

## JOHN JOSSELYN'S GEOLOGICAL OBSERVATIONS IN 1672-1674

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In seventeenth-century England the stirrings of interest in science culminated in the founding of the Royal Society. The new Society eagerly accepted for publication observations of facts and of phenomena in the New World and reviewed approvingly publications issued independently. From a slightly lower level came the support of travel books which contained more or less of natural history and on a still lower level even the common people eagerly paid to see exhibitions of curiosities from across the sea (Goode, 1901: 68, 378).

John Josselyn was one of the men in Restoration England who was influenced by those who were encouraging each other in observation and discussion of "rarities" and natural phenomena. That Josselyn, an educated man and possibly a physician, was stirred by this influence to write on American natural history is indicated by his statement that he made it his "business to discover all along the Natural, Physical, and Chyrurgical Rarities of this New-found World" (Mood, 1935: 26).

John Josselyn (ca. 1608-1675)<sup>1</sup> was the son of Sir Thomas Josselyn of Willingdale-Doe, Essex. He spent 15 months in 1638 and 1639 partly in Massachusetts, but mostly at Black Point (now Scarborough),

Maine, where his older brother Henry was an important official. Many years later he returned to New England where he lived from 1663 to 1671. The intervening years in England correspond closely to the period of the Protectorate and must have been difficult ones for Josselyn, who was a staunch Royalist. Josselyn, a bachelor with no family ties, could travel extensively and appears to have done so in New England.

Upon his return to England in 1671 Josselyn wrote a general description of New England, which was published in 1672 as *New-England Rarities*. So well was this received and so favorably reviewed by the Royal Society that he put together his journals and added more material of local color and in 1674 dedicated to the Royal Society *An Account of Two Voyages to New-England*. . . . This was so successful that a second edition was necessary the following year.

Commentators on Josselyn have usually written approvingly of him. *New-England Rarities* was immediately and favorably reviewed (by Henry Oldenburg ?) in the *Philosophical Transactions of the Royal Society* (1672:5021-5023). Edward Tuckerman in 1865 reprinted Josselyn's books and wrote approvingly of him and of the importance of his botanical writings. Tyler (1885: 180-185), the colonial literary his-

<sup>1</sup> [Biographical information on Josselyn is not extensive; my summary is derived from Felter (1927), Mood (1933, 1935), and Goodwin (no date).]

torian, wrote of Josselyn in a delightfully sympathetic way. Tyler's little essay is full of quotable remarks, perhaps the best of which is the comment about "this author, whose scientific methods had in them so little severity. . . ." The historian of early American biology (Goode, 1901: 376) spoke approvingly of Josselyn's moderate tone and "picturesque style", but had only a moderately favorable opinion of his biological observations. The historian of American materia medica, Dr. Felter (1927: 8), referred to "the cheerful author, Josselyn" and quoted extensively and approvingly his lengthy sections on plants and medical observations. Dr. Felter reproduced Josselyn's illustrations of plants, supplied the botanical names for them as well as for most of the plants listed, and gave the present day names of the diseases so quaintly but recognizably described. Mood (1935) in a critical and perceptive essay analyzed Josselyn's writings against the background of the time in which he worked, speaking of his "timeless" and "freshness of appeal".

These writers recognized Josselyn's claim to important and very early contributions to American botany, zoology, materia medica, anthropology, politics, and medical observations, but no one of them, or any one else writing on history of science, as far as I can determine, has noted that the two books contain geological observations—of uneven quality to be sure—but of considerable importance.

Josselyn's writing is delightful and should be made available to present day readers. Josselyn was

a man of "polite reading" and good family, was acquainted with physic, if not actually a physician, and displayed a continuous interest in matters of the kitchen and cellar.

Josselyn's *Rarities*, after an introduction, is divided into six sections descriptive of the "Natural, Physicall and Chyrurgical Rarities": (1) Birds, (2) Beasts, (3) Fishes, (4) Serpents and Insects, (5) Plants, (6) Stones, Minerals, Metals and Earths. The section on plants and their culinary and individual uses is much the most extensive one. The first geological observation is in the introduction where Josselyn describes the aspect of the country and especially of the White Mountains and Mt. Washington (p. 3-4):<sup>2</sup>

The Country generally is Rocky and Mountainous, and extremely overgrown with wood, yet here and there beautified with large rich Valleys, wherein are Lakes ten, twenty, yea sixty miles in compass, out of which our great Rivers have their Beginnings.

