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Women Make History:

Stories we should have learned in school

Note: Shout-out to Sue Mitchell for suggesting the subject of this issue!

"Science was of no country and of no sex. The sphere of woman embraces not only the beautiful and the useful, but the true."

Joseph Henry, introducing a paper by Eunice Newton Foote

Photo believed to be Eunice Newton Foote

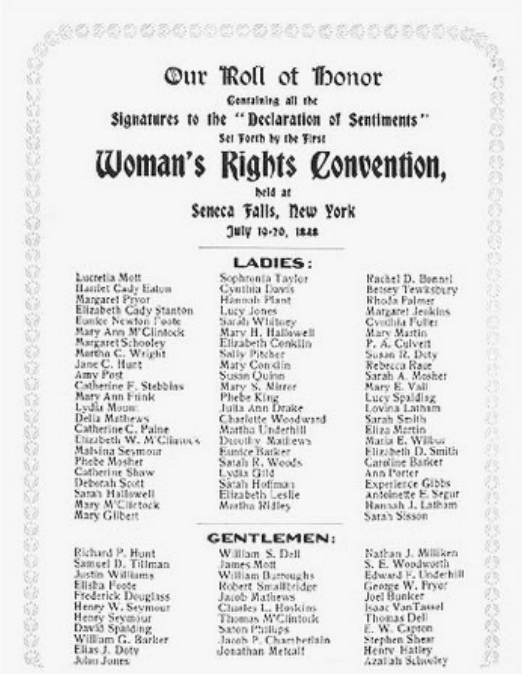
Foote-note no longer:
The Mother of Climate Science, Eunice Newton Foote

In the early 19th century, when women couldn't vote, own property, or speak at public gatherings, Eunice Newton Foote discovered the effect of greenhouse gas on the earth's atmosphere. An amateur scientist and relative of Sir Isaac Newton, Foote was also an inventor, suffragist, and landscape painter.

Born in 1819 in Goshen, CT, her family moved soon after to western New York, a cultural

mecca for political, social, and intellectual thought leaders including abolitionists, mystics, temperance advocates, and women's rights activists.

Foote attended the Troy Female Seminary, an innovative prep school for young women founded by feminist Emma Willard. Rather than the typical finishing school curricula for young ladies, students studied subjects normally reserved for men including astronomy, chemistry, geography, meteorology, and natural philosophy. Foote and her classmates were also encouraged to study science with Amos Eaton at the nearby Rensselaer School. A leading scientist and educator, Eaton taught his students to conduct practical experiments in addition to theoretical learning.



Our Roll of Honor

Containing all the Signatures to the "Declaration of Sentiments" Set Forth by the First

Woman's Rights Convention,

held at Seneca Falls, New York July 19-20, 1848

LADIES:

Lucretia Mott, Harriet Cady Eaton, Margaret Pryor, Elizabeth Cady Stanton, Eunice Newton Foote, Mary Ann M'Clintock, Margaret Schooley, Martha C. Wright, Jane C. Hunt, Amy Post, Catherine F. Stebbins, Mary Ann Frink, Lydia Mount, Delia Mathews, Catherine C. Paine, Elizabeth W. M'Clintock, Malvina Seymour, Phebe Mosher, Catherine Shaw, Deborah Scott, Sarah Hallowell, Mary M'Clintock, Mary Gilbert, Sophronia Taylor, Cynthia Davis, Hannah Plant, Lucy Jones, Sarah Whitney, Mary H. Hallowell, Elizabeth Conklin, Sally Pitcher, Mary Condlin, Susan Quinn, Mary S. Mirror, Phebe King, Julia Ann Drake, Charlotte Woodward, Martha Underhill, Dorothy Mathews, Eunice Barker, Sarah R. Woods, Lydia Gild, Sarah Hoffman, Elizabeth Leslie, Martha Ridley, Rachel D. Bonnel, Betsey Tewksbury, Rhoda Palmer, Margaret Jeaklns, Cynthia Fuller, Mary Martin, P. A. Culvett, Susan R. Doty, Rebecca Race, Sarah A. Mosher, Mary E. Vail, Lucy Spalding, Lovina Latham, Sarah Smith, Eliza Martin, Maria E. Wilkes, Elizabeth D. Smith, Caroline Barker, Ann Porter, Experience Gibbs, Antoinette E. Segur, Hannah J. Latham, Sarah Sisson

