

A life filled with firsts

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Ellen Swallow Richards. Credit: MIT Museum

In 1887, the Massachusetts State Board of Health commissioned MIT's new laboratory of sanitary chemistry to survey the state's drinking water, the first such study in America. Led by Ellen H. Swallow Richards, an instructor at the lab, the two-year survey analyzed more than 20,000 samples collected from inland bodies of water that had been polluted with industrial waste and sewage. As a result of the findings from the landmark study, Massachusetts established the first water-quality standards and municipal sewage-treatment plant in the country.

By the time Richards completed the study that many consider her greatest contribution to public health, she had already established herself

as a pioneer. As MIT's first female graduate and faculty member, she was instrumental in opening the Institute's first laboratory for women in 1876 and tirelessly promoted scientific education for women throughout her nearly 40 years at the Institute.

Richards was no less trailblazing in her career as an environmental engineer. Early on, she recognized the link between illness and the pollution of air, water and food, and urged her colleagues and students to use chemical analysis to test the purity of these elements. Her fascination with the relationship between human health and the environment prompted Richards to create a new discipline to explore this connection — a field of study she named ecology.

Through her environmental work, Richards realized that the establishment of widespread public-health standards must begin with efficient home management. By applying scientific principles to domestic topics such as nutrition, physical fitness and sanitation, she invented another new discipline — home economics — that made science more accessible to women at the turn of the 20th century.

An 'experiment' proves successful

After receiving her undergraduate degree in chemistry from Vassar College, Richards decided to continue her studies at MIT, where she was admitted in 1870 as part of what the faculty called "an experiment." As a student, she worked for professor and chemist William R. Nichols, who trained her in the methods of water analysis, a new branch of chemistry at the time. When Richards graduated with another bachelor's degree in chemistry in 1873, she was already known as one of the nation's top water scientists.

After she married Robert H. Richards, chair of MIT's Mine Engineering Department, in 1875, Richards remained closely involved with the

Institute. Her fundraising led to the 1876 opening of MIT's Women's Laboratory, where — without pay — Richards taught chemical analysis, industrial chemistry, mineralogy and biology to women. The lab closed in 1883, when MIT officially began accepting women and awarding them degrees as regular students.

One year later, the Institute opened the laboratory of sanitary chemistry — the first public-health laboratory in the country — and Richards was appointed to teach about the chemistry of air, water and food to chemists, biologists and engineers. The lab gained preeminence with the water-quality survey, which was designed to track the most significant trace of human activity at the time — chlorine from salt used in food and industry — in more than 20,000 samples. After determining the acceptable levels of naturally occurring chlorine in water throughout the state, Richards created a map to plot how the chlorine in the samples compared to those standards in different regions. The results showed the extent of manmade pollution in the state, and the “Normal Chlorine Map” became a template for conducting similar surveys around the world.

Although Richards continued to teach at the lab until her death in 1911, she focused the latter part of her career on advancing home economics. She organized conferences, established standards for certification and set up model kitchens to teach the public how to prepare nutritious food, including at the World's Columbian Exposition in Chicago in 1893. Today, specialists continue to address issues that were central to Richards' vision to advance “the betterment of living conditions through conscious endeavor,” including nutrition, elder care and protecting the environment.

Setting the standard

What made Richards' many scientific successes all the more remarkable

was that they were achieved in an enterprise dominated by men. That she was able to pave the way for untold numbers of women — at MIT and elsewhere — to establish successful careers in science, technology and teaching is arguably her lasting legacy.

“While discrimination against women is illegal today, it was very much a reality for Richards, and had the first woman at MIT been any less of a ‘winner,’ the position of women at MIT might have had a much sorrier history,” says Susan L. Kannenberg ’61, former president and member of the Association of MIT Alumnae (AMITA), an organization Richards founded in 1899.

For most of the 20th century, women represented only a small fraction of MIT students. Today, however, more than 3,900 female students — about 40 percent of the student population — are enrolled at MIT, and the number of women on the faculty has doubled since 1990.

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