

Herbert Conn: Mark Twain's Microbiologist Muse

A 1905 Twain story features an imaginary world containing human-like societies of microbes, noteworthy for their industriousness

Kenneth M. Noll

Mark Twain (1835–1910) and the microbiologist Herbert Conn (1859–1917) lived in the heyday of the early bacteriologists, including Pasteur, Koch, Winogradski, Lister, and Tyndall. They and others were discovering the fundamental roles that microbes fulfill in agriculture, public health, and industry. Conn, a founder of ASM and an early authority in dairy bacteriology, not only brought microbes to the attention of the general public, but he also interested Twain in this subject.

Early in his professional career, Conn was concerned about medical and public health education. In 1888 he published articles in *Science* insisting on the need to teach bacteriology in medical and nursing schools as well as public schools. Conn also noticed a shortage of bacte-

riology textbooks geared toward the public. Realizing that society did not fully appreciate the importance of hygiene, he began writing books about the roles of microbes in everyday life to raise public awareness of microbes and to improve public health. Thus he began a long career as a communicator of bacteriology to the public, a role that ultimately connected him to Twain.

Conn, Who Came to Bacteriology Accidentally, Soon Gained Fame

Conn came to study bacteria almost incidentally. He received his Ph.D. in zoology from Johns Hopkins University in 1884. Although he expressed some interest in bacteriology while a student, prominent biologists at the school helped to dissuade him from pursuing that field.

One of them commented, “No ordinary man can study bacteria. That takes a genius like Pasteur.”

Conn’s graduate education at Johns Hopkins was thoroughly grounded in evolution. Charles Darwin’s *On the Origin of Species* appeared less than 30 years earlier, making evolution a hot topic of the day. One of Conn’s professors at Hopkins had worked closely with Thomas H. Huxley, who was called “Darwin’s Bulldog.” Conn’s confluence of interests in evolution and bacteria were far ahead of his time considering the central role that evolution plays in microbiological research today.

Conn encountered microbiology soon after he joined the Biology Department at Wesleyan University in Middletown, Conn. in 1884. There he met and befriended Wil-

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Summary

- Although Twain and Conn did not meet, each read the other’s writings, and Twain drew on Conn in musing about microbes.
- Conn contributed to contemporary microbiology, focused on dairy research and public health, and helped to found the ASM.
- Twain referred often to microorganisms and one of his stories, “3,000 Years Among the Microbes,” depicts an imaginary inner world of thoughtful, highly verbal, and mostly helpful microorganisms.
- Because that story was not published during Twain or Conn’s lifetime, Conn did not appreciate how much he influenced Twain.

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Conn

bur Atwater, a nutritional chemist, who three years later was appointed to head the new Connecticut Agricultural Experimental Station located at what later became the University of Connecticut.

In part because Conn helped to solve the mystery surrounding an outbreak of typhoid fever in Connecticut, he was asked to direct the bacteriology laboratory at the new Station. Several students at Wesleyan had inexplicably died from typhoid fever. Conn traced the source of their infections to raw oysters they had all eaten and further determined that the shellfish became contaminated when an oysterman had rinsed them in sewage-contaminated water. This investigative feat was reported in newspapers across the country.

Dairy research that Conn did at the Connecticut Agricultural Experimental Station soon added to his growing fame. For example, to show off his successes in improving microbial cultures needed for producing butter and cheese, he was asked to sponsor an exhibit on dairy bacteriology at the 1893 Chicago World's Fair. While there, he and his assistant William Esten produced five batches of butter daily for several weeks. These activities at the fair were widely reported, and helped to make him more of a celebrity.

Although Conn worked primarily in agricultural bacteriology, his interest in public health issues led state officials to seek his expertise and services. Conn believed that the public needed to better understand the essential roles that microbes play in their lives. To address that cause, he became a prolific author of books and articles about microbes and also gave public lectures on related topics. *The Story of Germ Life*, which he published in 1897, became one of his most popular books. It describes how microbes are used in manufacturing, their importance in maintaining the natural world, and the fact that only a minority of microbes cause disease. "It is hoped that the result (of this book) may be to show that these organisms are to be regarded not primarily in the light of enemies, but as friends, and thus to correct some of the very general but erroneous ideas concerning their relation to our life," he wrote in its preface.