Fourscore miles (upon a direct line) to the Northwest of *Scarborow* [Maine] a Ridge of Mountains run Northwest and Northeast an hundred Leagues<sup>3</sup>, known by the name of the *White Mountains*, upon which lieth, Snow all the year, and is a Land-mark twenty miles off at Sea. It is rising ground from the Sea shore to these Hills, and they are inaccessible but by the Gullies which the dissolved Snow hath made; in these Gullies grow *Saven* Bushes, [dwarf conifers] which being taken hold of are a good help to the climbing Discoverer;

<sup>2</sup> [References are to the 1672 edition of the *Rarities* and to the 1674 edition of the *Account of Two Voyages*. I was able to consult these editions in the Grenville Kane Collection of the Princeton University Library. It is a pleasure to record the helpfulness of Miss Julie Hudson, Curator of Rare Books, and of Dr. Howard Rice, Jr., Chief of the Division of Rare Books and Manuscripts, in my studies in the Princeton Library in 1954.]

Quotations from Josselyn are printed with the spelling and punctuation of the original, except for the medial long "s". An occasional comment or explanation within a quotation is indicated by square brackets [ ].]

<sup>3</sup> [The Grenville Kane copy, now in the Princeton Library, has "Leagues" struck out and "miles" substituted in what appears to be a seventeenth or eighteenth century hand.]

upon the top of the highest of these Mountains is a large Level or Plain of a day's journey over, whereon nothing grows but Moss; at the farther end of this Plain is another Hill called the *Sugar-Loaf*, to outward appearance a rude heap of massie stones piled one upon another, and you may as you ascend step from one stone to another, as if you were going up a pair of stairs, but winding still about the Hill till you come to the top, which will require half a day's time, and yet it is not above a Mile, where there is also a Level of about an Acre of ground, with a pond of clear water in the midst of it; which you may hear run down, but how it ascends is a mystery. From this rocky Hill you may see the whole Country round about; it is far above the lower Clouds, and from hence we beheld a Vapour (like a great Pillar) drawn up by the Sun Beams out of a great Lake or Pond into the Air, where it was formed into a Cloud. The Country beyond these Hills Northward is daunting terrible, being full of rocky Hills, as thick as Mole-hills in a Meadow, and clothed with infinite thick Woods.

This description, the earliest printed of the White Mountains reads like one written by a man who had climbed Mt. Washington; the description of Bigelows Lawn, Lake of the Clouds, and the "ravines" seem to be derived from first-hand knowledge.<sup>4</sup> The country northward from Mt. Washington is still "full of rocky Hills, . . . clothed with infinite thick wood." Josselyn was not the first to climb Mt. Washington, that was Darby Field in 1642 (Tuckerman, 1860: 35).

The most important physiographic observation of the introduction is that the "gullies" on Mt. Washington, now known as gulfs or ravines, were eroded by "dissolved [melted] snow". This appears to be the first recognition in America of the cutting of valleys by running water. It was to be almost 150 years

until this view was generally accepted in England. Anyone who has made his way up Mt. Washington by way of Tuckerman Ravine on a warm late spring day when the water from the rapidly melting snow is running down the valley sides will recognize why Josselyn implies that the water in the brooks comes from melting snow and does not mention rainfall. It is interesting to note that the major valleys on Mt. Washington are in part due to glacial modification of earlier stream valleys (Goldwait, *et al.* 1951: 12).

The reference to the "pond of clear water" near the top of Mt. Washington is to the Lake of the Clouds. At the same time that Josselyn was a century and a half in advance of his time in recognizing (at least in part) the cutting of the valleys by running water, he was much less advanced in his thinking about the origin of the water in the lake. He could see the water run down the mountain from the lake but "how it ascends is a mystery". This is all the more remarkable when in the very next passage he describes cloud formation visible from this spot. His reference to water ascending is to the ancient and medieval belief in origin of springs and "sources" of streams in the hills and mountains from upward subterranean movement of water from the sea into the mountains where the water, desalted in some unspecified way, broke forth to the surface.<sup>5</sup>

<sup>4</sup> [See Tuckerman's note (1865: 36) for an analysis of routes and possibility of Josselyn's actual or hearsay information.]

