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## Maria Mitchell — Stellar Scientist

*Mary Draper Janney*



Maria Mitchell as a young astronomer on Nantucket. Taken from a portrait by Hermione Dassel, 1851. Courtesy Vassar College Library.

The universe of local history that *Spritsail* encompasses includes Nantucket Island, its history, its lore and its people. Maria Mitchell was a distinguished inhabitant of the island. Born in 1818, she became one of the great scientists of the 19th century, the first woman astronomer in America, a leading educator of women and a firm advocate of women's rights.

She was born into a Quaker family, one of nine children. From a very early age, she displayed an unusual aptitude for mathematics, a quality that was quickly observed by her father, William. He was among the earliest pioneers of astronomical observation in the country and his ability to record observations of the stars for the purpose of rating the chronometers of Nantucket's whaling ships was valued indeed. He was one of the town's respected citizens; whaling captains depended on his observations and skill for it was knowledge of the heavens that often steered them home.

By choice, from a very early age, Maria Mitchell was at her father's side on the walk on top of their house. On every clear evening, they observed all night long, recording observations, making calculations, noting the relative positions of stars. It was exact, unrelenting hard labor, but even as a child Maria Mitchell never flinched from the demands of the work. It fascinated her to observe the stars in the heavens, and early in life she seemed to sense the beauty and order in the universe.

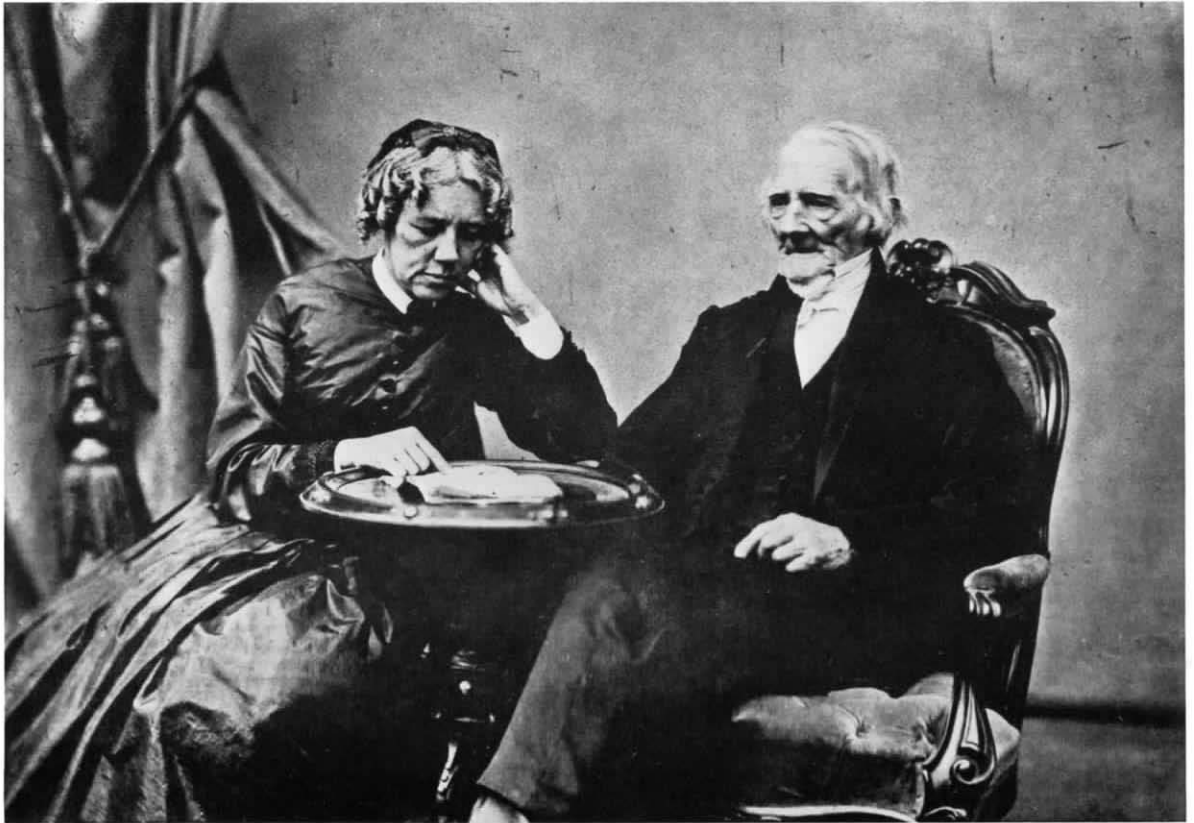
At the same time that she was a remarkably disciplined young girl, she also possessed a vivid imagination and unusual creative energies. She wandered the island at a young age observing nature and asking such questions as "Why is the grass green? Why is the sky blue? Why are the moon and the sun the same size in the sky?"<sup>1</sup> She envied her older brother who had escaped the confines of the island

