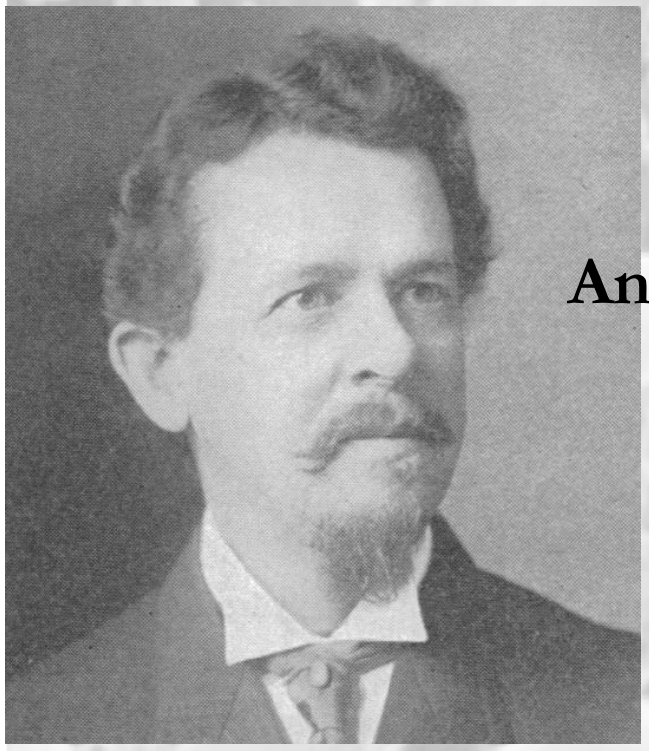
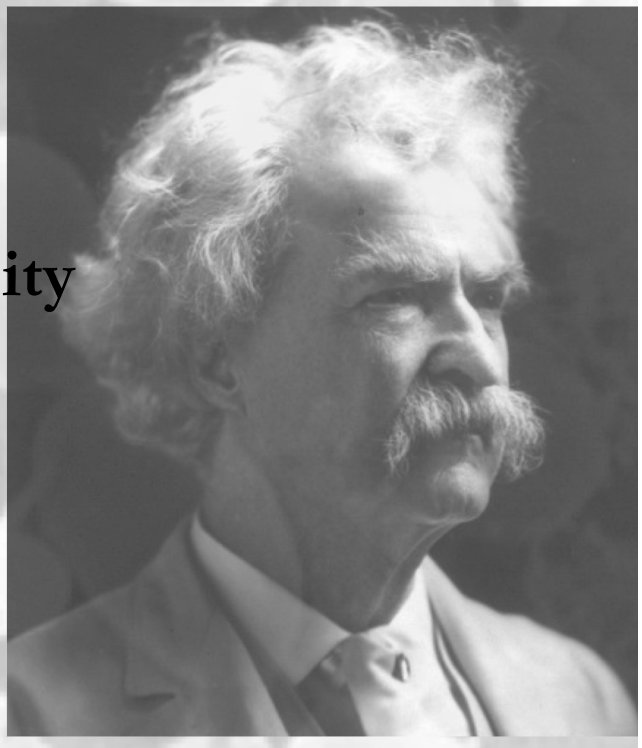
3000 Years Among the Microbes

Mark Twain and the Science of Professor Conn





An exhibit held at the University of Connecticut, Storrs
Homer Babbidge Library
Nov. 29 - Dec. 15, 2010

For information about the exhibit, contact Dr. Kenneth Noll, kenneth.noll.uconn.edu

3,000 Years Among the Microbes

3,000 Years Among the Microbes is an unpublished work by Mark Twain written in the summer of 1905. Twain's ingenious satirical story presents parallels between the lives of humans and the microbes living in his imagined world. Twain pokes fun at religious beliefs, the hierarchies of the world, and the selfishness of the common man.

In this story a man named Huck is changed into a cholera microbe and lives inside the body of a poor old tramp named Blitzowski. Huck lives among his fellow microbes, who call themselves "sooflaskies," for three thousand years, microbe time. This is three weeks in "World" or human time. Huck encounters characters such as "Catherine of Aragon," who teach him about microbial social standards and religious philosophies. He argues with them about the concept of the afterlife and about the nature of the Moral Sense.

