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The Scientific Inquiries of Professor John Winthrop, 1714-1779

Although Benjamin Franklin became distinguished as a colonial and early American pioneer of science, historians have sought equal recognition for his contemporary and friend, Professor John Winthrop. Born in 1714, Winthrop, like his famous namesake ancestors, lived a distinguished and influential life. Although his predecessors became noted for their role as colonial governors, historians have highlighted their overlooked contributions to early American scientific pursuits that culminated with the John Winthrop of the eighteenth century. A distinguished Harvard professor, Winthrop became noted for his scientific investigations in meteorology, seismology, and astronomy. Winthrop also garnered attention for his famous debate revolving around his 1755 work, *A Lecture on Earthquakes,* which sought to explain earthquakes as a natural phenomenon without the need for religious superstition. Along with his observations on the transits of Venus and comets, Winthrop exemplified the level of scientific reasoning found in the eighteenth century and its convoluted relationship with religion.

John Winthrop was born into a prominent, Puritan family that had aided the establishment of early science in colonial America. His ancestors include the governor of Massachusetts, John Winthrop (1587-1649) and his son, the first governor of Connecticut, John Winthrop, Jr. (1605-1676).[1] John Winthrop (1714-1779) was the "fourth generation" of

[1] Robert M. Benton, "The John Winthrops and Developing Scientific Thought in New England," *Early American Literature* 7, no. 3 (1973): 272, http://www.jstor.org/stable/25070588.

Winthrops and a great grandnephew of Winthrop, Jr.[2] According to Robert Benton, "There were other John Winthrops as well, but in these three one can see a development in scientific thinking which enabled it to escape the religious dominance which had impeded it."[3] Although not a scientist by profession, as he was frequently preoccupied with politics and religion, Winthrop of Massachusetts recorded natural phenomena like eclipses, storms, and tempest.[4] However, he did not attempt to explain them beyond divine creation or retaliation.[5] Winthrop of Massachusetts' interest in natural science led to careful recordings of the flora, fauna, and weather of New England. Winthrop consistently incorporated his theological beliefs that God expressed his displeasure through droughts and "unnatural" births.[6] Benton explained that Winthrop of Massachusetts' contributions to science were regulated to the recording of his and others' observations during his period with little interest in "testing and experimentation."[7]

Nevertheless, Winthrop of Massachusetts' aptitude for observing natural phenomena likely inspired his son, Winthrop, Jr., who became the first colonial member of the Royal Society, the prestigious British science academy.[8] In contrast to his father, Winthrop, Jr. avoided correlating all his observations to theology. He "was an avid astronomer" who reported (erroneously) a fifth moon of Jupiter and became recognized as a doctor and chemist.[9] In contrast to his father and his namesake descendant, Winthrop, Jr. devoted attention to practical science.

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[2] Frederick E. Brasch, "JOHN WINTHROP (1714-1779), AMERICA'S FIRST ASTRONOMER, AND THE SCIENCE OF HIS PERIOD," *Publications of the Astronomical Society of the Pacific* 28, no. 165 (1916): 155, http://www.jstor.org/stable/40693084.
[3] Robert M. Benton, "The John Winthrops and Developing Scientific Thought in New England," *Early American Literature* 7, no. 3 (1973): 272, http://www.jstor.org/stable/25070588.
[4] Benton, "The John Winthrops and Developing Scientific Thought in New England," 273-74.
[5] Benton, "The John Winthrops and Developing Scientific Thought in New England," 273-74.
[6] Benton, "The John Winthrops and Developing Scientific Thought in New England," 274-75.
[7] Benton, "The John Winthrops and Developing Scientific Thought in New England," 275.
[8] Benton, "The John Winthrops and Developing Scientific Thought in New England," 275-77.
[9] Benton, "The John Winthrops and Developing Scientific Thought in New England," 277.

His first scientific writing described a new windmill model he built.[10] Like his father, Winthrop, Jr. recorded observations in environmental science. He wrote papers detailing interest in colonial industries, such as a comprehensive analysis of Native American corn, its cultivation, and use.[11] Winthrop, Jr. communicated with the Royal Society and sent unique specimens of marine life such as fish and sea stars for study.[12] According to Donald Yeomans, Winthrop, Jr.'s scientific pursuits allowed him to create a correspondence with notable European scientists including Johannes Kepler and Isaac Newton.[13] Yeomans credits Winthrop, Jr. for "transplanting experimental science to the American colonies," including its first telescopes.[14] However, Yeomans highlights that colonial science lagged European advancements "due to the lack of instruments, libraries, and scientific intercourse."[15]