and gone to sea on a whaling ship without his parents' knowledge or permission. She was a free spirit and all of her life railed against rules and regulations that hemmed her in.

Quaker life dominated Nantucket in the 19th century. The religion censured color and frivolity in any form and Maria rebelled against these strictures of her faith. The drabness of her religion conflicted with what she saw around her. In nature she observed so much that was full of color and life. She was obstinate and hated her early schooling for the same kind of reason. At the age of four, she was forced to copy moralistic lessons from *The American Spelling Book*. Painfully and defiantly, she copied words that she didn't understand and therefore didn't want to know.

Fortunately, her father decided to open a school for children in Nantucket. Unlike the traditional rote approach to schooling typical of his day, William the Teacher, as he came to be called, learned with his pupils. With his young charges, including Maria, he walked the moors and shores of Nantucket looking for birds, shells, plants. "Thee must wonder. Thee must watch closely, then will thee see and know for thyself,"<sup>2</sup> he taught. This new approach to learning which encouraged Maria to participate actively in the quest for knowledge released her vast intellectual energies. Under her father's tutelage, she collected small fossils and called them "autographs of time."<sup>3</sup> By the age of ten, she had read all of the long volumes of Rollins' *Ancient History*, not because she had to but because her curiosity about the past had been aroused by her father's method of teaching.

At the age of 16 she opened her own school for girls in Nantucket. She had become assistant to the headmaster of another school on the island. Restless under his rules and lockstep method of learning, she



Maria with her father, William, shortly before his death in 1869. Photo by Slee Brothers, Poughkeepsie. Courtesy Vassar College Library.

decided that she could learn more and teach others if she could create a school where students were invited to participate in the learning process. She placed an ad in the local paper in Nantucket:

"Maria Mitchell proposes to open a school for girls on the first of next month at the Franklin School House. Instruction will be given in Reading, Spelling, Geography, Grammar, History, Natural Philosophy, Arithmetic, Geometry and Algebra.

Terms \$3 per quarter. None admitted under six years of age."<sup>4</sup>

She was surprised at her own audacity and convinced that no pupils would appear on opening day. They did though, including three Portuguese children who had been turned down by the free school in town. Maria Mitchell welcomed them all and for the next two years exposed her students to her kind of learning.

"Learn to observe," she told her pupils. "The eye learns to see. Watch after sunset, watch before sunrise."<sup>5</sup> Direct observation was the foundation for learning, she believed. She took her students on early morning and evening walks to observe nature. They went out after sunset to watch the stars appear. Their curiosity aroused, her students learned the disciplines required to understand what they had observed.

