to explain how moons were formed.

The popular theory today takes pieces from the theories of both of these men and calls it the "nebular theory". This theory proposes that our Solar System evolved from a large cloud of gaseous molecules (scientists can observe similar occurrences in space today) that had varying size pockets of swirling areas in

it. As the swirling action of the cloud began to move faster, especially in the area in the middle, compounds formed (ammonia and water) and dust particles accumulated in the larger middle swirl and formed the sun; while at the same time the smaller swirls were continuing to move about this “sun” collecting dust and debris. Scientists believe that at some point the sun experienced thermonuclear fusion at its center and began releasing light and energy. Why didn’t the planets also turn into “suns”? Simply stated, the planets did not have enough mass to trap hydrogen atoms to start this reaction. The planets were formed later as the swirling clouds of ice and water attracted dust and debris and stuck together.

What then became of this cold ball in space we have come to call the Earth? Well, many things—the core became hot and molten as radioactive elements began to act and molten rock often broke through the surface emitting gases that dispersed into space leaving methane and ammonia behind. As the radioactive elements melted the Earth’s center, gases were lost due to geologic activity; the Earth cooled and we were left with a planet that had four distinct layers: Crust, Mantle, Inner Core and Outer Core. (see diagram A)

In our journey through geologic history, we will eventually come to a discussion about the globe and inevitably a child will say, “these pieces look like they can fit together!!” In fact, most scientists believe that 200 million years ago the continents were combined into a large land mass called “Pangaea”. What then took place? Early scientific knowledge could not explain why marine fossils were found on mountain tops or why fossils of animals known to be only living in the tropics could turn up in Antarctica! The difficulty that scientists had could be traced to the very powerful influence and hold that religion had during this time period. Many geologists, along with astronomers, were continuing to try to fit the pieces of the puzzle together in terms of literal biblical translations and interpretations. Any theories contrary to the Bible were set aside and the scientist held in low esteem. Only recently, findings have allowed scientists to formulate, according to Dr. Maurice Ewing, “global-plate tectonics“ [3] a theory stated by F.B. Taylor and Alfred Wegener [4] refined and updated that is now generally agreed upon, although some of the finer points still go unanswered.

## *GLOBAL-PLATE TECTONICS*

This theory contends that the Earth’s Crust is not a solid mass but is made of “plates” which float on the Earth’s Mantle. It also states that the Earth, which was mostly covered by water, was at one time, one large continent and has, over the last 200 million years split to form seven continents. This movement of the plates produces a great deal of geologic activity that effects us today-for scientists contend that the continents are still moving!! There are four distinct movements of the plates that have been identified which produce this continental activity. One type of movement that the plates make by moving back and forth produce violent earthquakes that affect the land masses. (This type of movement, or plate collision, can be evidenced by India crashing into Asia and forming the Himalayas.) Another movement of the plates occurs when they split apart and allow molten rock to slip through. Other plate action happens when one plate dips below another (sub-suction zone) to produce large valleys and volcanoes. Finally, we have the action of two plates being continually pushed around and new ones formed by molten rock being forced through the ocean floor. Another facet of this movement is when a continental plate rides over an ocean plate and simply covers it up taking off the sediments formed.

## *VOLCANOES*

Volcanoes, a source of great power, beauty, destruction and benefit to man have been written, talked and wondered about for centuries. Volcanoes, simply stated, are openings in the Earth's surface through which molten rock (magma) has come out. When we look at volcanoes, however, we get a different picture formed—that of a cone shaped mountain spewing forth lava and gases. Scientists believe that in order to have volcanoes, magma must be present 20-40 miles below the surface of the Earth and have a conduit to carry the rocks and gases to the surface. (see diagram B) The familiar cone shapes of the volcanoes are built up, not from lava, but from ashes and cinders along with other debris thrown out.

Although still feared, volcanoes produce by-products that are useful to man. The volcanoes have built new islands that eventually could be inhabited; have a great effect in forming the Earth's atmosphere (see book by H. Stommel in the bibliography that addresses the effects volcanoes have on the atmosphere. In particular, this book discusses a notable turnabout in the seasons once suffered through in New England.); created water by combining gases; are being harnessed to produce electricity (Italy and New Zealand) from steam; pumice for grinding; sulphur to make chemicals; good farmland from lava and ash; and finally the lava itself, used to help produce a water source because of its porous qualities and traprock used in various forms of building.

