

Perry L. McCarty 1931–2023

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Perry L. McCarty, a pioneer in environmental biotechnology, passed away at the age of 91. His contributions to environmental engineering will live on.

Perry McCarty was passionate about environmental engineering and, especially, environmental biotechnology, a discipline that harnesses microorganisms for water purification, stabilization of organic matter and recovery of renewable energy. Perry and his students developed fundamental understanding and practical strategies that have been widely adopted by academia and industry. Principles laid out in *Chemistry for Environmental Engineering and Science* and *Environmental Biotechnology: Principles and Applications* are widely used in classrooms and by practitioners throughout the world.

Perry was born in 1931 in Grosse Pointe, Michigan. A relentless curiosity and ‘tinkering spirit’ served him well during hard times. As a child, he built crystal radios from scraps he unearthed at a junkyard. Working at his father’s used car lot, he carved treads in bald tyres and patched holes in floorboards with scrap metal.

During his early college years at Wayne State University, Perry planned to study physics, but given his love for both science and the outdoors he was drawn to civil engineering. He soon found his true passion in the wonders of the natural world and was inspired by the synthesis of aquatic chemistry and biology in the Streeter–Phelps equation. This sparked his interest in environmental engineering and science, a love he never left. Other interests also drew his attention. He insisted that the most important achievement of his college years was meeting Martha, his future wife. The two were together for 70 years.

Perry obtained his BSc in Civil Engineering from Wayne State University in 1953, his MSc in 1957 and his ScD degree in Sanitary Engineering from the Massachusetts Institute of Technology (MIT) in 1959. While studying for the ScD degree in Sanitary Engineering, Perry was asked why he needed to obtain such an advanced degree to become a garbage collector. Others expressed similar views. With the rise of the environmental movement and



sustainable development, however, their attitudes changed, and, according to Perry, “they began to admire my choice”. Later, when asked how he knew that environmental engineering would become so important, he responded “Of course I didn’t” but he believed “the need for good practical science just grew”.

Perry was recruited to Stanford University in 1962 to help build the Environmental Engineering and Science programme, with a focus on environmental biotechnology and chemistry. With Perry at the helm, the Stanford programme became the ‘gold standard’ for environmental engineering programmes worldwide. Perry’s work at Stanford was widely recognized. In 1992, Perry received the John and Alice Tyler Prize for Environmental Achievement; in 1997, the Athalie Richardson Irvine Clarke Prize for Outstanding Achievements in Water Science and Technology; and, in 2007, the Stockholm Water Prize, often referred to as the Nobel Prize for water. The citation for the Stockholm Water Prize underscored Perry’s “pioneering work in developing the scientific approach for the design and operation of water and wastewater systems”. His efforts helped define environmental biotechnology, a discipline that underpins several of the Sustainable Development Goals with a focus on biological processes for clean water and sanitation.

Throughout his career, Perry embraced sustainability as the path forward. His focus was microbial processes for clean water and renewable energy¹. Later, as Director of the Western Region Hazardous Substance Research Center (1989–2002), he encouraged development of new processes for microbial biodegradation and detoxification of hazardous substances in groundwater^{2,3}, with the aim of protecting and restoring aquatic ecosystems. More recently, he returned to anaerobic treatment processes, with a focus on mainstream applications that can enable net-energy-positive domestic wastewater treatment^{4,5}, bringing us one step closer to sustainable cities. His research efforts in these fields resulted in more than 350 publications, garnering more than 54,000 citations, and inspired generations of scientists and engineers.

From 1980 to 1985, Perry served as Chair of Stanford’s Department of Civil and Environmental Engineering. In 2004, the Directorship of the Stanford Woods Institute for the Environment, now part of the Stanford Doerr School of Sustainability, was named in his honor. In 2011, the Association of Environmental Engineering and Science Professors (AEESP) Foundation established the Perry L. McCarty AEESP Founder’s Award, given annually in recognition of Perry’s significant contributions to environmental engineering education, research and practice. In 2016, Stanford named him an “Engineering Hero”, because he “profoundly advanced the course of human, social and economic progress through engineering”.






As an educator, Perry inspired over 1,400 scholars globally, including his PhD students, grand-students and great-grand-students. In 2021, researchers from around the world celebrated his 90th birthday, creating a [phylogenetic academic tree](#) in his honor. He also made numerous contributions to governments and industries. His leadership on committees of the US National Research Council and the state of California provided essential direction for water reuse and bioremediation. He also participated in the development of environmental infrastructure of other countries, including China, South Korea and Singapore. In this way, Perry contributed to environmental engineering globally through education, research and service in many countries.

His passion for environmental engineering and sustainability was lifelong. After retirement, Perry worked for many years with faculty and students at Inha University to achieve anaerobic secondary treatment using fluidized bed reactors⁶, membranes⁷ and pilot-scale testing⁸. Later, scale-up of the process enabled net energy positive operation at the Codiga Resource Recovery Center at Stanford⁵.


Perry saw opportunity where others could not. In the second edition of *Environmental Biotechnology*⁹, he espoused a new viewpoint on wastewater: “Ironically,” he said, “what we call wastewater is water that contains a wide range of resources, which we could term to be ‘used resources’ that must not be wasted but cleansed, captured in a useful form, and used once again”. In fact, Perry held this view for decades, and today it has inspired next-generation researchers and practitioners to develop new technologies and new process trains that recover clean water, energy and

nutrients from domestic wastewater, while minimizing costs and greenhouse gas emissions¹⁰. More researchers would be inspired by Perry’s ‘tinkering spirit’.

Everyone who knew Perry McCarty was touched by his kindness, integrity and interest in the well-being of others. Despite his many accolades, Perry was unassuming and gracious to all. He truly was a role model for his family members, students, faculty colleagues and everyone with whom he associated. Perry McCarty will be missed, but his legacy will live on.

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Competing interests

The authors declare no competing interests.