Maria Mitchell's qualities of mind had not gone unnoticed by the town leaders of Nantucket. Although some were critical of her non-traditional approaches to schooling, none could doubt her intellectual appetite and discipline. At the age of 18, she was offered the job of librarian at the Atheneum, the town's library and center of intellectual activity. Her salary was to be sixty dollars the first year, seventy-five the next and one hundred dollars thereafter. Maria accepted eagerly because she knew that de-

spite the duties of the job, she would have access to books to further her never-ending search for knowledge. The library was open only afternoons and Saturdays. Hurrying through her chores at home, she made time in the mornings at the Atheneum to do her own reading. She taught herself French and German so that she could read works of scientists in those languages. She read and puzzled over Bridge's *Conic Sections*, Hutton's *Mathematics*, Bowditch's *Practical Navigator* and Airy's work on *Gravitation*. She was always searching for truth about the great laws of the universe which were so poorly known in the mid-19th century.

In 1847 when Maria Mitchell was 29, an event occurred that changed her life: she discovered a comet. During her years of schooling and her work at the Atheneum, Maria continued her habit of observations whenever the night sky was clear, using first the walk on top of her house and later a similar perch on top of the Pacific Bank. The family had moved when her father had been appointed manager of the bank because, in those early days of banking, people felt more comfortable if the bank's official lived in the same building where their money was.

One particular night, when her father was entertaining friends downstairs, Maria observed a strange body in the sky. She ran quickly for her father who confirmed her observation. Further observations over successive nights convinced the father/daughter team that a significant discovery had been made.

The King of Denmark, interested in science, had offered a series of medals for original work. In 1847 he offered a gold medal to the first person who discovered a comet through a telescope. Through his connections at Harvard University, William Mitchell forwarded his daughter's name as contender for the medal. Although the comet had also

been observed by astronomers in England and Italy, it was determined that the medal belonged to Maria. The medal arrived on the island almost a year after her discovery. This was the first time that one of the medals had been awarded to an American and the first instance in which it had been won by a woman anywhere.

Word of the "lady astronomer" spread through the small but growing scientific world and the extraordinary talents of Maria Mitchell began to be recognized. Over the violent protest of the distinguished Harvard botanist, Asa Gray, Maria Mitchell was elected to the newly founded American Association for the Advancement of Science, the first woman ever admitted. Louis Agassiz, the great naturalist whose work and teachings inspired the founding of the Marine Biological Laboratory in Woods Hole, became a friend of Maria Mitchell's. A native of Switzerland, he had come to Harvard in 1850. He proposed her name to the American Academy of Arts and Sciences, and again she was the first woman member.

Maria's recognition by the leading scientific professional associations strengthened her confidence in her research. She was also exposed to the great currents of scientific and literary thought that were then sweeping the United States. Thirty miles out to sea, Nantucket might have been an intellectual backwater; instead it became an extraordinary seat of learning and intellectual ferment. To the Atheneum came the great scholars, writers, scientists and philosophers of the day. Ralph Waldo Emerson, Herman Melville, James Audubon were featured lecturers. Henry Thoreau and Louis Agassiz came often to the island. It would seem that every conceivable subject was addressed to the many learned societies that flourished on the island. In the Nantucket Philosophical Society and the Social

Reading Society for example, men and women read original stories and poems and discussed contemporary literary works. "I think there is no town in New England where the whole body of women is so well educated"<sup>6</sup> wrote one visiting lecturer. That view was echoed by Lucy Stone and other activists for women's rights who lectured on the island.

Her mind bursting with ideas and questions stimulated by these visitors, Maria yearned to travel to Europe but the idea of a woman traveling alone was out of the question. As luck would have it, a wealthy Chicago banker, H.K. Swift, wanted his daughter to make the grand tour of Europe and to see parts of the United States. He had heard of Maria Mitchell and decided that she would make a suitable chaperone for his daughter. For Maria, it was a dream come true.