## *MOUNTAINS*

Mountains, which are in our horizon, rise to a majestic height, can be snow-covered, beautiful and breathtaking. What a mountain is, however, can be very difficult to describe. Generally, one can say mountains are 2,000 feet or more and have a noticeably different character from the surrounding area. [5] Mountain formation is a process that is complicated and long lasting, except in the development of volcanic mountains, which are made relatively quickly due to the eruption of, and spewing out of, cinder, ash and lava. Fault-block mountains grow when crustal masses tilt or slip along a fault, this action is very slow and erosion carves the upturned scarp and builds rubble at its base. [6]

Fold-mountains are formed due to large ripples in the Earth' s Crust. [7] These ripples occur when the forces in the Earth compress rock (usually sedimentary) and push them upward. In this process faulting can also happen on top of more folding with dramatic results, The Rocky Mountains and Himalayas. (This process is also called continental collision.) Scientists believe that on the Earth today, that the two processes are still going on; new mountains are being made and still pushing upwards, while erosion is taking its toll on the older ones.

## *GEOLOGIC FEATURES OF CONNECTICUT*

As we have seen, there have been many geologic forces that have helped shape and are still shaping the Earth. The geologic forces that acted upon the land mass we call Connecticut produced four very distinct areas: Central Valley, Coastal Lowland, Western Highland and Eastern Highland. The forces that played a key role in determining these include volcanic and mountain building activity, erosion and glaciation.

The area of Connecticut was at one time a mountain that had been formed by continental collision. (In the past this process has also formed the Appalachian Mountains and Highlands in Scotland and Scandanavia. [8]) Nearly 180 million years ago as the Atlantic Ocean began to split apart, fracturing occurred (fracturing results from the Earth's movements or contractions of Igneous rock as it cools [9]), accompanied by volcanic activity which left lava to form the Hudson River Palisades. The lava cooled and became trapped by layers of sand and gravel into the area known as the Connecticut Valley. This area extends from Vermont, through Massachusetts and Connecticut, ending in Long Island Sound. (see diagrams C and D)

The continual process of erosion (wearing down of a surface) was taking a mighty toll on our mountains and transporting layers of sand into the fault area, The Connecticut Valley. The geologic forces that were active throughout the Earth had not yet finished with Connecticut. Forces within the Earth pushed on either side of this valley and the hardened trapped lava (traprock) which was very strong, cracked and broke through the surface in many areas of the state. Sediments which had been continually deposited on this area were compressed into Sandstone as the fault continued its downward motion. As water eroded the softer sand and gravel surrounding the traprock, the Central Valley began to take the shape we see today. Other cracks also occurred which account for the variety of landscapes we have in our state. The sediment that was eroded away during this time was deposited in a coastal plain, part of which we now call Long Island.

## *GLACIERS*

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There have been several glaciations that have had an impact on Connecticut geology with the last glacial activity ending about 10,000 years ago. In order to have a glacier, certain conditions must exist such as low temperatures, which do not allow all of the snow to melt (permanent snow line), heavy snowfall and mountains that allow a build-up.

The last glacier spread from Canada to the middle of Long Island Sound and the trapped gravel and rock helped to smooth out areas as well as leave deep tracks in the surface. (The rocks used to mark the surface were "plucked" from outcrops or just dropped on the ice from mountain ridges.) As the ice receded, sand and clay deposits were left in various areas around the state which led to the development of certain industries using these deposits. (sand for quarries, clay for bricks)

Glacial activity tends to modify existing landforms. The Connecticut Valley has a rich deposit of alluvial soil that provides the region with an excellent agricultural system. This valley was a exception to the general soil left in New England because most of the valley was an old lake bottom. More in line with the rest of New England, Connecticut has been left with glacial till (a mixture of sand, clay and rocks) which make farming unprofitable. In this manner many decisions about our industry and commerce were made thousands of years ago.

