A six major epidemics of cholera swept the globe during the 19th century, fecally contaminated drinking water killed millions of people. For more than 30 of those terror-filled years, the resolute courage of one chemist, Edward Frankland, protected the public health.

Edward Frankland believed that water was guilty until proven innocent, and he condemned tainted water with the righteous conviction of a law-and-order prosecutor. As the illegitimate son of a rich lawyer and a chambermaid, however, Frankland had to hide his origins. So he is almost unknown today, although during his lifetime he was one of Britain’s most important chemists.

Frankland discovered the fundamental principle of valency—the combining power of atoms to form compounds. He gave the chemical “bond” its name, and popularized the notation we use today for writing chemical formulas. He codiscovered helium, helped found synthetic organic and structural chemistry, and was the father of organometallic chemistry. He was also the first person to thoroughly analyze the gases from different types of coal, and—dieters take note—the first to measure the calories in food.

In the 1860s, Frankland had just turned his attention to reforming science education in Britain when London fell prey to the epidemic that had been sweeping Europe—cholera. The disease causes vomiting, fever, and profuse, watery diarrhea. Half of all people with severe and untreated cholera die of dehydration and electrolyte imbalance.

A total of six cholera pandemics—all now thought to have originated in Bangladesh—circled the world during the 19th century. For 50 years, there were never more than six years of relief between the end of one pandemic and the beginning of another. Responsible for an estimated 20,000 deaths in England alone, the epidemic prompted Queen Victoria’s personal physician to remove the handle from the polluted Broad Street pump in London in the first recorded, appropriate measure to prevent waterborne disease.

Cities were particularly easy prey for cholera, as urbanization and industrialization polluted water supplies. Although London’s water was the most notorious, it was probably not the worst. And although cities in the United States were late to industrialize, they too had problems as cities grew and the middle classes demanded more water for bathtubs, showers, and toilets. Chicago, for example, used Lake Michigan as both a water reservoir and a sewage dump.

Disease and contagion were already widely associated with decaying human and animal waste when Frankland took over as London’s water consultant in 1865 and as virtually the only working member of the Rivers’ Pollution Commission in 1868. Little was known about clean water. Although some experts thought that decaying matter directly caused disease or indirectly nurtured disease-causing microbes, others regarded feces-rich water as no more than unacceptably disgusting. Until the German bacteriologist Robert Koch identified the cholera bacillus in 1883, no one knew how the disease spread from human feces to drinking water to human victim and back again.

As the disease devastated cities, clean water issues threatened to tear British society apart. Arguing for “the greatest good for the greatest number”, liberals demanded government action. In contrast, industrialists and Parliament argued that government should not interfere with business, even when the public health was at risk. No one objected to pollution in general or to uncontrolled urbanization and industrialization, but terrified of cholera, people demanded sanitary water.
Modern water treatment delivers safe drinking water by a series of chemical and physical steps. First, simple screens remove solids; next, chemicals are added to cause remaining solids to clump or “floculate” for easy removal. Finally, an addition of chlorine kills bacteria.

Prometheans in the Lab: Chemistry and the Making of the Modern World tells the dramatic stories of nine chemists whose discoveries shaped the Western world. Their lives demonstrate the benefits and costs of science and technology, the rise of the environmental movement, and science’s growing ability to identify and solve pollution problems. Other scientists profiled in the book are Nicolas Leblanc (cheap soap); William Henry Perkin (cheap dyes); Norbert Rillieux (cheap sugar); Fritz Haber (fertilizer and poison gas); Thomas Midgley, Jr. (leaded gasoline and safe refrigeration); Wallace Hume Carothers (synthetics); Paul Hermann Mueller (DDT); and Clair C. Patterson (lead-free gasoline and food).