Although training his sons in scientific observation, ironically, John Winthrop, Jr.'s great-grandnephew "achieved distinction in science which surpassed that of any of his illustrious family."[16] In 1732, after studying mathematics and astronomy, at age 18, John Winthrop graduated from Harvard College at the top of his class.[17] Winthrop sought to become a mathematics professor when a vacancy opened at Harvard. Frederick Brasch highlighted the committees established to determine Winthrop's proficiency in mathematics and "potential contaminations of heresy and the status of his liberal ideas, which [they] feared might prove too

[10] Benton, "The John Winthrops and Developing Scientific Thought in New England," 276-77.
[11] Benton, "The John Winthrops and Developing Scientific Thought in New England," 277.
[12] Benton, "The John Winthrops and Developing Scientific Thought in New England," 277.
[13] Donald K. Yeomans, "The Origin of North American Astronomy--Seventeenth Century," *Isis* 68, no. 3 (1977): 416, http://www.jstor.org/stable/231317.
[14] Yeomans, "The Origin of North American Astronomy--Seventeenth Century," 417.
[15] Yeomans, "The Origin of North American Astronomy--Seventeenth Century," 425.
[16] Robert M. Benton, "The John Winthrops and Developing Scientific Thought in New England," *Early American Literature* 7, no. 3 (1973): 279, http://www.jstor.org/stable/25070588.
[17] Frederick E. Brasch, "JOHN WINTHROP (1714-1779), AMERICA'S FIRST ASTRONOMER, AND THE SCIENCE OF HIS PERIOD," *Publications of the Astronomical Society of the Pacific* 28, no. 165 (1916): 155-66, http://www.jstor.org/stable/40693084.

dangerous for Harvard at that period."[18] Nevertheless, in 1738, at just twenty-four years old, Winthrop was "elected the second Hollis professor of mathematics and natural philosophy" at Harvard.[19] According to Brasch, the "work and influence of John Winthrop established for the first time America's independence in scientific development, and also gave to Harvard College her early prominence in scientific investigation."[20] Winthrop established Harvard's first experimental physics laboratory, introduced calculus to the mathematical curriculum, and taught for forty years until his death.[21] According to Alicia DeMaio, Winthrop's classes resembled modern physics with courses taught on Newton's laws of motion, lenses, optics, astronomy, simple machines, and electricity.[22] Winthrop and his second wife Hannah, "were avid diary keepers" and documented natural phenomena, personal lives, children, household life, and death statistics of their resident area. [23]

Winthrop's observational pursuits exemplify the level and incentive of scientific knowledge in the eighteenth century. In 1739, after his appointment as professor, sunspots were among Winthrop's first recorded astronomical observations.[24] According to Benton, Winthrop became the first colonial American to record sunspots.[25] The following year, Winthrop observed a transit of Mercury across the sun and a lunar eclipse that "resulted in his first communication to

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[18] Brasch, "JOHN WINTHROP (1714-1779)," 156.
[19] Robert M. Benton, "The John Winthrops and Developing Scientific Thought in New England," *Early American Literature* 7, no. 3 (1973): 279, http://www.jstor.org/stable/25070588.
[20] Frederick E. Brasch, "JOHN WINTHROP (1714-1779), AMERICA'S FIRST ASTRONOMER, AND THE SCIENCE OF HIS PERIOD," *Publications of the Astronomical Society of the Pacific* 28, no. 165 (1916): 156, http://www.jstor.org/stable/40693084.
[21] Robert M. Benton, "The John Winthrops and Developing Scientific Thought in New England," *Early American Literature* 7, no. 3 (1973): 279, http://www.jstor.org/stable/25070588.
[22] Alicia DeMaio, "The Winthrops: A Harvard Family," Colonial North America at Harvard Library, Harvard University, accessed April 4, 2023, https://colonialnorthamerica.library.harvard.edu/spotlight/cna/feature/the-winthrops-a-harvard-family.
[23] DeMaio, The Winthrops: A Harvard Family."
[24] Frederick G. Kilgour, "Professor John Winthrop's Notes on Sun Spot Observations (1739)," *Isis* 29, no. 2 (1938): 355, http://www.jstor.org/stable/225482.
[25] Robert M. Benton, "The John Winthrops and Developing Scientific Thought in New England," *Early American Literature* 7, no. 3 (1973): 279, http://www.jstor.org/stable/25070588.