An example of the force glaciers have can be seen all around us by finding large rocks called "erratics" which are seemingly out of proportion and design with the surrounding formations. These rocks were carried a great distance in the glacial ice and then deposited on the ground. (An example would be in the Western Highlands on Fountain Street where you can find traprock on paths in the woods.)

Other effects of glaciation that one might investigate are its effect on sea level, outwash structures, kettleholes, moraines, till, and ice contact drifts to mention a few. (The use of a surficial geology map would

be a great help in presenting this material—see lesson plans.)

## *NATIVE ROCKS*

Connecticut has within its boundaries the three types of rocks found on the Earth: Igneous, Sedimentary, and Metamorphic. These rocks have spawned many businesses that have been vital to the economy of our state. Igneous rocks form by the cooling and solidification of magma in the crust and of lava on the crust. [10] (see diagrams) We tend to find Igneous rocks in places where the Earth has broken through, East Rock, West Rock and outcrops in the Central Valley, An easy way to identify traprock is its black color. It is also possible to find this type of rock with a red coloring in it. This red coloring is actually the rusting of the rock due to its high iron content being exposed to the elements. Areas in the state where you could find samples of these rocks, which were primarily crushed and used for building roads (traprock) would be: Woodbury Traprock Quarry, Pine Rock Quarry and Tilcon Quarry.

Another rock common to Connecticut and used in industry is Sedimentary Rock. These rocks can be made of loose mineral particles deposited on land or in water then compacted and cemented together, e.g. sandstone from sand, shale from mud. [11] This type of stone is easily cut for building supplies, is very porous and does not weather well unless properly installed in a wall. A great deal of Portland sandstone was used in buildings in New York City. Connecticut sandstone is easily recognizable due to its high concentration of iron which makes it have a brown appearance. Places to visit are: The Andrews and The Case Quarries in Portland.

Metamorphic Rocks are Igneous and Sedimentary Rocks changed by internal heat, pressure and penetration by fluids without melting. They form deep in the Crust and are later exposed by erosion. [12] Examples of Metamorphic Rock in Connecticut are granite, that is found in Stony Creek and marble, found in the highlands of Northwestern Connecticut. Both of these rocks were formed by a change in sandstone. These rocks resist weathering very well and are used a great deal in buildings and curbstones. (The Brooklyn Bridge has facings that came from the Stony Creek Quarry.) Places to visit are: Stony Creek and Cobalt Mines.

## *FARMINGTON*

Note: In the section that follows, I will present a discussion of an area of study that can be used with the children. It will require the use of maps (see lesson plans) and some further research (see bibliography) on the teachers part. I intend this to be a guide and a small section of the entire unit compared to the major portion on the geology of the Earth and Connecticut.

Where did that lock you just opened come from? That hat you just bought, look inside the label. What time is it who knows, it may be a New Haven clock you have! Many of the items our parents or grandparents had in their home were made in Connecticut and children enjoy learning about them and finding out how and where they were made. Why did Connecticut turn away from farming? Were conditions so good for manufacturing in Connecticut, did “mother nature” leave us the proper tools? Are we restricted by nature in what we do? These and other points will be addressed as we proceed in this section on the Town of Farmington. In this section of the unit, which can be used directly after the geologic part, or on its own, children will gain a sense of how the

geologic formations around the town affected its growth using the river and canal as focal points for discussion. They will be able to describe the importance of the river while relating it to the pros and cons of the canal. The children will be able to provide an explanation of the founding of the Town of Farmington while showing how it changed from an agricultural to industrial area. They will be able to locate Farmington on a map: list factors that contributed to the industrial growth of Connecticut and relate this to the Town of Farmington (Unionville). Finally, the children will be able to list types of industry in Connecticut and those found in the Town of Farmington (Unionville).

The reasons that I chose the Town of Farmington, over other towns, are varied. One is that the Town of Farmington is a city far removed both physically and structurally from New Haven yet has historic and physical ties. (Farmington Canal) Field trips to this area, although difficult to arrange, are not impossible. They would be beneficial because it gets the children out of the city and exposes them to a semi-rural area that might not be accessible to them for some time. It is a source of information that will help them in their study of Connecticut History and will allow them to use and experiment with the skills they have formed in school.