Frequent Microbial References in Twain's Writings

Meanwhile, during the 1880s and 1890s, Twain explored new ways to frame his satires of man's over estimated self-importance. One recurrent theme throughout these later writings was a portrayal of men as small creatures. For instance, Twain referred to the "small King and his butterfly dukelets" in *Personal Recollections of Joan of Arc by the Sieur Louis de Conte* (1895). In the better-known work, *Prince and the Pauper* (1881), he compared man to butterflies and ants. In a notebook from that period, he made men even smaller, writing, "I think we are only the microscopic trichina concealed in the blood of some vast creature's veins."

In 1897 Twain jotted ideas for a story he called "The General and the Cholera Microbes." "The globe is a living creature, and the little stinking human race and the other animals are the vermin that infest it—the microbes," he wrote. Although the stage was set for Twain to write in more depth about microbiology, he awaited further facts and inspiration before creating a fully imagined microbial world. That inspiration came during the same year when Conn published *The Story of Germ Life*, a book we know Twain read and which influenced him a great deal.

Twain began writing "3,000 Years Among the Microbes" on 20 May 1905, while on holiday in New Hampshire. The next month he told his publisher, "I am deep in a new book which I enjoy more than I have enjoyed any other for twenty years, and I hope it will take me the entire summer to write it." He took a break from writing on 5 June, the first anniversary of the death of his wife, Livy. He resumed work, writing more than 100,000 words until he stopped on 23 June. Brief additions to the story can be found in his notes in later years, but the story remained unpublished during his lifetime. It first came into print in 1967 as part of a compendium of his writings, *Mark Twain's Which Was the Dream? and Other Symbolic Writings of His Later Years*, compiled by John S. Tuckey.

The story "3,000 Years Among the Microbes" recounts the life of a man called Huck, who is transformed into a cholera germ within the body of Blitzkowski, an old tramp. There Huck meets other microbes belonging to differ-

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ent “societies” and calling themselves “Sooflaskies.” Among these Sooflaskies, Huck meets the character Duke, an amateur scientist and a member of a religious order. They converse at length about the activities and philosophies within those imagined societies. For instance, Huck asks Duke if lower animals would be allowed to accompany them to “the Happy Land” after death, and the Duke assures him that all creatures would do so, including “even the invisible and deadly microbe that feeds upon our bodies and rots them with disease!” Thus, Duke reveals that the Sooflaskies have their own microbes, which are called “swinks.”

Although Duke’s world was created for the Sooflaskies, he says it would be uninhabitable were it not for the swinks. They are responsible for decomposing dead animals, setting free “a lot of oxygen, nitrogen, and other things necessary to the plant-table,” he tells Huck, explaining that a plant uses these elements “with the exception of the nitrogen, which it must get later through the labors of other breeds of swinks.”

Thus Twain misconstrued some microbiological details that Conn understood and described correctly in his book. For example, contrary to what Twain wrote, microbial decomposition does not directly release oxygen. Remarkably, however, Twain grasped what Conn had written about how microbes fix nitrogen, describing it in his fictional world as being processed through the agency of a type of swink before it becomes available to plants. Remarkably, Beijerinck had reported microbial nitrogen fixation only as recently as 1888, a process that Conn studied at the Agricultural Station and described in *The Story of Germ Life*.

