

*An American industrial and safety
engineer, environmental chemist
during 19th century*

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- Ellen Henletta Swallow was born on Dec. 3rd 1842 in Dunstable, Massachusetts in a family, who came from an established families of modest means and were believers in the value of education.
- In her early years she was home-schooled. In 1859 her family moved to Westford where she attended Westford Academy, the second oldest secondary school in Massachusetts.
- At the academy, Swallow's found her proficiency in Latin which allowed her to study French and German, because of this she was much in demand as a tutor and her hard-earned income made it possible for Swallow to further her studies.
- In 1870, she wrote to Merrick and Gray, commercial chemists in Boston, asking if they would take her as an apprentice.

- Their response is they weren't in a position to take pupils and the best way is to enter MIT as a student. After some discussion and vote, Swallow became the first woman admitted to MIT, although the corporation made it clear that, "her admission did not establish a precedent for the general admission for females."
- In 1873 Swallow received a B.S degree from MIT and continued her studies. She was not awarded with her advanced degree in Master of Science in Chemistry until 1886.
- In 1910 she was awarded an honorary Doctor of Science degree.
- On June 4th 1875, she married Robert Hallowell Richards, chairman of the Mine Engineering Department at MIT.

- First post-college career: unpaid chemistry lecturer at MIT (1873-1878)
- 1872-1875: consulting chemist for Massachusetts State Board of Health
- 1884-death: instructor at the newly founded lab of sanitary chemist at the Lawrence Experiment Station, headed by her former Professor William R. Nicholas
- 1884: appointed as an instructor in sanitary chemist at a newly formed MIT lab for the study for sanitation.
- 1887-1897: Commonwealth's official water analyst, nutrition expert for the US Department of Agriculture

- In 1800s, her interests turned toward issues of **sanitation of air and water quality**. She performed a series of water tests on 40,000 samples of local waters which served as drinking water for their immediate populations, which led to the "Richards' Normal Chlorine Map" which was plotted the chlorine concentrations in water of the states. These chlorine concentration was distributed from the ocean. As a result, water with chloride concentration that deviate from the plot was suspected of human pollution, therefore, Massachusetts established the first water-quality standards in US and the first modern sewage treatment plant.
- Richards applied her her scientific knowledge to the home. She felt that all women should be educated in science, so she wrote books about science for use in home such as, *The Chemistry of Cooking and Cleaking (1882)*, *Food Materials and Their Adulterations (1885)*

- She used her own home as experimental lab for healthier living through science. With the concern of air quality, she moved from coal heating and cooking oil to gas. She and her husband installed fans to pull air from the home to the outside to create a cleaner air environment within the home. She also determined the water quality of the property's well through chemical testing, and to ensure that wastewater was not contamination the drinking water.

- The Ellen Swallow Richards House was designated a National Historic Landmark in 1992
- In her honor, MIT designated a room for the use of female students and on occasion of the 100th anniversary of Richards graduation in 1973, established the Ellen Swallow Richards professorship for distinguished female faculty members.
- In 2011, she was listed as number eight on the “MIT150” list of the top 150 innovators and ideas from MIT with the tag line, “Drink up,” in reference to her work on assuring the safety of the domestic water