<sup>5</sup> [For a discussion of these beliefs see Adams (1638: 426-460) who reproduced several diagrams illustrating the principle. Several of these diagrams are from the 1678 edition of Kircher's *Mundus Subterraneus*; the edition of 1665 seems not to have been available to Adams. Some of the diagrams of Kircher (1665) showing subterranean passages for upward movement and storage of underground water are on pp. 71, 148, 233, and 234. Kircher's books were widely distributed over Europe, and perhaps Josselyn may have seen a

Josselyn's sixth section, on "Stones . . ." is less than three pages long and half of that is irrelevant. The whole section is reproduced (1672: 92-94):

*Of Stones, Minerals, Metals and Earths.*  
As first, the *Emrald* which grows in flat Rocks, and is very good.

*Rubies*, which here are very watry. I have heard a story of an *Indian*, that found a stone, up in the Country, by a great Pond as big as an Egg, that in a dark Night would give a light to read by; but I take it to be but a story.

*Diamond*, which are very brittle, and therefore of little worth.

*Crystal*, called by our West Country Men the *Kenning Stone*; by *Sebegug* Pond is found in considerable quantity, not far from thence is a Rock of Crystal called the *Moose Rock*, because in shape *Moose*, and

*Muscovy Glass*, both white and purple of reasonable content.

*Black Lead.*

*Bole Armoniack.*

*Red and Yellow Oker.*

*Terra Sigilla.*

*Vitriol.*

*Antimony.*

*Arsnick*, too much.

*Lead.*

*Tin.*

*Tin Glass.*

*Silver.*

*Iron*, in abundance, and as good bog Iron as any in the World.

*Copper.* It is reported that the French have a *Copper* Mine at *Port Royal*, that yieldeth them twelve Ounces of pure *Copper* out of a Pound of *Oar*.

I shall conclude this Section with a strange Cure effected upon a Drummers Wife, much afflicted with a Wolf in her Breast; the poor Woman lived with her Husband at a Town called by the *Indians*, *Casco*, but by the *English*, *Famouth*; where for some time she swaged the Pain of her Sore, by bathing it with strong Malt Beer, . . . . When she could come by no more Beer, (for it was brought from *Boston*, along the Coasts by Merchants,) she made use of *Rhum*, a strong Water drawn from Sugar Canes, with which it was lull'd a sleep; at last, (to be rid of it alto-

gether) she put a quantity of *Arsnick* to the *Rhum*, and bathing of it as formerly, she utterly destroyed it, and Cured her self; . . .

His "Emrald" is probably beryl, sometimes found in schist; his "Rubies" garnets; "Diamond" probably quartz; "Muscovy glass" muscovite; the purple probably biotite; and "Bole armoniack" and "Terra sigilla" varieties of clays. The "Arsnick" was probably arsenopyrite, which is not uncommon in New England. To this day arsenopyrite in northern New England is sometimes believed by the uninformed to carry important precious metal values; perhaps that is what Josselyn meant by "too much". A small amount of tin has been found in New England and Josselyn's informant may have seen a bit of the ore from Jackson, New Hampshire.

It is difficult to explain the shortness of this section; Josselyn had travelled widely about New England and diligently, if indiscriminately, collected notes on plants and animals. It is noteworthy that all through the *Rarities* the author exhibits little sense of location; indeed, after the introduction, in which location is passably dealt with, he rarely mentions any locality. Josselyn's almost disdain of the value of the minerals is in direct contrast to the reports of earlier travellers who still had hope of finding mineral treasure and who describe, often overly optimistically, every observation or rumor about minerals. By Josselyn's time the settlers were convinced that, aside from iron ore, there were few minerals of value—the rubies were watery and the diamonds brittle and "of little worth". We leave to medical historians the

copy. At any rate, the concept was so "classical" and so much a part of "general knowledge" that Josselyn would have included it in his mental equipment.]

evaluation of Josselyn's report on the cure for "wolf" or cancer.

Josselyn exhibited a high regard for the Indians; his description of their physical features, while having nothing to do with geological observation, may interest the reader (1672: 99-100):

The Men are somewhat Horse Fac'd, and generally Faucious, *i.e.* without Beards; but the Women many of them have very good Features; seldome without a *Come to me*, or *Cos Amoris*, in their Countenance; all of them black Eyed, having even short Teeth, and very white; their Hair black, thick and long, broad Breasted; handsome streight Bodies, and slender, considering their constant loose habit: Their limbs cleanly, straight, and of a convenient stature, generally, as plump as Partridges, and saving here and there one, of a modest deportment.