Twain through Duke also described swinks as being important contributors to industry in the world of the Sooflaskies, producing linen, jute, bread, wine, beer, butter, and tobacco. Probably not by accident, those swink activities are listed in the same order as they appear in the second chapter of Conn’s book. Praising the practical importance of the swinks, Duke says to Huck, “. . .they create Our wealth for Us, they prepare it for Our hand. We take it and use it.” By contrast, he sees disease-causing microbes to be of considerably less consequence. “Take all the other disease-germs in a mass . . . they are responsible for ten graves out of a hundred, that is all. We have seen that the swink—and the swink alone—saved our planet from denudation and

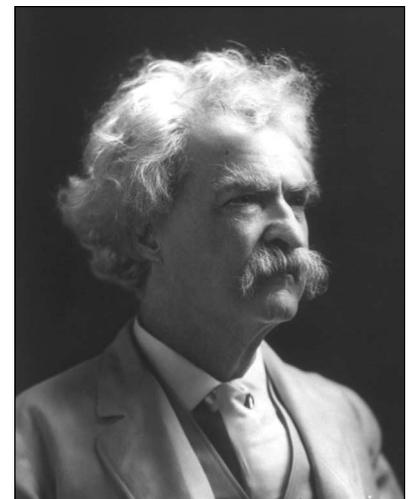
irremediable sterility in the beginning; saved Us and all subordinate life from extinction; is still standing between Us and extinction to-day.” These passages provide further evidence that the writings of Conn persuaded Twain of the fundamental importance—and goodness—of microbes.

Mark Twain never wrote another tale involving microbes. However, he picked up many of the same themes covered in *3,000 Years* in his story *The Chronicles of Young Satan* in his *Mysterious Stranger* tales (1916). Perhaps more importantly, in describing an imaginary world of microbes living in communities within a human body, Twain foreshadowed our modern efforts to study the body as an ecosystem in which microbes play a critical role. We now marshal metagenomic analyses to study the microbial “societies” of the gastrointestinal tract—bringing scientific reality to a realm Twain depicted through literature and imagination .

Conn Influenced— but Never the Twain Did Meet

In his scientific writings, Conn stressed the beneficial aspects of microbes, and Twain took this message to heart. In “3,000 Years Among the Microbes,” through the character Huck, Twain explicitly acknowledged Conn as the source for his inspiration about microbes. “In the World, when I was studying micrology (sic) under Prof. H. W. Conn, we knew all these facts,” Huck says to his audience in the story. Thus, a distinguished American microbiologist joined the elite cadre of world figures that Twain mentioned in his works.

Because this story was not published during Twain or Conn’s lifetime, Conn probably did not know just how much he had influenced Twain. Moreover, there is no evidence that Conn and Twain met, although we know that Conn read Twain’s published works. While on sabbatical leave in Europe, Conn, like Twain, grew tired of the seemingly endless parade of classical paintings he saw in art museums. “I am in the position of Mark Twain,” he wrote in his diary, “being able to recognize a St.

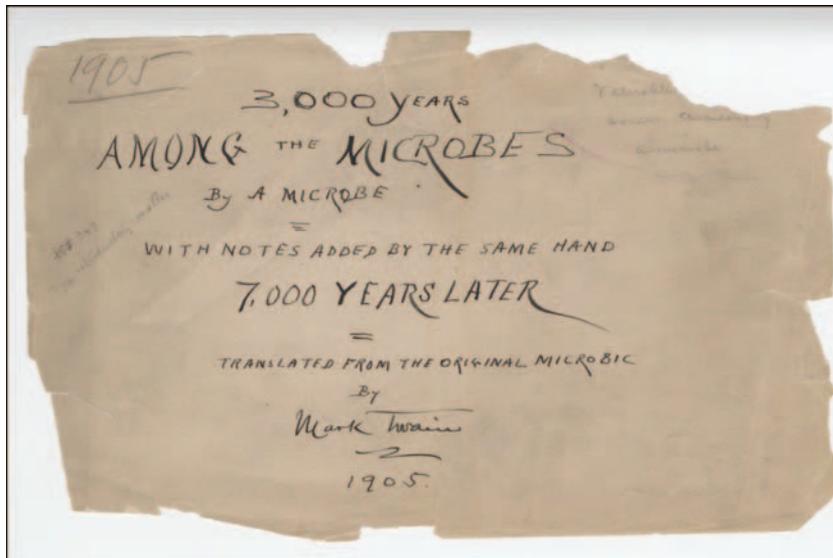


Twain

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FIGURE 3



Original title page of the manuscript for “3,000 Years Among the Microbes.” (Image courtesy of the Mark Twain Project, The Bancroft Library, University of California, Berkeley.)