How did the Town of Farmington (Unionville) get into the industrial arena? In our discussion, it is appropriate to begin using the entire state, then through examples, help the children formulate and investigate ideas based on the larger scope. Connecticut and Farmington were first agriculturally oriented and produced food that was shipped to New York and the West Indies. Any industrial goods needed, had to be made locally or imported from England. Why then did the towns leave this peaceful way of life and turn toward industry, which would have been a gamble?

There were many factors that influenced the change in the basic economy starting with a sudden growth in population and land not available to all who wanted it. Also, who is to say it was wanted at all? The Western and Eastern Highlands were not suitable for farming and the poor glacial soil outside of the Central Valley was not very conducive for farming. Along with poor fertilizer and the lack of equipment, adding the poor soil led the people of Connecticut by the hand into industry.

## *INDUSTRIAL FARMINGTON????—HISTORY AND GEOLOGY*

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A natural starting point in our discussion and one that is asked immediately is—where is Farmington? The Town of Farmington is located West of Hartford, North of New Haven and has land in the Western Highlands and Central Valley. The area that is now Farmington was bought in two different land deals with the Tunxis Indians. These indians were part of the Suckiaugs, whose chief was Sunckquasson. The indians were very friendly and even lived in the town at Indian Neck on the Farmington River. Relations were so good that the settlers made provisions for the indians' schooling, seats were set aside for them at town meetings and the names of some are found on church rolls. [13]

From this large parcel of land that was purchased from the indians, many smaller settlements started. [14] These settlements were formed by groups of families or followers of a particular church leader joining together.

Farmington, located in the central lowland basin, has a subsoil composed mostly of sandstone and shale that has had lava flow over it. When this lava cooled, basalt was formed. Talcott Mountain, formed by this lava, is an example of this type of basalt ridge. Talcott Mountain also divides the Connecticut Valley and smaller Farmington Lowlands. During the tertiary uplift, [15] the Farmington River flowed south to the ocean as the other

rivers to the east flowed over rock broken down more easily.

Finally, one last geologic event that changed the land around the Town of Farmington dramatically was caused by glaciation. The glacier, as it receded, eroded the land and left large deposits of glacial till. The glacier also changed the flow of the Farmington and Pequabuck Rivers. As glacial debris was deposited around Plainville, a lake was formed that stopped the flow of the rivers. The Farmington River was able to continue a new path eastward through a fault in Talcott Mountain at Tariffville Gap. The Farmington River, which once flowed to the ocean, now became a tributary of the Connecticut River.

## *INDUSTRIAL FARMINGTON—UNIONVILLE*

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There were three factors that attributed to the change in Farmington from an agricultural to industrial area. One factor can be thought of as the “grandfather” to the California gold rush. During the seventeenth century, graphite was located in Waterbury (no exact location given) and copper was discovered in Simsbury. These mineral discoveries touched off a search in the Farmington area for minerals that could be used.

Another factor was that waterpower, although not yet used was starting to come into its own as a power source. Men were now learning how to harness the river’s power, and mills at this time would turn a profit. Finally there was a factor best stated by Simeon Hart, “There was a low return on the time and money invested in farming.” [16]

The early use of the Farmington River, besides that of water, was as a source of power for a gristmill. (This mill is pre 1700 and still visible.) As power demands began to increase, modifications and alterations had to be made to the river. Some businesses (1850-1870) that were dependent on the river as a source of power and which employed a large number of people were: The Upson Nut Company which made bolts, nuts, rules, belt hooks and door springs; The Upson & Hart Company which made table cutlery, nut cracks, nut picks, bicycle pedals and chains; The Platner and Porter Paper Company which made fine book and writing paper; The Ripley Company that made binders’s board; J. Broadbent and Son who made cotton batting and hosiery yarn and The Case Company that made manilla and wrapping paper. [17] (The Platner and Ripley Companies can be found on the 1878 Bailey and Company Map of Unionville #’s 13 and 18 respectively.) Although there was a great deal of industrial activity in this region, the absence of a rail connection to Hartford and fluctuations in water supply hindered the further growth of business.