Huck also comes to realize, with the help of a member of the microbe Nobles, the Duke, that even microbes have microbes of their own, called "swinks." He learns from the Duke that the bad reputation of swinks (like that of World microbes) as only being responsible for disease, is undeserved. Swinks are also responsible for the functioning of the microbe world and for important microbe-based industries, including the manufacture of butter, fermented beverages, bread, linen, and tobacco. Huck knew of these things because, as a man, he had studied under the famous H. W. Conn. Twain about microbes by reading Professor Conn's book *The Story of Germ Life*.

Who is Herbert W. Conn?

Herbert W. Conn was born in 1859 in Fitchburg, Massachusetts. He was a brilliant scientist who was always deeply immersed in his work and research. He received his Bachelors degree from Boston University in 1881. He received a Ph.D. in Zoology from Johns Hopkins University in Baltimore in 1884 where he studied evolution, a new area of science at the time. He did not study bacteriology, though he went on to be one of the premier microbiologists of his time.

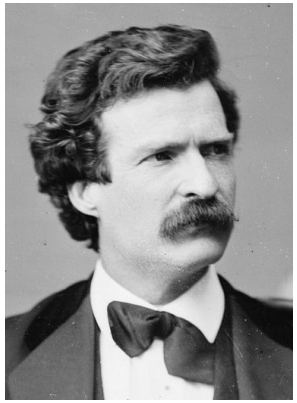
The 1880's saw the flowering of the new science of Bacteriology with the research of Louis Pasteur in France (namesake of pasteurization) and Robert Koch in Germany, known for developing tests to prove that specific bacteria cause specific diseases. He took a teaching post at Wesleyan University in Middletown, Connecticut where he became known as an inspiring teacher of biology and lecturer in evolution.

Conn was a well-known public figure. His research at the Connecticut Agricultural Experimental Station on improving traditional butter and cheese manufacturing by amending natural populations with pure cultures lead to his creation of a butter bacteriology exhibit at the 1893 Chicago World's Fair. Although Conn's work was primarily in agricultural bacteriology, he later gained fame in public health microbiology, particularly in the nationwide drive to require milk pasteurization to prevent the deaths of children.

Conn believed that the public needed to know that microbes play essential roles in their lives. He was a prolific author of books and articles about microbes and gave numerous public lectures on microbiological topics. First published in 1897, *The Story of Germ Life* was among his most popular books.

Information from *"H. W. Conn, A Religious Scientist at this turn of the Century"* by his son, H. J. Conn, 1947

Mark Twain



1870
Marries Olivia Langdon; their son Langdon is born later that year

1872
Moves his family to Hartford, Connecticut; publishes Roughing It; daughter Susy is born, but Langdon dies of diphtheria

1873
Publishes the satiric novel The Gilded Age

1874
Daughter Clara is born

1876
Completes and publishes The Adventures of Tom Sawyer

1880
Daughter Jean is born

1883
Publishes Life on the Mississippi, a memoir of his years as a steamboat pilot

1884
Founds his publishing company, Charles L. Webster & Co.

1885
Publishes The Adventures of Huckleberry Finn and a biography of President Ulysses S. Grant

1889
Publishes A Connecticut Yankee in King Arthur's Court

1891
Moves his family from Hartford to Europe due to poor family finances

1893
"Panic of 1893" marks national severe economic depression

1894
Publishes his last novel, Pudd'nhead Wilson; Charles L. Webster & Co. files for bankruptcy

1895
Participates in a worldwide lecture tour to pay his creditors

1896
Twain is devastated by the death of his daughter Susy while he is lecturing in Europe

1904
Twain's wife Livy dies after a two-year illness; Twain moves to New York City

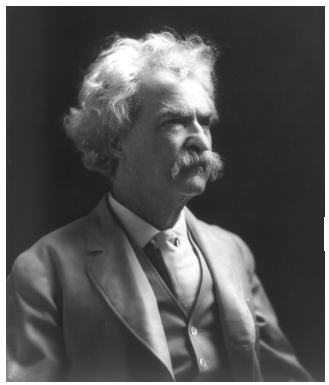
May/June 1905
Writes 3,000 Years Among the Microbes