She traveled first to Chicago to pick up her charge. They went west to the Mississippi and down the river to New Orleans, then came east by way of Savannah and Charleston to sail for Europe. It was 1857 and the issue of slavery and the future of the union was in the air. Maria heard southerners extol the virtues of slavery and she observed the slave markets in the big southern cities. They made her physically ill as the idea of one human being owning another was abhorrent to her. She wrote her father: "I think that the Union cannot last."<sup>7</sup>

Her travels to England, France and Italy stretched her mind and added to her knowledge. She had letters of introduction to leading European astronomers from Edward Everett, president of Harvard, Benjamin Silliman of Yale and Joseph Henry, secretary of the Smithsonian. Her accomplishments opened doors for her. Furthermore, she carried with her the first photograph of a star ever taken; and she discussed the implications of this ground-

breaking technological development on the future of astronomy with eminent European scientists and astronomers.

She visited the observatories at Liverpool, Greenwich, Cambridge and Glasgow. Everywhere she was recognized. When she would modestly introduce herself to England's foremost scientists and astronomers by saying that she had brought a letter of introduction from a friend in America, they would invariably say: "It is quite unnecessary. I know you without."<sup>8</sup> She did not confine her time to just people of science. To her father she wrote from London: "There are four great men whose haunts I mean to seek out, and on whose footprints I mean to stand — Newton, Shakespeare, Milton and Johnson."<sup>9</sup>

After Miss Swift was called home by her father, Maria went on to Rome with the Nathaniel Hawthorne family; there she visited the Vatican Observatory. No woman had ever been allowed there, but she asked permission and ultimately it was granted. The irony of being on the site where the Vatican telescope has clockwork made to compensate for the motion of the earth on its axis, the very motion for asserting whose existence Galileo had suffered, did not escape her. She wrote, "I know of no sadder picture in all the pages of religious history more pitiable than that of the Holy Church trembling before Galileo, denouncing the truths which he taught because they were in conflict with what they considered God's only book, unknowing that the Book of Nature is also the Book of God."<sup>10</sup>

When Maria Mitchell returned home, she found new resources and invitations to work with other scientists. She spent a summer in Maine with the Coast Survey, learning to use and apply new instruments. She was appointed field researcher and computer for the *Nautical Almanac*. On a continuing basis, she computed the position of Venus. She

was the only American woman at this time to have self-supporting scientific employment and international recognition. The Women of America, an association in Boston, gave her a new and powerful telescope.

In 1862 Maria was invited to occupy the Chair of Astronomy at Vassar, the first endowed college for women in the country. She was promised an observatory and a telescope. She would be the first woman on the faculty of a new institution that accepted the premise that women should have the same kind of educational opportunities as men.

It was a long time before she was able to join Vassar's first faculty. The Civil War delayed the college's opening and gave its critics ample time to thunder against higher education for women. "You cannot feed a woman's brain without starving her body," declared a worthy doctor of the time. "Open the door of your colleges to women," he roared, "and you will accomplish the ruin of the commonwealth."<sup>11</sup> Some trustees believed in the college's purpose of educating women but could not conceive of such education being carried out by women professors. Wasting little time over this furor, Maria continued her research and preparation of scientific papers. On occasion, she went to Cambridge with her father and there she visited often with Louis Agassiz.

Unlike most of his colleagues, Louis Agassiz was a strong proponent of women in science. He encouraged their application to the Penikese Island School. His views on teaching coincided with those of Maria Mitchell. Rejecting the traditional pattern of lecturing professor and passive student, they both insisted upon involving students in the learning process.

In 1865, after the end of the Civil War, she was formally invited to join the Vassar faculty. Her





Astronomy Class with  
Maria Mitchell in front  
of Observatory at Vassar,  
1878. Student kneeling is  
Elizabeth Cady Stanton's  
daughter, Harriet Stanton  
Blatch, Vassar, 1878.  
Photographer unknown.  
Courtesy Vassar College  
Library.

With class in Vassar  
College Observatory, 1885.  
Photographer unknown.  
Courtesy Vassar College  
Library.





salary was to be \$800 a year with board for herself and her father. The observatory and telescope that she was promised were in place. It was testimony to Vassar's commitment to the role of science in the education of women, and a joyous gift to the woman who would lead them.