Waterpower was essential to economic growth and James Cowles, recognizing this, made alterations on the river to best utilize its potential. This was a period in Farmington history after 1820-1850 which began to show a gradual transformation from an agricultural to industrial area. The tax list of 1821 showed that in Farmington (Unionville) there were 14 mills and 14 “factories”. In just 20 years the tax list confirms this change by indicating a drop in mills to 12 and an increase in factories to 25. [18] (For a complete list of businesses, use pages 249-252 in Bickford’s book and refer to the 1853 Unionville map.)

As time passed new inventions made themselves available to better harness the river’s power. A major breakthrough was the use of turbines which greatly increased power and eventually powered all of the factories. An example that shows need and ingenuity was when the Cowles Paper Company, organized in 1866 needed power. What was done to supply the power was to build a power canal underground, below Main Street, to the factory. (Location noted on Unionville Map 1878 #11)

## THE FARMINGTON CANAL

The canal construction was started on July 4, 1825, after James Hillhouse, in 1822, secured a charter. The rush to complete this project became intensified after the building of the Erie Canal and hopes were raised about its potential.

The building of the canal was hoped to increase trade and spur industrial growth. The people in this region wanted to take away as much business as they could from the river towns especially Hartford. The canal cut through Hamden, Cheshire, Plainville, Southington, Farmington (1828), Avon, Granby. then across to Northampton, Massachusetts (1835). Trouble immediately followed: landslides, washouts, leakages, lawsuits, floods and boat crashes hampered its profitability. Management changed hands often and investors had to pour money into it. The canal venture finally ended in 1847 and rights were sold to Consolidated Railroad.

Finally, one last alteration was made to the river to help produce a greater source of power to move machines. The alteration was made to the river by the Farmington River Company which built a power canal that produced a water-fall of 36 feet and added much needed power to the region. In addition to the factories mentioned earlier (Platner and Ripley), the companies that benefited from being in Unionville and utilizing its good source of power were: The Union Nut Company (Upson Nut) which made nuts, bolts, and washers; The Standard Hule Company that made levels and iron planes and The Cowles Hardware Company which made home furnishings. (There locations can be seen on the Unionville Map 1878 #'s 10, 14, 17.)

## FOR ANOTHER TIME

Note: The last two sections are briefly mentioned as possible future areas for teachers to research on their own. These are interesting areas and will allow you to utilize skills that the class has already acquired through the use of this unit. Another way that the remaining two summaries can be used is for those children who are able to pursue and research topics independently to be assigned them as special projects.

## COLLINSVILLE: MORE THAN JUST A TOWN

The Collins Brothers began manufacturing axes and machetes around 1826 along with William Wells and being joined in 1832 by E.K. Root. Samuel Collins was a very shrewd businessman who believed in controlling all phases, of not only his business, but the "factory town" that grew up as a result of his enterprises.

The site chosen for his factory was carefully selected considering land factors and natural resources that would enhance his operation. He chose a site that had a water supply formed by an outcrop of bedrock which formed a waterfall, and near at the time to the iron industry.

As was the case with so many factories being supplied by water, even Samuel Collins, who painstakingly saw to all phases of the business, underestimated the water supply. This underestimation was probably due to unreliable topographical maps. Eventually Collins was forced, in order to keep expanding his business, to modify his water supply to meet his demands for power. He accomplished this by raising the dam that supplied water to his water wheels, replacing the water wheels with turbines and building, along with the

Greenwoods Company, a reservoir to supply water when normal supplies were low.

The Collins factory was closely tied to the iron industry in Connecticut because of the quantity of iron needed in the production of axes. They soon found out that the quality of iron produced in Salisbury and other Connecticut iron factories were not up to the standards of Samuel Collins, so they began to import their raw materials from England. The English suppliers were experiencing difficulty in making their quotas, so, Samuel Collins took it upon himself to produce his own steel. He brought in a European who had a qualified background to operate this plant which produced a high quality of steel for the company.