the Royal Society."[26] His scientific contemporaries included the giants of European science Isaac Newton, Edmund Halley, William Herschel, Immanuel Kant, and Gottfried Leibniz. In the American colonies, Winthrop befriended Benjamin Franklin and became a primary supporter of his "theories and conclusions… regarding electricity."[27] Similarly, "he was New England's most outspoken advocate of Newtonian science."[28] In the American colonies, science emerged "primarily for the advancement of technology, manufacturing, agriculture, and medicine."[29] Winthrop, like his ancestors, often correlated observations of natural phenomena to God's creation.[30] He associated human understanding of scientific laws as an increased understanding of God.[31] Louis Graham highlights that colonial science prioritized technology, manufacturing, agriculture, and medicine.[32] However, Graham explained that Winthrop's papers "concerned with earthquakes, sunspots, transits of Mercury and Venus, comets, and eclipses, indicate that he was far more concerned about the theoretical aspects of astronomical physics than he was about either the religious applications of science or the more practical applications that characterized [Benjamin] Franklin's research."[33]

In 1755, destructive earthquakes struck both Lisbon, Portugal and New England. Ironically, Winthrop's ancestors had written about earthquakes, including Governor Winthrop of Massachusetts, over a century prior, though associated the phenomena with God's displeasure.[34]

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[26] Frederick G. Kilgour, "Professor John Winthrop's Notes on Sun Spot Observations (1739)," *Isis* 29, no. 2 (1938): 355, http://www.jstor.org/stable/225482.
[27] Robert M. Benton, "The John Winthrops and Developing Scientific Thought in New England," *Early American Literature* 7, no. 3 (1973): 279, http://www.jstor.org/stable/25070588.
[28] Louis Graham, "The Scientific Piety of John Winthrop of Harvard," *The New England Quarterly* 46, no. 1 (1973): 112-13, https://doi.org/10.2307/364890.
[29] Graham, "The Scientific Piety of John Winthrop of Harvard," 113.
[30] Graham, "The Scientific Piety of John Winthrop of Harvard," 113.
[31] Graham, "The Scientific Piety of John Winthrop of Harvard," 113.
[32] Graham, "The Scientific Piety of John Winthrop of Harvard," 113.
[33] Graham, "The Scientific Piety of John Winthrop of Harvard," 113.
[34] Robert M. Benton, "The John Winthrops and Developing Scientific Thought in New England," *Early American Literature* 7, no. 3 (1973): 274, http://www.jstor.org/stable/25070588.

In response to the events, Winthrop's *Lecture on Earthquakes* highlighted his unique deistic views on science and religion. He attempted to argue that earthquakes were a phenomenon with natural causes, in contrast to the general belief that they were the result of divine punishment.[35] He explained that earthquakes exhibited various motions like waves of water; earthquakes were "a *wave of earth*" with some countries are more prone to earthquakes than others. [36] This correlation, he explained, was a result of the abundance of combustible materials such as coal, sulfur, and the increased activity of volcanoes during earthquakes.[37] He argued that fire is the primary element powerful enough to drive earthquakes.[38] He described Earth's interior: "The earth is not solid throughout, but contains within it many large holds, pits, and caverns; as is agreed by all Natural Historians."[39] Within this interior is an "inexhaustible" abundance of heat "evident from the influence of hot springs, and from the warmth which is always found at great depths, as in the bottom of mines."[40] When water flowed into heated caverns, it converted into an explosive release of steam which generated earthquakes and volcanic activity.[41] Winthrop, an astronomer, criticized astrologers who associated earthquakes with planetary alignments or appearances of comets.[42] Despite the irony of his lecture being read in a chapel, Winthrop mentioned that "The all-wise CREATOR could not but foresee all the effects of all the powers he implanted in matter; and, as we find in innumerable instances (and the more we know of his works, the more such instances we discover) that he has established such laws for the

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[35] John Winthrop, *A Lecture on Earthquakes: Read in the Chapel of Harvard-College in Cambridge, N.E., November 26th, 1755. On Occasion of the great Earthquake which shook New England the Week before* (Boston: Edes & Gill, 1755), 5, https://babel.hathitrust.org/cgi/pt?id=osu.32435018499178&view=1up&seq=9.
[36] Winthrop, *A Lecture on Earthquakes*, 6.
[37] Winthrop, *A Lecture on Earthquakes*, 6-7.
[38] Winthrop, *A Lecture on Earthquakes*, 17-18.
[39] Winthrop, *A Lecture on Earthquakes*, 18.
[40] Winthrop, *A Lecture on Earthquakes*, 20.
[41] Winthrop, *A Lecture on Earthquakes*, 21-22, 27.
[42] Winthrop, *A Lecture on Earthquakes*, 26.