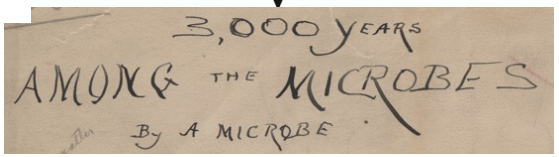
1906
Daughter Jean is institutionalized due to severe epilepsy

1908
Moves to Redding, Connecticut

1909
Daughter Jean Clemens dies

April 10, 1910
Mark Twain dies at the age of 74 at his home in Redding, Connecticut





Herbert W. Conn

1884
Hired as Instructor of Biology at Wesleyan University, Middletown, CT

1886
Appointed Associate Professor of Biology at Wesleyan, Evolution of To-Day published

1888
Appointed Professor of Biology at Wesleyan

1888
Publishes his first three bacteriology papers

1889
Storrs Agricultural Station is founded
Begins studying microbes that ferment milk

1890
Begins conducting research at the Storrs Agricultural Station

1891-97
Director of the Marine Biological Laboratory at Cold Spring Harbor

1891
Begins studying microbes that ferment ripening cream, subjects of his World's Fair exhibit

1893
The Columbia Exposition or the Chicago World's Fair
Conn's exhibit showed the effects of bacteria on the flavor of butter

1894
News of Conn's identification of oysters as the source of a fatal typhoid outbreak at Wesleyan brings national fame

1896
The Story of Germ Life published; book read by Twain influences 3000 Years Among the Microbes

1897-1898
Conn travels to Europe to study bacteriology and meet with other eminent bacteriologists from Germany, Denmark, and Sweden.

1899
Conn and two other scientists found the Society of American Bacteriologists; Conn serves as the Society's President from 1899-1902

1900
Conn begins working with Dr. Park at the Board of Health Laboratory in New York City

1906-1917
Director of the Connecticut State Board of Health Laboratory

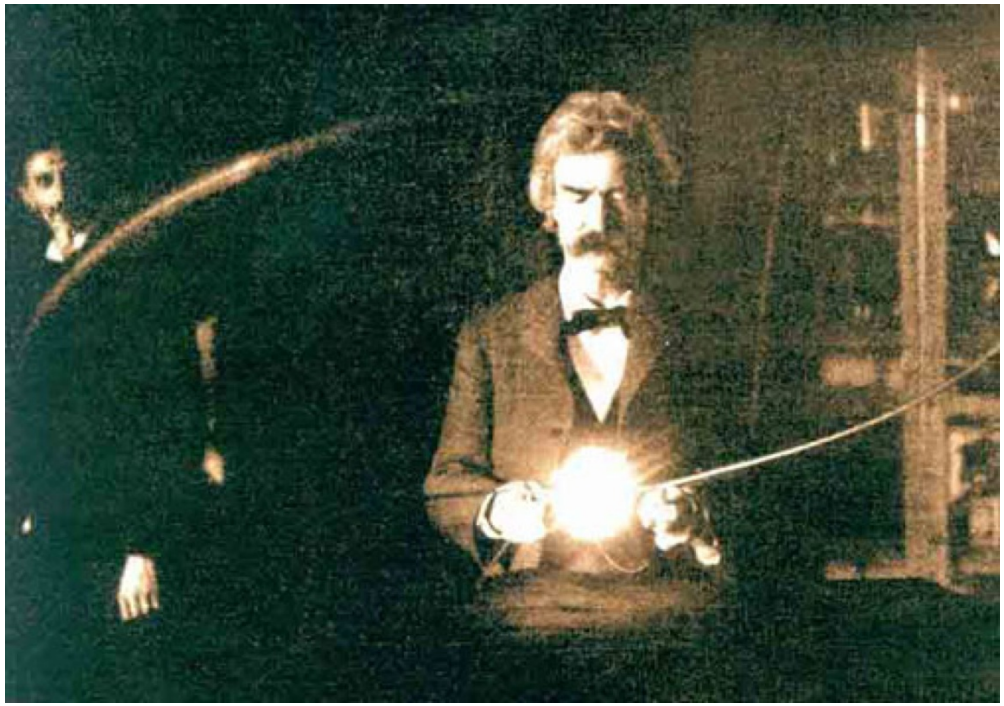
1911
Appointed a member of the National Commission on Milk Standards