## *IRON INDUSTRY*

In Connecticut, the iron industry possessed a high degree of esteem and posture in the United States for a very long time. It was an industry that became extinct, not because it had exhausted all of its resources, but for many other reasons.

The Connecticut Iron Industry was primarily located in the northwestern section of the state in Salisbury, Sharon and Kent. The industry in Salisbury existed until 1923 with a history almost two centuries long. Interestingly, one of the early iron works was located in our own backyard and fully operational in the middle 1600's, its location was East Haven!! The shift however, to upstate Connecticut was a logical move. There was a large supply of "quality" iron ore, water power, a source of fuel and the fact that the supply of iron ore from North Haven, that supplied the East Haven factory, was exhausted.

The iron industry began to handle orders from many different concerns such as the Whitney and Springfield Armories which made muskets contracted for with the federal government, needed large quantities of iron. It was soon discovered and the source of great concern by the gun makers that the Salisbury makers could not guarantee and maintain a high quality of iron products and much business was lost to the Europeans.

Some factors involved in this loss were: not modernizing plants, poor managers, inconsistent quality of iron in the size and distribution of slag, high phosphorous content in the iron and European technology and competition.

## Notes

1. Rhodes W. Fairbridge, *Marvels and Mysteries of the World Around Us* , (Pleasantville, New York, The Readers Digest Assoc. Inc., 1972), p.10.
2. Ibid., p.10.
3. Ibid., pgs. 19-20.
4. Thomas Browne, *The Earth* , (Great Britain, Chartwell Books Inc., 1977), p.17.
5. Ibid., p.21.
6. Edwin H. Colbert, Our *Continent* , (Washington, D.C. National Geographic Society, 1976), p.36.
7. Browne, p.21.

8. Colbert, p.40.
9. George F. Adams and Jerome Wyckoff, *Landforms* , (New York, Golden Press, 1971), p.29.
10. Ibid., p.22.
11. Ibid., p.24.
12. Ibid., p.26.
13. Tercentenary Commission of the State of Connecticut, *Farmington, One of the Mother Towns of Connecticut* , (New Haven, Yale University Press, 1935), pgs. 4-5.
14. Christopher P. Bickford, *Farmington In Connecticut* , (Canaan, New Hampshire, Phoenix Publishing, 1982), p. 101.
15. Ibid., pgs.3-4.
16. Ibid., p.221.
17. Ibid., p.247.
18. George C. Atwell, *The Connecticut Quarterly Vol. III Jan.-Dec. 1897* , (Hartford, 1897), p. 340.
19. W. Storrs Lee, *The Yankees of Connecticut* , (New York, Henry Holt and Company, 1957), p.77.

## *SAMPLE LESSON #1*

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***Objectives: The child will be able to:***

1. explain the theory of “global plate tectonics”

2. explain the term “Pangaea”
3. illustrate graphically how the continents were proposed to be.

***Materials :*** rulers, scissors, globes, tape, glue, crayons, paper, ditto book *Map Reading The World Part I gr. 4-6* (Milliken) and encyclopedias listed in the bibliography.

***Procedure:***

1. Discuss the theory of “global plate tectonics” with the class and the Earth’s movements. (include Pangaea) Use the unit and encyclopedias.
2. Show overhead #4. This shows the continents as they look today, label them and have the children be able to recognize them.
3. Show overhead #27. This shows the continents randomly placed on the sheet. Repeat their names so the children will be able to recognize them.
4. Pass out ditto #27. This has the same random display of the continents and have the class cut them out and put them together where they feel they should fit.
5. Discuss all possibilities that the children have put together.
6. They may color and glue them if they choose to and time permits.

NOTE: The above exercise is intended to begin to show the class that the possibility existed that the continents were all joined together at one time. It will not match perfectly so you will have to guide them along. The matching of the continental margins, now flooded, would be better.