In his second book, *An account of two voyages to New-England* . . . published in 1674, Josselyn reproduced a large part of his diary of the voyages, in some parts without much editing. He recorded that on his first voyage, somewhere on the banks, on the 14th of June, 1638 (1674: 9):

. . . we sailed by an Island of Ice . . . three leagues in length mountain high, in form of land, with Bayes and Capes like high clift land and a River pouring off it into the Sea. We saw likewise two or three Foxes or Devils skipping upon it. These Islands of Ice are congealed in the North, and brought down in the spring-time with the Current to the banks on this side New-found-land, and there stopt, where they dissolve at last to water.

Josselyn knew the fate of icebergs even if he was ignorant of their origin. Even men who had been in higher latitudes at first failed to recognize the origin of icebergs from glaciers, as may be seen in the early reports of the Frobisher voyages.

A day or two before entering Boston Harbor, on June 29th, Josselyn's ship had some difficulty, possibly at the Isles of Shoals, but the delay enabled them to hear news, partly geological, from Boston (1674: 11):

The Nine and twentieth day, sounded at night, and found 120 fathome water, the head of the Ship struck against a rock; At 4 of the clock we descryed two sail bound for *New-found-land*, and so for the *Streights*, they told us of a general Earth-quake in *New-England*, of the Birth of a Monster at *Boston*, in the *Massachusetts-Bay* a mortality, and now we are two leagues off *Cap Aun*.

The report of the earthquake is of that of June 1, 1638, the earliest recorded in the list of earthquakes in the United States (Heek, 1938: 11). Brigham (1871: 2) quoted several more extensive contemporary reports of this apparently widespread and at least moderately violent shock. New Englanders were always impressed by the score or more of earthquakes in the colonial period; they provided the occasion for many stirring sermons (Leet, 1948: 21-23).

Josselyn went on to describe the location of New England and its boundaries. Here he discussed the sea which forms part of the boundary and passed on to a description of the tides. His statements about depths of the sea are very early ones, perhaps the first which referred to the region off the American coast (1674: 42-43):

. . . the Sea lyes East and South from the land, and is very deep, some say that the depth of the Sea being measured with line and plummet, seldom exceeds two or three miles, except in some places near the *Swevian-shores*, and about *Pontus*, observed by *Pliny*. Sir *Francis Drake* threw out 7 Hogsheads of line near *Porto-bello* and found no bottom, but whether this be true or no, or that



they were deceived by the Currants carrying away their lead and line, this is certainly true, that there is more Sea in the Western than the Eastern Hemisphere, on the shore in more places than one at spring-tides, that is at the full or new of the moon, the Sea riseth 18 foot perpendicular, the reason of this great flow of waters I refer to the learned, onely by the way I shall acquaint you with two reasons for the ebbing and flowing of the Sea; the one delivered in Common conference, the other in a Sermon at Boston in the Massachusetts-Bay by an eminent man; The first was, *that God and his spirit moving upon the waters caused the motion*; the other, *that the spirit of the waters gathered the waters together; as the spirit of Christ gathered Souls.*

The spirit of the time is well illustrated in this passage in which in one sentence the author refers to Pliny, the classical authority, and in the next to Drake, the man who had actually attempted to measure depth by a sounding line. The inductive attitude, very often lost sight of by Josselyn, is exhibited here in the shrewdly expressed possibility of erroneous record of sounding because of currents acting on the lead and line.

Josselyn would have seen tides at least 18 feet high in Maine and heard of those much higher in the Bay of Fundy. The explanation of tides in a sermon in Boston "by an eminent man" would have been taken at face value by most of his readers, but it seems to me that Josselyn actually wrote this with tongue in cheek.