1914
Social Heredity and Social Evolution published, Conn says "it is by far the best thing I ever did"

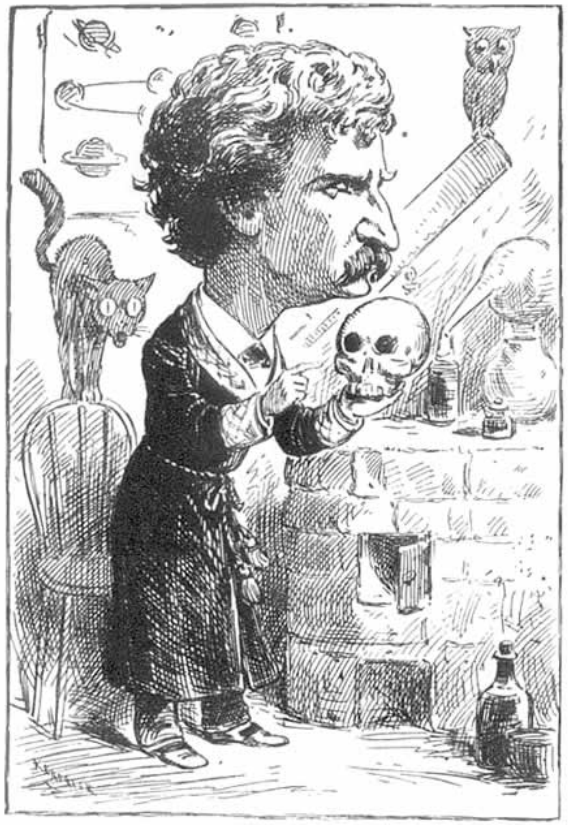
April 18, 1917
Herbert W. Conn dies suddenly at age 58 at home in Middletown, Connecticut

Twain was interested in science and technology, from the latest in electricity to Darwin's new theory.

Twain in the laboratory of Nikola Tesla, pioneer of electric technology (1894).



Cartoon from *Life* magazine, March 22, 1883



"It now seems plain to me that that theory ought to be vacated in favor of a new and truer one… the Descent of Man from the Higher Animals."
Mark Twain, *"Then Lowest Animal"*

“There is something fascinating about science. One gets such wholesale returns of conjecture out of such a trifling investment of fact.”

Mark Twain, Life on the Mississippi

Spoiled milk was a serious public health problem in Conn and Twain's time.

MILK ALIVE WITH GERMS.

Wesleyan Professor Says New York's Supply Contains More Than Sewage.

Special to The New York Times.

MIDDLETOWN, Conn., Jan. 11.—Prof. H. W. Conn of the Biology Department at Wesleyan tells his classes that the milk sold in the big cities contains more bacteria to the cubic inch than a similar measurement of sewage. Dirt and dust settle in it and the conditions are ideal