GENTLEMEN:

Richard P. Hunt, Samuel D. Tillman, Justin Williams, Elisha Foote, Frederick Douglass, Henry W. Seymour, Henry Seymour, David Spalding, William G. Barker, Elias J. Doty, John Jones, William S. Dell, James Mott, William Burroughs, Robert Smalldridge, Jacob Mathews, Charles L. Hoskins, Thomas M'Clintock, Saxon Phillips, Jacob P. Chamberlain, Jonathan Metcalf, Nathan J. Milliken, S. E. Woodworth, Edward F. Underhill, George W. Pryor, Joel Bunker, Isaac VanTassel, Thomas Dell, E. W. Capron, Stephen Shear, Henry Hatley, Azariah Schooley

In 1841 Foote married an attorney, who was also an amateur scientist and inventor. They had two daughters and lived in Seneca Falls where Foote became close friends with Elizabeth Cady Stanton. In 1848 Stanton organized the Seneca Falls Convention, considered to be the birth place of the women's suffrage movement in the U.S.

Foote and her husband took the radical step of attending and they both signed the convention's Declaration of Sentiments. Modeled after the Declaration of Independence, it listed grievances against women and demanded equal rights including the right to vote. Foote was a member of the editorial committee, and one of five women who prepared the proceedings for publication.

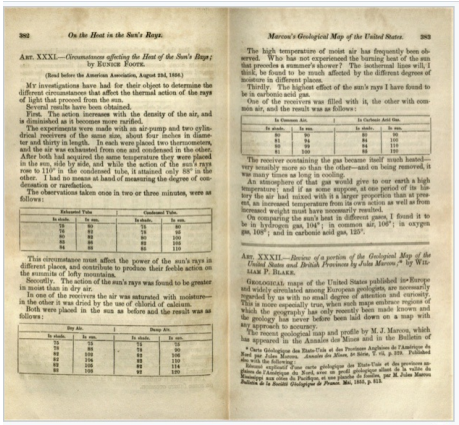
It was also in Seneca Falls that Foote built a laboratory at home and began conducting experiments on the effects of sunlight on different gases. Her simple equipment included an air pump, two glass cylinders, and four mercury-in-glass thermometers. Foote placed two thermometers in each cylinder then pumped the air from one and compressed it in the other. When both cylinders reached the same temperature, she placed them in the sun to measured the effects.

Foote found that the amount of moisture in the air effected the temperature. She experimented with air, carbon dioxide (CO_2) and hydrogen, and discovered that the tube with CO_2 became hotter than the others when exposed to sunlight. Foote wrote: "The receiver containing this gas became itself much heated—very sensibly more so than the other—and on being removed [from the Sun], it was many times as long in cooling."

These experiments led Foote to conclude: "An atmosphere of that gas would give to our earth a high temperature; and if, as some suppose, at one period of its history, the air had mixed with it a larger proportion than at present, an increased temperature from its own action, as well as from increased weight, must have necessarily resulted."

In 1856, Foote became the first person to warn that increased levels of CO_2 could lead to

climate warming.



Eunice Foote – "Circumstances Affecting the Heat of the Sun's Rays" (1856), *American Journal of Science and Arts*. Foote recognized the implications of carbon dioxide's heat-capturing properties—the greenhouse effect—for the entire planet.

Foote published her results in a paper, *"Circumstances Affecting the Heat of the Sun's Rays,"* and submitted it to the 10th annual meeting of the American Academy for the Advancement of Science (AAAS). Probably because of her gender, her paper was presented by a male colleague, Joseph Henry. He began by stating: "Science was of no country and of no sex. The sphere of woman embraces not only the beautiful and the useful, but the true". However, Henry later dismissed Foote's theory in an article published in the *New-York Daily Tribune*.