***SAMPLE LESSON*** **(The point of the following exercise is to begin to get children using maps.)**

***Objectives: The child will be able to:***

1. read a surficial geology map
2. Locate the route of the Farmington Canal
3. define: glacial striation swamp deposits outwash
   morainal deposits glacial drift alluvium
   artificial fill bedrock talus
   ice-contact stratified deposits

***Materials surficial geology map of New Britain Quadrangle #119, paper, pencils***

***Procedure:***

1. Make a slide of the map (very helpful aid).
2. Pass out maps to class (2-3 children per map).
3. Discuss terms and map legend. (all definitions are located on the opposite side of the map.)
4. Have the children locate the abandoned canal route and describe where it goes—the land it passes through.
5. Locate artificial fill, bedrock, swamp deposits, clay, sand and till pits, glacial striations, direction of meltwater and flood plain channel scars.

Note: Let the children find these areas on the map as they are discussed in class. They will eagerly do it and will become excited and enthusiastic. The key is to keep it light—let them learn by doing.

## *SAMPLE LESSON #3*

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***Objectives: The child will be able to:***

1. Trace the route of the Farmington Canal.
2. Transpose this route onto a regular state map.

***Materials Connecticut State Maps, maps reproduced from the pamphlet The Farmington Canal: A Proposal for Selective Restoration , paper, pencils and rulers***

***Procedure:***

1. Make slides of the maps.
2.. Make copies of the maps for the children. (2 per map)
3. Discuss the history of the canal—use Farmington book, and Farmington pamphlet as a source of information.
4. Use this sample below which can be adapted for the rest of the sections of the canal.
    p. 19 Farmington pamphlet—Hamden section from Lock 12 to Todd Street. Discuss:
    a) Lock 12 in Cheshire restored-National Register of Historic Places.

b) 3 centered skewed archway
c) stretch of canal detoured under roads
d) lock 13-stone lock with weir (allows excess water to flow around the lock) (hard to find)
e) its link between Sleeping Giant and Brooksvale Park

5. Transfer the location to a map of greater New Haven.
6. Discuss future uses of the canal—recreational (pages 33-39 in the Farmington pamphlet)
7. Possible field-trip

## STUDENT BIBLIOGRAPHY


George F. Adams and Jerome Wyckoff. *Landforms* . New York: Golden Press, Western Publishing Company, 1971.

A basic book on geology that can be very helpful in the class. It is easy to read with illustrations that are well done,

Thomas Browne, Editor. *The Mind Alive Encyclopedia: The Earth* . Great Britain: Marshall Cavendish Limited, 1977.

A good classroom resource that will be beneficial in helping the children understand basic geology of the earth.

Joseph B. Hoyt. *The Connecticut Story* . New Haven: Readers Press, 1981.

A general text on Connecticut History used in the schools.

William H. Matthews III. *The Story of Glaciers and the Ice Age* . New York: Harvey House Publishers, 1974.

An easily read book for children which will help them grasp many concepts about glaciers. Illustrations are adequate.

National Geographic Society. *Our Continent: A Natural History of North America* . Washington, D.C.: National Geographic Society, 1976.

A very good classroom reference book covering the Earth.

Reader's Digest. *Marvels and Mysteries of the World Around Us* . Pleasentville: The Reader's Digest Association, 1977.

A resource book that will help children, through the use of excellent illustrations, obtain basic information about the Earth' s past.

Kathleen H. Ryerson. *Rock Hound's Guide to Connecticut* . Stonington: The Pequot Press, Inc., 1968.

An excellent book that describes where different kinds of rocks can be found in Connecticut. Included are maps and diagrams with a list of quarries you can visit.

## TEACHER BIBLIOGRAPHY

Christopher P. Bickford. *Farmington in Connecticut* . New Hampshire: Phoenix Publishing, 1982.

This book gives a very detailed history of the Town of Farmington. It is a very well written book that will be of great help in the presentation of this unit.

Arthur L. Bloom and Charles W. Ellis Jr. *Postglacial Strati and Morphology of Coastal Connecticut* . State Geological and Natural History Survey, 1965.

This publication discusses three coastal marsh environments and the beaches of Westport and Norwalk. Highly technical teachers resource.

Jonathan Clapp. *The Farmington Canal: A Proposal for Selective Restoration* . State of Connecticut: Department of Environmental Protection, 1983.

A very useful guide tracing the canal route and detailing its history while noting plans for its proposed future uses. The maps detailing the canal are very well done.