Josselyn described the New England shore and the territory back from it; the prominent mountain mentioned in the following passage is of course Mt. Washington (1674: 43-44):

The shore is Rockie, with high cliffs, having a multitude of considerable Har-

bours; many of which are capacious enough for a Navy of 500 sail, one of a thousand, the Countrie within Rockie and mountainous, full of tall wood, one stately mountain there is surmounting the rest, about four score mile from the Sea: The description of it you have in my rarities of *New-England*, between the mountains are many ample rich and pregnant valleys as ever eye beheld, beset on each side with variety of goodly Trees, the grass man-high unmowed, uneaten and uselessly withering; within these valleys are spacious lakes or ponds well stored with Fish and Beavers; the original of all the great Rivers in the Countrie, of which there are many with lesser streams (wherein are an infinite of fish) manifesting the goodness of the soil which is black, red-clay, gravel, sand, loom, and very deep in some places, as in the valleys and swamps, which are low grounds and bottoms infinitely thick set with Trees and Bushes of all sorts for the most part, others having no other shrub or Tree growing, but spruce, under the shades whereof you may freely walk two or three mile together; being goodly large Trees, and convenient for masts and sail-yards.

Josselyn's remarks on the intervals of northern New England and on the soils in them are early comments on pedology, but not the earliest in America; John Smith in 1612 mentioned the soils in Virginia (Smith, 1612: 3; White, 1953a: 136; 1953b: 125) and William Wood had a short chapter in *New Englands Prospect* of 1634 on "Soyle" (White, 1953a: 137). Like Smith, Josselyn realized the relation of plants to soil types and thus early were ecological observations made in America. Only a few years later in 1705 Robert Beverley in *History and Present State of Virginia* was to write in great detail and extent about Virginia soils and the relation of soils to vegetation.

In a time when the settlers were at first dependent on springs and streams for water supply and later on shallow wells, it is natural that

considerable attention would be paid to these springs and to the quality of their water. Josselyn left no doubt about abundance and quality of water from springs, calling on the aid of poetry to reinforce his enthusiasm (1674: 44):

The whole Countreie produceth springs in abundance replenished with excellent waters, having all the properties ascribed to the best in the world.

*Swift is't in pace, light poiz'd, to look in clear,*

*And quick in boiling (which esteemed were)*

*Such qualities, as rightly understood Withouten these no water could be good.*

*One Spring there is, at Black-point in the Province of Main, coming out of muddy-clay that will colour a spade, as if hatcht with silver, it is purgative and cures scabs and Itch. &c.*

The spring at Black-point was probably of sulfur water, which would have the effects that Josselyn ascribed to it. The curative properties of various mineral waters were usually described in writings of the time on natural resources in America as well as in England. An English example is the long chapter on the water of Oxfordshire by Robert Plot (1677: 18-50).

Josselyn is at his poorest in the remarks on metal deposits and on minerals and rocks in general. His credulity shows up in his reports of precious metal resources. In the *Rarities* he had said little about these, but allowed himself to speculate at greater length two years later in the *Two Voyages* (1674: 44-47):

The Mountains and Rocky Hills are richly furnished with mines of Lead Silver, Copper, Tin, and divers sorts of minerals, branching out even to their summits, where in small Crannies you may meet with shreds of perfect silver; yet have the *English* no maw to open any of them, whether out of ignorance

or fear of bringing a forraign Enemy upon them, or (like the dog in the manger) to keep their Sovereign from partaking of the benefits, who certainly may claim an interest in them as his due, . . .

The stones in the Countreie are for the most *mettle-stone*, freestone, pebble, slate, none that will run to lime, of which they have great want, of the slate you may make Tables easie to be split to the thickness of an inch, or thicker if you please, and long enough for a dozen men to sit at. Pretious stones there are too, but if you desire to know further of them, see the *Rarities of New-England*; onely let me add this observation by the way, that Crystal set in the Sun taketh fire, and setteth dry Tow or brown Paper on fire held to it. There is likewise a sort of glittering sand, which is altogether as good as the glassie powder brought from the *Indies* to dry up ink on paper newly written.

The reference to mineral deposits branching out even to the summits of the mountains is a survival of the medieval idea of the tree of ores growing in the earth (Adams, 1938: 286). Perhaps it is a conscious or unconscious remembrance of the extensively developed exposition of Peter Martyr of Angleria translated into English by Eden in 1555, and reappearing in later editions.

The continued mixture of fanciful foolishness and accurate observation is illustrated by the jumble of lore about crystal and the accurate report on cleavable slate and on the lack of stone "that will run to lime", still a serious lack in New England's natural resources.