government of the world, as tend to promote good of *the whole*."[43] Similarly, Winthrop displayed restraint in his lecture by stating that although God governed the moral and natural world, "it would be improper of me to enter into these disquisitions at this time, since my province limits me to consider this subject only in relation which it bears to *natural philosophy*."[44] In other words, although associating nature with God, Winthrop sought to concurrently explain earthquakes through a scientific lens instead of a purely theological one. Although his views were not entirely accurate by modern standards, Winthrop nevertheless attempted a modern, scientific explanation for earthquakes which contrasted with the predominant superstitions.[45] According to Brasch, Winthrop's lecture aimed "primarily to alleviate the fears, superstition, and ignorance concerning the significance of such phenomena…"[46]

However, a passionate four-month feud with fellow Puritan Reverend Thomas Prince, who contested Winthrop's conclusions, highlighted that trying to meld science and religion failed to alleviate controversy. Following Winthrop's lecture, Reverend Prince republished a sermon with an appendix suggesting that electricity powered earthquakes. He cited the earthquake as divine retaliation for the installation of lightning rods in Boston.[47] Prince writes that lightning rods or "points of iron" were a crude attempt by Benjamin Franklin to avoid "the mighty HAND of GOD."[48] In the appendix of his previous lecture, Winthrop had refuted popular

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[43] Winthrop, *A Lecture on Earthquakes*, 27.
[44] Winthrop, *A Lecture on Earthquakes*, 29.
[45] Frederick E. Brasch, "JOHN WINTHROP (1714-1779), AMERICA'S FIRST ASTRONOMER, AND THE SCIENCE OF HIS PERIOD," *Publications of the Astronomical Society of the Pacific* 28, no. 165 (1916): 161, http://www.jstor.org/stable/40693084.
[46] Brasch, "JOHN WINTHROP (1714-1779)," 162.
[47] Robert M. Benton, "The John Winthrops and Developing Scientific Thought in New England," *Early American Literature* 7, no. 3 (1973): 279-80, http://www.jstor.org/stable/25070588.
[48] Thomas Prince, *Appendix Concerning the Operation of GOD in Earthquakes by Means of the Electrical Substance*, Manuscript, Boston: Old South Church, December 5, 1775, From National Humanities Center Resource Toolbox Library, *Two Boston Puritans on GOD, EARTHQUAKES, ELECTRICITY, and FAITH 1755-1756*, 1-2,

theories suggesting that electrical energy powered earthquakes.[49] He states that "according to the laws of magnetism and electricity, so far as they have been hitherto discovered, it is inconceivable to me, how earthquakes can be accounted for by them."[50] Similarly, Winthrop argued that recent attempts to explain everything by electricity were a result of "philosophical fashions."[51]

Naturally, Winthrop took Prince's comments personally and retaliated in print. Prince's and Winthrop's publications directly answered each other. Fifteen days later, Winthrop responded and wrote that he "was surprised to find so many mistakes in so few lines; and concerned, for the ill effects it would probably have."[52] Prince's words would cause "unnecessary terrors" in the minds of people not familiar with the "laws of electricity…" and "would discourage the use of the *iron points*, which were erecting in *Boston* and elsewhere; and which, by the blessing of GOD, might be a means of preventing many of those mischievous and sorrowful accidents, which we have so often seen to follow upon thunderstorms…"[53] Winthrop highlighted that brick buildings were more susceptible to damage than wooden buildings and a significant number of the buildings damaged in the city were constructed of brick.[54] In a scathing remark, Winthrop labeled Prince as a person who was "so weak, so ignorant, so foolish…"[55] In a

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http://nationalhumanitiescenter.org/pds/becomingamer/ideas/text5/godlightningrods.pdf, (accessed December 7, 2022).

[49] John Winthrop, *A Lecture on Earthquakes: Read in the Chapel of Harvard-College in Cambridge, N.E., November 26th, 1755. On Occasion of the great Earthquake which shook New England the Week before* (Boston: Edes & Gill, 1755), 32-33, https://babel.hathitrust.org/cgi/pt?id=osu.32435018499178&view=1up&seq=9.

[50] Winthrop, *A Lecture on Earthquakes*, 33.

[51] Winthrop, *A Lecture on Earthquakes*, 32.