Department of Environmental Protection. *Natural Resources Information Directory and List of Publications* . State of Connecticut, 1983.

A pamphlet that maps and other geologic publications can be ordered from at no charge. A must to have.

Robert B. Gordon. *Materials for Manufacturing: The Response of the Connecticut Iron Industry to Technological Change and Limited Resource* s. University of Chicago: Technology and Culture Vol. 24, No. 4, 1983.

An excellent resource article detailing the iron industry in Connecticut. It would be a great help in the For Another Time section of the unit.

Malcolm L. Johnson. *Yesterday's Connecticut* . Miami: E.A. Seeman Publishing, Inc., 1976.

A photographic history of Connecticut with short explanations and some written history. An excellent collection of old pictures.

W. Storrs Lee. *The Yankees of Connecticut* . New York: Henry Holt and Company, 1957.

A general book on Connecticut History. Teacher's reference, vocabulary to difficult for the children.

Chester R. Longwell and Edward S. Dana. *Walks and Rides in Central Connecticut and Massachusetts* . The Shoe String Press, Inc., 1961.

This book can provide you with an excellent source of the geologic history of Connecticut and Massachusetts. I would recommend that this book be used as a reference.

John Rodgers, et. al. *Explanatory Text for Preliminary Geological Map of Connecticut.* Storrs: State Geological and Natural History Survey, 1956.

A teachers' scientific resource for geologic information on Connecticut. Maps are included.

Helen Earle Sellers. *Connecticut Town Origins* . Stonington: The Pequot Press, Inc., 1942.

A book that lists all of the towns in Connecticut and describes their names and local histories.

Henry and Elizabeth Stommel. *Volcano Weather* . Newport: Seven Seas Press, 1983.

A book that can be used to illustrate the dramatic effects that a volcanic eruption can cause. The book has a section on the effects of an eruption in New England.

Tercentenary Commission. *Farmington, One of the Mother Towns of Connecticut* . State of Connecticut, 1935.

A brief history of the town of Farmington.

Tercentenary Commission. *The Rise of Manufacturing in Connecticut 1820-1850* . State of Connecticut, 1935.

A brief chronicle describing the growth of manufacturing during this time period in Connecticut.

Michael F. Tobin, Editor. *Field Trip Guidebook* , Hartford: Elementary School Principal's Association, 1970.

A resource book that lists specific field trips students can take in Connecticut and certain sections of New York.

Albert E. Van Dusen. Connecticut. New York: Random Rouse, 1961.

A detailed account of Connecticut History. It should be used primarily by teachers or very advanced readers.

George C. Atwell. *The Connecticut Quarterly Vol. III January-December 1897* .

A collection of articles relating to Connecticut.

*Unpublished Resource*

Robert B. Gordon. *Hydrological Science and the Development of Water Power for Manufacturing* . Yale

University: Kline Geology Lab.

***Maps (Natural Resources Pamphlet)***
Surficial Geology-New Britain Quadrangle GQ 119

Surficial Geology-Windsor Locks Quadrangle GQ 137

Aeromagnetic Map of the New Britain Quadrangle GP 846

***Maps (Courtesy of the Farmington Library)***
1878 Unionville Map-O.H. Bailey and Company Boston

1853 Unionville Map-E.M. Woodford

Unionville (Farmington Township)

*DIAGRAM A*
*(figure available in print form)*
*DIAGRAM B*
*(figure available in print form)*
*DIAGRAM C*
*Long Island Sound—Western and Eastern Highland-Metamorphic Rock. Central Valley-Traprock (lava) and Sandstone in different layers*
*(figure available in print form)*
*DIAGRAM D*
*Lava breaking through the Central Valley*
*(figure available in print form)*
*Map of Unionville Connecticut. O.H. Bailey and Company, 1878. Courtesy of Farmington (See author for larger map)*
*(figure available in print form)*
*Manuscript Map. Unionville. E.M. Woodford, 1853. Courtesy Town of Farmington (See author for larger map)*
*(figure available in print form)*
*Courtesy Town of Farmington (See author for larger map)*
*(figure available in print form)*