Sebastian by seeing a man tied to a tree and filled full of arrows. Some way St. Sebastian don't look in pain and appears to be rather enjoying himself . . .” This comment shows Conn’s wry sense of humor and echoes what Twain wrote in *Innocents Abroad* (1869) about paintings of St. Sebastian.

Following his return from Europe in August 1898, Conn’s career path changed. That December he attended a meeting of the American Society of Naturalists in New York, where he met with E. O. Jordon of the University of Chicago. They talked of forming a society focused on bacteriology, and invited A. C. Abbott of the University of Pennsylvania to join them in this discussion. Their efforts led them to found the Society of American Bacteriologists the following year in New Haven, and Conn became secretary of this new society—the predecessor of the American Society for Microbiology (ASM).

While Twain was writing “3,000 Years Among the Microbes” in 1905, Conn was asked to lead a new state laboratory devoted to the diagnosis of infectious diseases. By this time, he had relinquished his duties at the Connecticut Agricultural Station as well as his post as Director of the Cold Spring Harbor Laboratory, enabling him to shift his focus to

public health. He became active in the American Public Health Association, later served on its executive committee, and from there became involved in efforts to enact laws requiring the pasteurization of milk. He also served on the New York City Milk Commission, whose decisions influenced pasteurization legislation around the country. As a member of committees developing new public health standards, he typically sought to reconcile conflicting views, while holding firm to his own high standards. He often moved contentious debates forward to practical solutions.

Conn held a teaching philosophy widely promoted in educational circles today. His son, former ASM President Harold J. Conn, attended Wesleyan while his father was a professor there. He once told his father that students enrolled in his introductory lecture courses on evolution and bacteriology because they were considered “snap,” that is, relatively easy courses. “I make

these two courses easy intentionally,” he told his son. “I put into them ideas that I think all the students ought to know, and I want as many to take them as possible. Even though they take the courses just to avoid hard work, they learn something; and I think that does them more good than it would if I made the work so difficult only the best students would elect the courses.” Like those courses, Conn’s books explained difficult subjects in ways his readers could comprehend. When he spoke publicly, he communicated effectively with his audiences and provided information relevant to their daily lives.

In both his teaching and his public presentations, Conn was ahead of his time. His books and lectures were approachable without being condescending. There is a lesson here for those scientists and administrators who consider communication of science to society as unnecessary and who dismiss it as diverting them from other, seemingly more important efforts. Conn was an expert at distilling information to its essentials and describing science in a manner that held the interest of his readers and audiences. If we can eliminate the phrase to “dumb down” science, we will do much to honor the memory of Herbert W. Conn.

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ACKNOWLEDGMENT

Quotations by H. W. Conn are from an unpublished biography (*A Religious Scientist at the Turn of the Century. Herbert William Conn of Wesleyan University*) written by his son, Harold J. Conn. Special Collections and Archives at Wesleyan University provided that document to Dr. Noll. Portions of that biography appeared in the *Journal of Bacteriology* article listed below.

SUGGESTED READING

Conn, H. J. 1948. Professor Herbert William Conn and the founding of the Society. *J. Bacteriol.* **12**:275–296.

Conn, H. W. 1897. *The Story of Germ Life*. D. Appleton and Company, New York. (available free, without illustrations, from several online sources).

Ketterer, David (ed.). 2003. *Mark Twain—Tales of Wonder*. University of Nebraska Press, Lincoln.

Royal, C. J. 1979. Mark Twain's diminishment of man; moral, intellectual, and physical aspects. Ph.D. dissertation, Texas Tech University, Lubbock (available online).

For more information visit Dr. Noll's webpage accessible at www.mcb.uconn.edu/fac.php?name=nollkm.

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