Maria differed from most of the Vassar faculty. She scorned the traditional teacher-pupil relationship and involved her students in the process of learning from the very start. The observatory was a teaching laboratory. To the consternation of their parents and some teachers, the young women of the 1860s, 70s and 80s stayed up night after night with their astronomy teacher, observing the stars and making notations of their courses and movement. They developed a collegiality and pride in their work which their teacher shared: "We are women studying together,"<sup>12</sup> she noted proudly in her diary. She trained them in mathematics saying that: "Astronomy is not stargazing. The entrance to astronomy is through mathematics."<sup>13</sup> Some of her students excelled and went on in the field, but all of them were encouraged to think critically and creatively, to test hypotheses, observe closely, and calculate accurately the results of observations. A great teacher, Maria Mitchell cultivated qualities of mind in young Vassar women that they used the rest of their lives.

At Vassar Maria continued her resistance to unquestioned authority and strict codes of behavior and thought. In the early days of the college there were, in her view, some petty rules and regulations. *The Students Manual* stated: "Students must not light the gas in their own rooms or elsewhere at any time between the retiring bell and the rising bell next morning, except for sickness or other unavoidable necessity."<sup>14</sup> As was usually the case, Maria was looking through her telescope between dusk

and dawn and if a meteor shower or comet crossed her field of vision, she was off to the dormitory to wake the students, no matter what the hour. The corridor teachers protested to no avail.

She objected to grades, insisting that there was no accurate measurement of the intellect. She abhorred compulsory classroom attendance on the theory that if the class were interesting, the student would attend. Perhaps most of all she detested the petty discussions and arguments that permeated faculty meetings. They seemed endlessly boring and without meaning to her. She said of one particularly frustrating session: "Our faculty meetings always try me in this respect — we do things that other colleges have done before. If the Earth had waited for a precedent, it would never have turned on its axis."<sup>15</sup>

Maria never really made peace with the majority of trustees and the presidents of the college during her tenure. By and large, they were of a traditional, conservative nature and objected both to her beliefs about the role of science in life and to her independent ways. One day the president asked her not to sit so near the front windows of the observatory when mending her stockings on Sunday. It was the

Lord's day and no purposeful activity other than worship should take place. She replied that upon examining her conscience she could not find mending on Sunday a misdemeanor in itself. She explained that she sat by the window because it gave her the best light. The trustees and president strongly protested but she remained adamant. Because of her personality and the nature of her work, she was a threat to those who believed that the teachings of religion held sway over the new truths that science was revealing. The argument of creationism versus Darwinism had begun and feelings ran high.



Waiting for the skies to clear, circa 1877. Photo by Vail Brothers, Poughkeepsie. Courtesy Vassar College Library.

Matthew Vassar's vision of a college that offered equal educational opportunities for women was not always reflected in the atmosphere on its campus. The few women on the faculty were regarded as second-class citizens. Their names were omitted from the list of faculty committees. When the president of the college asked the faculty for a list of their publications, he neglected to ask the women. Predictably, women were paid less than men. Maria and another woman on the faculty threatened to resign on one occasion unless this inequity was resolved.

In part because of this atmosphere, Maria often seized opportunities to get away from the campus and into the larger world. She was in demand as a lecturer at other campuses and communities and she accepted requests to speak whenever she could. She was an effective, moving speaker, able to talk about her work in ways that lay people could understand. She opened up the wonders and beauties of the large and largely unknown universe, and she talked about the poetry of science without leading her audiences into complexities which were beyond them. These widening contacts in academic and intellectual circles convinced her to work actively for change in society's attitude toward women. She railed against the belief that women should not and could not work in science. She came to believe that the advancement of women in society in general was a goal she wished to pursue. "I believe in women even more than I do in astronomy,"<sup>16</sup> she said.

Maria came naturally to the cause of women's rights. The Quaker religion, for all its drabness, believed in the equality of men and women. In Nantucket, a community where one third of the men were at sea at any time, women naturally assumed positions of responsibility and authority. Encouraged

by her father, Maria grew up in an atmosphere that assumed women were competent and able. Finally, Louis Agassiz had always championed her right to a place with other scientists of distinction.