Three years later, the renowned Irish scientist John Tyndall announced similar findings. When he published his results, Tyndall cited research by other scientists, but not Foote. Today, scholars still debate whether Tyndall was unaware of her research, or if he deemed it irrelevant. However, since then, Tyndall is the person recognized for discovering the effects of CO_2 on the earth's atmosphere.

Foote also conducted research on static electricity which she called "electrical excitation." She wanted to find which gases in the air could generate static electricity. Again, her equipment was simple and again, when she submitted her paper to the AAAS in 1857, it was introduced by Joseph Henry.

However, her paper, *"On a New Source of Electrical Excitation,"* marked the first time an American woman's work in physics had ever been published. In the 19th century, only sixteen physics papers were published in scientific journals by American women, two of which were authored by Foote.

By 1860, the Footes moved to Saratoga Springs, NY, and then to Washington, D.C., in 1865 where her husband later became the Commissioner of Patents.

Foote, like her husband, was also an inventor and they often collaborated. According to Rachel Brazil, in an article for *Chemistry World*, in 1842 Foote's husband filed for a patent on a cooking stove invented by his wife. Brazil also reported that many of Foote's inventions were patented in her husband's name, because as a married woman, she wouldn't have been able to defend them in court.

In 1868, Elizabeth Cady Stanton allegedly visited Foote at the patent office. Foote remarked that in her opinion, half the patents filed were for inventions by women. Because men controlled the money for manufacturing and also sought the prestige, they ascribed the inventions to themselves.

However, Foote did receive a patent in her name for a device that prevented shoes and boots from squeaking. She also invented a strapless skate and a paper-making machine that reportedly saved one company $157 per day (about $2,720 in 2021) in raw materials.

Foote died in September 1888, in Lenox, MA, and is buried in Green-Wood Cemetery. Her 1862 passport application described her as just under 5' 2" tall, with blue-gray eyes, a "rather large" mouth, oval face, sallow complexion, and dark brown hair.

Like too many others, Foote fell into obscurity for multiple reasons including gender bias especially in the field of science. Also, she was regarded as an *amateur* at a time when American scientists were less highly regarded than their European counterparts.

Foote's legacy is slowly being reclaimed. In the 1970s, female scholars began referencing her in academic papers. In 1992, Elizabeth Wagner Reed, included a chapter on Foote in her book, *American Women in Science Before the Civil War*. But it was retired geologist, Ray Sorenson, who came across a summary of Foote's research in a 1857 scientific journal. In 2011, he published an article claiming that Foote's discovery preceded Tyndall's in making the connection between CO_2 and climate change.

Since then, the University of California, Santa Barbara, held a symposium on Foote and a short-film about her life, *Eunice*, was produced. In 2022, the American Geophysical Union instituted The Eunice Newton Foote Medal for Earth-Life Science.

Ask a Friend: Beyond the obvious gender bias, why have women's achievements been dropped from history?

Ask Yourself: As we learn their stories, how do we keep them alive?

Remember the Dads with Women Make History Swag

In time for Father's Day, BBQ aprons are available! Spread the love. If you purchase a mug or book bag, post a photo of yourself with the item on Instagram and or Facebook, and tag me (@SharonSpaulding) in your post.

Aprons. Mugs & More: WomenMakeHistory.com

Sharon Spaulding discovered the hidden story of Mary Ware Dennett, suffragist, sex education and reproductive rights activist, when she married one of Dennett's great-grandsons. Today, she curates the family's archives.

Sharon has spent twelve years researching first-wave feminism, the battle for reproductive rights, and Mary's life in the context of politics and social mores from 1914–1947. She received a grant from Radcliffe College's Schlesinger Library to support her research and the creation of a manuscript. Her essays about Dennett have appeared in *Ms.Magazine*, *Smithsonian*,

and *New Hampshire Magazine*.

Sharon is a popular speaker at women's and civic groups, and also book clubs. She is available to speak on the forgotten stories of remarkable women and the history of the suffrage and reproductive rights movements of the early 20th century. Schedule a talk with your group!

Sharon lives near Salt Lake City with her husband and two dogs, Gus and Hank.

Help reclaim the lives of remarkable women. Please share the newsletter and invite others to subscribe. Follow me on social media. **www.SharonSpaulding.com**

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