[52] John Winthrop, *APPENDIX Concerning the Operation of Electrical Substance in EARTHQUAKES; and the Effects of Iron Points*, Manuscript, Boston: Harvard College, December 20, 1755, From National Humanities Center Resource Toolbox Library, *Two Boston Puritans on GOD, EARTHQUAKES, ELECTRICITY, and FAITH 1755-1756*, 1-2, http://nationalhumanitiescenter.org/pds/becomingamer/ideas/text5/godlightningrods.pdf, (accessed December 7, 2022).

[53] Winthrop, *APPENDIX Concerning the Operation of Electrical Substance in EARTHQUAKES*, 2.

[54] Winthrop, *APPENDIX Concerning the Operation of Electrical Substance in EARTHQUAKES*, 2.

[55] Winthrop, *APPENDIX Concerning the Operation of Electrical Substance in EARTHQUAKES*, 2.

letter to the *Boston Gazette*, Prince replied sarcastically, "This is to return my public Thanks to the ingenious Mr. Professor *Winthrop* for his printed *Lecture on Earthquakes*…"[56] Prince denied that he was against the use of lightning rods and instead clarified that people should trust God for safety and not in man-made objects.[57] Winthrop responded by stating that science and religion are mutual and not antagonistic. He stated that "consideration of a DEITY is not peculiar to Divinity, but belongs also to natural Philosophy… havenot such [scientific] inquiries when properly conducted, a direct tendency to promote, and not to obstruct, Religion?"[58] In February 1756, Prince forgave, though avoided directly conceding, to Winthrop in his second and final letter to the *Boston Gazette*; Prince clarified the need for truth over victory.[59] In his final response to Prince, Winthrop avoids naming him and stated that his "Answer did not proceed from a Desire of *Victory*, but of *Truth* and *Justice*." [60]

According to Eleanor Tilton, the argument largely devolved from one of scientific discourse into a quarrel of personal attacks.[61] Graham states Reverend Prince, ironically, "ignored the final pages of the lecture in which Winthrop returns, as he does in most of his

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[56] Thomas Prince, *Letter to the* Boston Gazette, Letter, Boston: Boston Gazette, January 26, 1756, From National Humanities Center Resource Toolbox Library, *Two Boston Puritans on GOD, EARTHQUAKES, ELECTRICITY, and FAITH 1755-1756*, 3, http://nationalhumanitiescenter.org/pds/becomingamer/ideas/text5/godlightningrods.pdf, (accessed December 7, 2022).
[57] Prince, *Letter to the Boston Gazette*, 3.
[58] John Winthrop, *A Letter to...the* Boston Gazette*…Containing an Answer to the Rev. Mr. Prince's Letter*, Pamphlet, January 28, 1756, From National Humanities Center Resource Toolbox Library, *Two Boston Puritans on GOD, EARTHQUAKES, ELECTRICITY, and FAITH 1755-1756*, 3, http://nationalhumanitiescenter.org/pds/becomingamer/ideas/text5/godlightningrods.pdf, (accessed December 7, 2022).
[59] Thomas Prince, *Letter to the* Boston Gazette, Letter, Boston: Boston Gazette, February 23, 1756, From National Humanities Center Resource Toolbox Library, *Two Boston Puritans on GOD, EARTHQUAKES, ELECTRICITY, and FAITH 1755-1756*, 4, http://nationalhumanitiescenter.org/pds/becomingamer/ideas/text5/godlightningrods.pdf, (accessed December 7, 2022).
[60] John Winthrop, *Letter to the* Boston Gazette, Letter, Boston: Boston Gazette, March 1, 1756, From National Humanities Center Resource Toolbox Library, *Two Boston Puritans on GOD, EARTHQUAKES, ELECTRICITY, and FAITH 1755-1756*, 4, http://nationalhumanitiescenter.org/pds/becomingamer/ideas/text5/godlightningrods.pdf, (accessed December 7, 2022).
[61] Eleanor M. Tilton, "Lightning-Rods and the Earthquake of 1755," *The New England Quarterly* 13, no. 1 (1940): 96-97, https://doi.org/10.2307/360683.

lectures, to a discussion of God's influence in the universe."[62] Winthrop explained that earthquakes represented a compromise of divinity to prevent the destruction of the Earth, which he believed relieved pressure from Earth's interior.[63] Graham reiterates that Winthrop firmly integrated his Puritan beliefs with science as an understanding of nature provides a reciprocal to understanding God.[64] Nevertheless, Winthrop's reputation had "survived the confrontation" and he received an honorary "Doctor of Laws" by Harvard.[65] Winthrop's influence contributed to the founding of the American Academy of Arts and Sciences.[66]