In the fall of 1873, a call went out to women everywhere which read: "We hope to found an association for the Advancement of Women, at the annual gathering of which shall be presented the best ideas and the most advantageous methods of our foremost thinkers and writers."<sup>17</sup> At the first gathering in New York were the prominent women of the day, preachers, teachers, professors, artists, lawyers, editors, authors, practical philanthropists. The Women's Congress, as this group came to be called, differed from the American Equal Rights Association founded by Elizabeth Cady Stanton and Susan B. Anthony some years before to advocate voting rights for women. The new group was more concerned with the advancement of women through education. From that would flow access to the ballot, it was believed. Banded together, these were the professional women of the day. Their goal was to support and encourage women to enter public life, be it as a teacher, doctor, lawyer, scientist, artist, wherever their talents would lead them. Maria was active in this association from the beginning and became its president in its fourth year. Throughout its history, she helped to formulate its agenda and until the end of her life she spoke up for women everywhere.

Maria Mitchell stayed at Vassar College until the year before her death in 1889. Despite her "wars" with the college, she recognized and appreciated that it was the first institution in the country to open the doors of higher education to women. Near the end of her long tenure, she wrote that, "The world is better while Vassar lives . . . The college will continue with vigor and will live and grow in its long centuries and continue to bless the world."<sup>18</sup>



Waiting for sundown. Note open door in revolving roof and telescope visible through upper window. On Christmas Day 1888 Maria Mitchell retired to Lynn, Mass. There she continued to sweep the skies in the little observatory of which she proudly said, "Lick Observatory is the largest in the world; mine is the smallest." Photo by W. Marshall Wires, Lynn, Mass. Courtesy Vassar College Library.

Maria Mitchell possessed a drive to learn about the universe. She used every available moment in her life to pursue knowledge. It is hard to think of her frittering time away. Yet she was aware of the enormity of her task. She wrote: "The world of learning is so broad and the human soul so limited in its power. We reach forward and strain every nerve, but we seize hold only of a bit of the curtain that hides the infinite from us."<sup>19</sup> She seemed unaware of her extraordinary talents and spent little time thinking about her accolades and triumphs. She said of herself: "I am a person of ordinary capacity but extraordinary persistency."<sup>20</sup> She seemed to ignore the fame that came to her in many forms. She was the first woman elected to the American Philosophical Society. She received honorary degrees from Rutgers Female College and from Columbia. She was amazed to hear that a crater on the moon had been named after her.

She would have liked to know that an association has been named after her. Founded 86 years ago with the financial help of Quakers and Vassar alumnae on the island, The Nantucket Maria Mitchell Association is a living memorial to the most important woman scientist of the 19th century. The organization owns and operates an observatory, a natural science museum and a science library. Each summer it sponsors weekly lectures by astronomers from the Harvard-Smithsonian Center for Astrophysics in Cambridge and other institutions. It sponsors children's classes in natural science and marine life as well as adult programs including wildflower walks, bird walks and nature walks. A resident astronomer directs the observatory on the island all year long. In addition to providing public education, the observatory is a research center with summer internships in astronomy, mathematics and physics. Maria Mitchell would

approve of this living memorial which carries on her work. One can almost hear her saying to these students: "Did you learn that from a book or did you observe it yourself?"

Mary Draper Janney has spent part of every summer of her life in Woods Hole. All of her professional life she has been concerned with education, and currently she is executive director of the "I Have a Dream Foundation" of Washington, D.C. It is an organization dedicated to helping disadvantaged youngsters stay in school and aim for college. She is also chair of the Board of Trustees of Vassar College. There she became interested in Maria Mitchell, not only as a scientist, but more importantly to her, as a teacher of young women.

## Notes

1.  
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2.  
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3.  
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4.  
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5.  
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11.  
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12.  
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17.  
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