Josselyn discussed weather and climate at some length and concluded with a page on earthquakes in which his reference to the raising of the White Mountains by that agency is of interest. His proof for the hollowness of these mountains is startling, but of course they had to be hollow so the subterranean water could

ascend and so the "tree of metals" could grow (1674: 58).<sup>6</sup>

In *Anno Dom.* 1667. March, appeared a sign in the Heavens in the form of a Sphear, pointing directly to the West: and in the year following on the third day of April being Friday, there was a terrible Earthquake, before that a very great one in 1638, and another in 58 and in 1662/3. January 26, 27, & 28. (which was the year before I came thither) there were Earthquakes 6 or 7 times in the space of three dayes. Earthquakes are frequent in the Countrie; some suppose that the white mountains were first raised by Earthquakes, they are hollow as may be guessed by the resounding of the rain upon the level on the top. The *Indians* told us of a River whose course was not only stopt by an Earthquake in 1668. (as near as I can remember) but the whole River swallowed up. And I have heard it reported from credible persons, that (whilst I was there in the Countie) there happened a terrible Earthquake amongst the *French*, rending a huge Rock asunder even to the center, wherein was a vast hollow of an immeasurable depth, out of which came many infernal Spirits.

Josselyn next went on to extensive lists and description of trees and other plants (1674: 59-122; the famous panegyric on tobacco is on p. 76); to mammals, including the egg-laying porcupine, birds, fish, mollusks, snakes, and insects (including the amusing tale of the farmer and the bumble bee). Much of the description is from rumor and hearsay and some of it worth just about as much as the reward Josselyn believed would be his in the ribald quotation from Ben Jonson (1674: 123).

After a long description of towns and rivers Josselyn presented the

final observation of geological interest on the "clay bullets cast up by a mineral vapor" near the "Kenibunk River" which "is by the Town of Wells" (1674: 204). This is no doubt in reference to the concretions in the late Pleistocene marine clay.

Josselyn was like many other writers of the time who touched on scientific subjects and even like some who devoted most of their time to scientific activities—he could write accurate description and could also report outrageous rumor as probable fact. He had some classical knowledge and liked to exhibit it. John Lederer (1672), the German physician, who at almost the same time reported on a part of the colonies much farther south, was far less chatty and perhaps less credulous than Josselyn, but Lederer's report tells us much less of what was being seen, conjectured, and written about at the time.

The writer on geological subjects in England at about the same time who invites comparison with Josselyn is Robert Plot, whose *Natural History of Oxfordshire* appeared in 1677. Dr. Plot was Professor of Chemistry, first Keeper of the Ashmolean Museum at Oxford, and secretary of the Royal Society. His book on Oxfordshire was much longer than both little books of Josselyn's which deal only incidentally with natural history. However, it should be noted that the Oxford professor was not sure that streams were supported by rainfall, gives no indication of any thought of valley cutting by streams, and, although he publishes many excellent plates of fossils, cannot bring himself to be

<sup>6</sup> [The listing of earthquakes corresponds fairly well with the listing of Brigham (1871: 2-4). If we read "1663" for "1668" for the Indians' story, it then also refers to the great 1663 St. Lawrence valley earthquake "amongst the *French*", which is known from several sources to have been violent even in New England (Brigham, 1871: 3, 4) and was the most famous earthquake of the colonial period (Heck, 1936: 135).]



sure they are actual remains of real organisms. Plot wrote more voluminously, observed more acutely, repeated wondrous tales, and quoted more classical references, but considering his position and advantages he was not nearly as much better than Josselyn as he should have been in development of explanations and exhibition of the inductive method.

Josselyn should not be criticized for credulity and inaccuracy — he was quite abreast of his time. Although his books were general reports on New England and not primarily on natural history, they stand up surprisingly well when compared with the productions of the professionals in England at about the same time—those of Plot, Ray, or Lhuyd, for example. Furthermore, it is probable that some of Josselyn's information is from his 1638 notes of a third of a century earlier.

In summary, Josselyn's major contributions were on:

1. The sea off New England, and its

depth, determined by actual measurements.

2. Tides and their (probably incorrect) causes.
3. Icebergs, accurate as to their fate, but inaccurate as to their origin.
4. Mt. Washington, its topography and its valleys, believed to have been cut, at least in part, by running water; and on the lake near the summit with unknown origin of its "ascending water".
5. Mineral resources, but in a disappointingly brief and partly inaccurate way, except for iron ore, building stone, and clay.
6. Earthquakes and their possible cause of mountain building, as well as in producing "hollowness" of the mountains.
7. The quality and character of groundwater.

Because of his worthwhile observations, especially on topography, John Josselyn deserves a place in the history of geology in America.

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