Following the earthquake debate, Winthrop's lectures and observations of natural phenomena continued to allude to his deistic views of science and religion. Like earthquakes, comets in the night sky sparked fear and superstition. Bright comets observed for millennia appeared without warning, wandered the sky, and disappeared as rapidly as they manifested. The sudden appearance of comets became associated with heavenly displeasure. Although seventeenth century astronomers deduced that comets were astronomical instead meteorological phenomena, speculation continued over their behavior and characteristics.[67] Yeomans explains that while plenty of sermons existed proclaiming comets as divine warnings, many astronomers too continued to retain their superstitious views of comets as omens of earthly calamity.[68]

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[62] Louis Graham, "The Scientific Piety of John Winthrop of Harvard," *The New England Quarterly* 46, no. 1 (1973): 114, https://doi.org/10.2307/364890.
[63] Graham, "The Scientific Piety of John Winthrop of Harvard," 115.
[64] Graham, "The Scientific Piety of John Winthrop of Harvard," 115.
[65] Robert M. Benton, "The John Winthrops and Developing Scientific Thought in New England," *Early American Literature* 7, no. 3 (1973): 280, http://www.jstor.org/stable/25070588.
[66] Benton, "The John Winthrops and Developing Scientific Thought in New England," 280.
[67] Donald K. Yeomans, "The Origin of North American Astronomy--Seventeenth Century," *Isis* 68, no. 3 (1977): 417, http://www.jstor.org/stable/231317.
[68] Yeomans, "The Origin of North American Astronomy--Seventeenth Century," 419-21.

Although not the first colonial American to write about comets, Winthrop attempted to allay public fear of comets by explaining their behavior scientifically.[69] Edmund Halley became the first astronomer to deduce that a single comet orbiting the sun explained some observations of several comets coincidently observed every 76 years. The predicted reappearance of Halley's comet in 1759 led Winthrop to present another series of lectures, also given in the Harvard chapel.[70] In the first of his lectures, read on April 11, 1759, Winthrop dissected and explained the nature of comets in the sky. Although moving across the sky like the planets, comets appear as a "hairy star" exhibiting a long tail and appearing from random directions in the sky.[71] Winthrop referenced the ancient Greek *Pythagorean* astronomers that speculated the comets were celestial. The belief that comets were meteorological phenomena, or like meteors to maintain a perfect heavenly realm, superseded their claims, and "thus does one error lead to another."[72] He argues that this erroneous belief stagnated modern scientific analysis of comets. Only until the efforts of Tycho Brahe, who used parallax to estimate the distance of a comet in the sixteenth century, did the modern astronomical nature of comets manifest.[73] Winthrop explains, which modern science confirms, that comets remain visible when light reflects from particles surrounding the comet, like dust reflecting off sunbeams in a dark room.[74] Winthrop concludes that Isaac Newton's contributions to science provide the basis for identifying the orbital behavior of comets.[75]

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[69] Frederick E. Brasch, "JOHN WINTHROP (1714-1779), AMERICA'S FIRST ASTRONOMER, AND THE SCIENCE OF HIS PERIOD," *Publications of the Astronomical Society of the Pacific* 28, no. 165 (1916): 162, http://www.jstor.org/stable/40693084.
[70] Brasch, "JOHN WINTHROP (1714-1779)," 162.
[71] John Winthrop and A. (Andrew) Oliver, *Two lectures on comets* (Boston: W. Wells and T.B. Wait and Co., 1811), 1-3, https://archive.org/details/twolecturesoncom00wint/page/n13/mode/2up.
[72] Winthrop and Oliver, *Two lectures on comets*, 4-5.
[73] Winthrop and Oliver, *Two lectures on comets*, 5-7.
[74] Winthrop and Oliver, *Two lectures on comets*, 10-13, 25-26.
[75] Winthrop and Oliver, *Two lectures on comets*, 15.

Winthrop presented his second lecture on April 18, 1759, and explained comets concerning the laws of gravity and planetary motion. Winthrop described the cometary motion as natural extensions of Newton's laws of gravity and Johannes Kepler's laws of planetary motion.[76] Unlike planets which follow nearly circular orbits around the sun, comets orbited in stretched elliptical orbits that rendered them invisible from Earth upon reaching their greatest distance from the sun.[77] The invisibility of comets explained the mistaken belief that every comet was a new and unrelated example. Winthrop highlighted that the comet of 1759 obeyed Newtonian principles as outlined by Edmund Halley, who predicted the comet's return based on an orbit around the sun.[78] Winthrop correctly deduced that the vapor emitted from comets reflected light and brightened upon their closest approach when "excited by the heat of the sun…"[79] However, like his lecture on earthquakes, Winthrop associated comets as a phenomenon created by God. He claimed that comets direct human attention to "the supreme GOVERNOR of the universe" and that the calculable orbits of comets, provided evidence of intelligent design.[80] In 1766, Benjamin Franklin would communicate Winthrop's *Cogitata de Cometis*, an extensive mathematical and scientific analysis of comets, to the Royal Society upon which it "received laudable notices."[81]

Along with seismology and astronomy, Winthrop's observation of various meteorological phenomena highlights the contrasting levels of scientific understanding in the eighteenth century. However, Winthrop's characteristic deistic views on natural phenomena are notably restrained in

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[76] Winthrop and Oliver, *Two lectures on comets*, 16-19.
[77] Winthrop and Oliver, *Two lectures on comets*, 16, 25.
[78] Winthrop and Oliver, *Two lectures on comets*, 22-25, 39.
[79] Winthrop and Oliver, *Two lectures on comets*, 28-29.
[80] Winthrop and Oliver, *Two lectures on comets*, 32.
[81] Frederick E. Brasch, "JOHN WINTHROP (1714-1779), AMERICA'S FIRST ASTRONOMER, AND THE SCIENCE OF HIS PERIOD," *Publications of the Astronomical Society of the Pacific* 28, no. 165 (1916): 163, http://www.jstor.org/stable/40693084.

some of his records. In 1761, Winthrop wrote about eyewitness accounts of a meteor and tornado in New England. At the time, meteors were categorized as meteorological phenomena instead of astronomical.[82] Instead of providing a scientific explanation of the meteor, Winthrop merely recorded eyewitness accounts akin to his ancestor, John Winthrop of Massachusetts. According to Winthrop, eyewitness accounts heard a sound "like a report of a cannon, or a volley of small arms" before the meteor was observed.[83] The sound was "followed by a rumbling noise, which most took for the roar of an earthquake…"[84] Winthrop described that people heard the meteor within a region eighty miles in diameter centered around Bridgewater, New England. The daytime fireball produced by the meteor briefly became brighter than the sun and was bright enough to reverse the shadow of the observer who had his back towards the sun.[85]

Winthrop also documented an account of a "whirlwind" that manifested in Leicester. In June 1761, eyewitnesses observed the circular motions of clouds prior to the emergence of the whirlwind making "a terrible noise."[86] Winthrop described that residents of the house destroyed in the whirlwind had attempted to close the doors when the whirlwind approached, only to be surprised by the collapsing chimney.[87] When the whirlwind vanished, only half of the stone chimneys remained, wood timber from the house were impaled several feet deep nearly vertically into the ground, beds hung from trees, and nails were driven into tree trunks.[88] Winthrop mentioned God once as he "ordained" that the whirlwind kill a black slave, two horses,

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[82] John Winthrop, "An Account of a Meteor Seen in New England, and of a Whirlwind Felt in That Country: In a Letter to the Rev. Tho. Birch, D. D. Secretary to the Royal Society, from Mr. John Winthrop, Professor of Philosophy at Cambridge in New England," *Philosophical Transactions* 52, (1761): 7, http://www.jstor.org/stable/105580.
[83] Winthrop, "An Account of a Meteor Seen in New England, and of a Whirlwind Felt in That Country," 7.
[84] Winthrop, "An Account of a Meteor Seen in New England, and of a Whirlwind Felt in That Country," 7.
[85] Winthrop, "An Account of a Meteor Seen in New England, and of a Whirlwind Felt in That Country," 7.
[86] Winthrop, "An Account of a Meteor Seen in New England, and of a Whirlwind Felt in That Country," 8.
[87] Winthrop, "An Account of a Meteor Seen in New England, and of a Whirlwind Felt in That Country," 13.
[88] Winthrop, "An Account of a Meteor Seen in New England, and of a Whirlwind Felt in That Country," 11-13.

while sparing the master's family.[89] Winthrop admitted that "It appears to me so difficult to assign a cause adequate to these effects, to shew by what means a small body of air could be put into a circular motion, so effectively rapid as this must have been, that I dare not venture any conjectures about it."[90] Winthrop's conclusions lacked his usual confidence when explaining earthquakes and comets.

In contrast to his account of the meteor and tornado, Winthrop's expeditions to document the transits of Venus in 1761 and 1769 reverted to his synthesis of scientific pursuit and religious disclosure. The transit of Venus across the sun in 1761 was the second recorded occasion the rare event occurred. He cited the late astronomer Edmund Halley's discovery that transits happened in pairs, or *series*, roughly twice per century.[91] Winthrop described the scientific value the transit provided by allowing refinement to the orbital calculations of the inner planets, determining accurate longitude on Earth, and demonstrating Copernicus' sun-centered planetary system.[92] Winthrop highlighted Halley's assertions that a planetary transit could determine the parallax [distance and dimensions] of the sun which would provide accurate measurements of the solar system, its planets, their masses, and their orbits.[93] Along with other scientific, geographic, historical, and chronological values, Winthrop mentioned that the transit would "probably give us a deeper insight into many of the wonderful works of GOD."[94] He described the power of Newton's discovery of gravity as the "fundamental Law which the allwise CREATOR has established for regulating the several movements in this grand machine…"[95] Winthrop did not

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[89] Winthrop, "An Account of a Meteor Seen in New England, and of a Whirlwind Felt in That Country," 14.
[90] Winthrop, "An Account of a Meteor Seen in New England, and of a Whirlwind Felt in That Country," 16.
[91] John Winthrop, *Relation of a Voyage from Boston to Newfoundland for the Observation of the Transit of Venus, June 6, 1761*, Excerpts, 1761, From National Humanities Center Resource Toolbox Library, 1, http://nationalhumanitiescenter.org/pds/becomingamer/ideas/text6/winthropvenus.pdf.
[92] Winthrop, *Observations of the Transit of Venus*, 1.
[93] Winthrop, *Observations of the Transit of Venus*, 1.
[94] Winthrop, *Observations of the Transit of Venus*, 2.
[95] Winthrop, *Observations of the Transit of Venus*, 2.

see a conflict between religion and science. He continued describing the unique advantage of North America in observing the transit. The transit occurred as predicted on June 6, 1761. Winthrop mentioned that the transit did not reveal any moon of Venus as claimed by other astronomers. Nevertheless, his observations would be compared to others recorded around the world to refine calculations of Venus' parallax.[96]

Like his ancestors, Winthrop and his family continued a legacy of achievement. Following his great-granduncle, the Royal Society elected Winthrop as a Fellow in 1765, and the American Philosophical Society enrolled him as a member in 1768.[97] All four of Winthrop's stepsons enrolled at Harvard. Following his graduation in 1769, James became the Harvard college librarian and served as one of Cambridge's Justices of the Peace from 1784-1795, overseeing civil disputes.[98] His youngest son, William, graduated in 1770 and became an apprentice to John Hancock, served as a town clerk, and likely became a successful merchant, owning a wharf and co-owning a cargo sloop. [99] Meanwhile, John Winthrop continued his scientific studies and teaching at Harvard until he died in 1779.[100] He was buried next to his ancestors in Boston.

The scientific legacy of John Winthrop of Harvard provides a unique insight into the level of eighteenth-century scientific understanding. Although religious superstition continued to dominate the American colonies, Winthrop counteracts this potential hamper to scientific

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[96] Winthrop, *Observations of the Transit of Venus*, 5.
[97] Frederick E. Brasch, "JOHN WINTHROP (1714-1779), AMERICA'S FIRST ASTRONOMER, AND THE SCIENCE OF HIS PERIOD," *Publications of the Astronomical Society of the Pacific* 28, no. 165 (1916): 170, http://www.jstor.org/stable/40693084.
[98] Alicia DeMaio, "The Winthrops: A Harvard Family," Colonial North America at Harvard Library, Harvard University, accessed April 4, 2023, https://colonialnorthamerica.library.harvard.edu/spotlight/cna/feature/the-winthrops-a-harvard-family.
[99] Alicia DeMaio, "The Winthrops: A Harvard Family."
[100] Frederick E. Brasch, "JOHN WINTHROP (1714-1779), AMERICA'S FIRST ASTRONOMER, AND THE SCIENCE OF HIS PERIOD," *Publications of the Astronomical Society of the Pacific* 28, no. 165 (1916): 156, 170, http://www.jstor.org/stable/40693084.

progress by incorporating a unique religious deism into his observations and lectures. He both defied and defended his Puritan faith in scientific arguments. His lectures on earthquakes and comets demonstrate his period's gradual transition from fear of the unknown to one of inquiry and fascination. Similarly, Winthrop did not hesitate to denounce those he perceived as deliberately misguiding in scientific or theological debates. Winthrop sought to universally enlighten the young colonial nation that would, in subsequent centuries, transform into a scientific giant that continued building on his foundation.