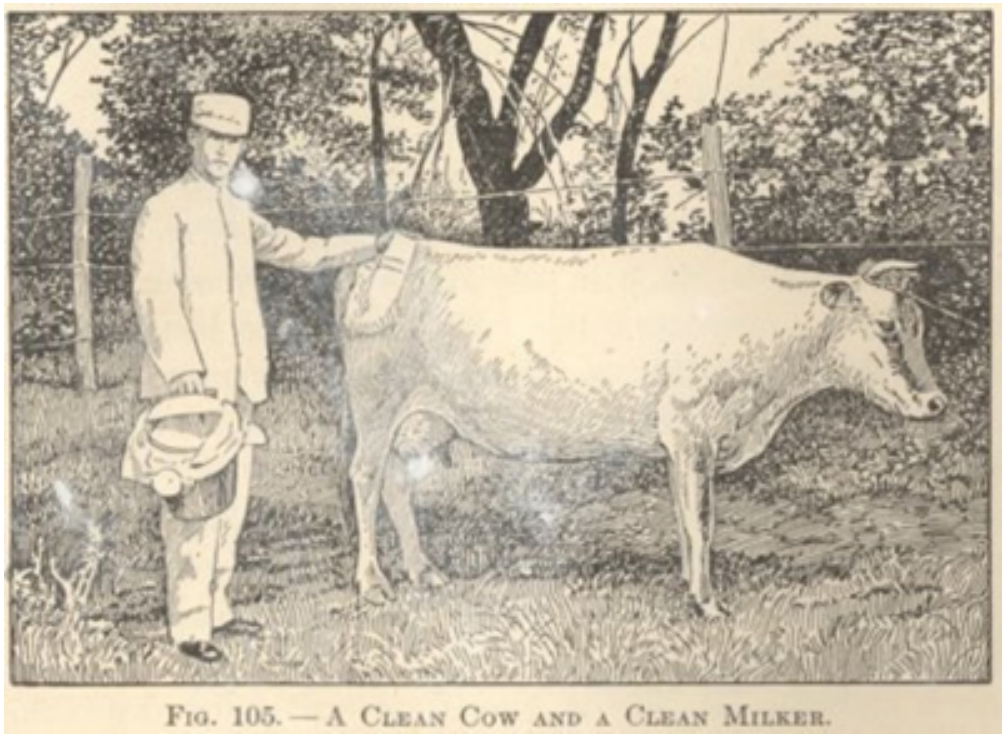


Fig. 105.—A Clean Cow and a Clean Milker.

MILK INSPECTION CALLED A JOKE.

Dairymen's Convention Starts Off With Lively Criticisms.

Meriden, Jan. 21.—Municipal milk inspection was called a joke by G. Warren Davis, president of the Connecticut Dairymen's Association, in his annual address at the opening of the three days' state convention here today. He also said that the general inspection of milk, as conducted at the present time, was unjust to the producers, and favored placing the

Conn worked to inform the public of the problem and advocated for mandatory pasteurization of milk. He met resistance from farmers as seen in this newspaper report.

Swat the Fly

In the early 1900's a campaign to eradicate flies from homes and barns spread across the US and Canada.

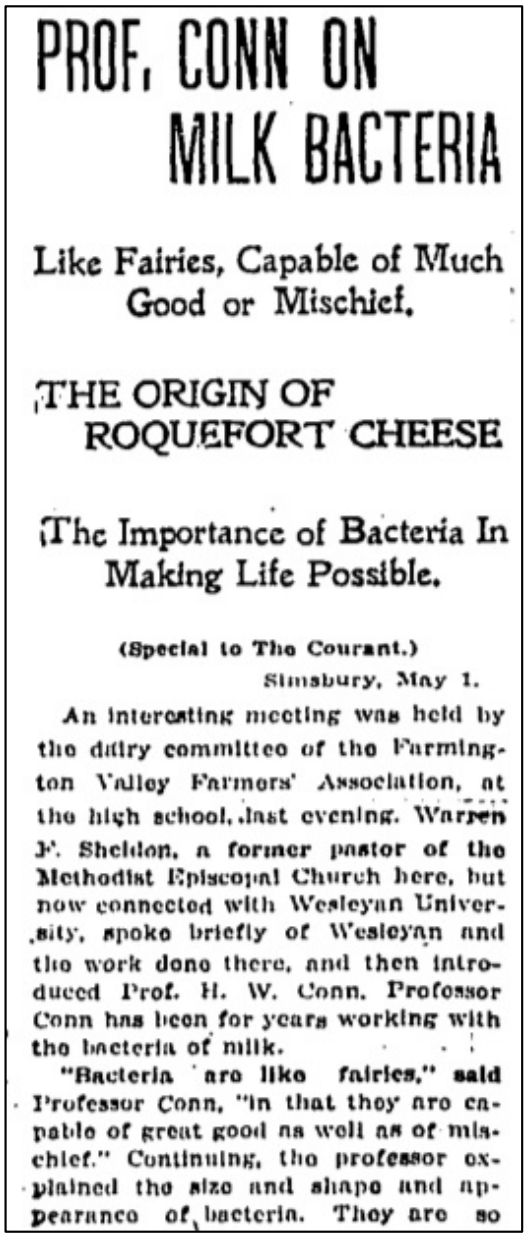
Newspapers sponsored contests for children to bring in flies, with prizes for the most flies.

The buckets of flies children brought in in a single day.

This boy is holding a box containing 451,500 flies!

There were 451,500 flies in the box this boy, Harold Brookwell, brought to The Star Office this morning.

Conn was a widely acclaimed public speaker in southern New England and New York.



PROF. CONN ON MILK BACTERIA

Like Fairies, Capable of Much Good or Mischief.

THE ORIGIN OF ROQUEFORT CHEESE

The Importance of Bacteria In Making Life Possible.

(Special to The Courant.)

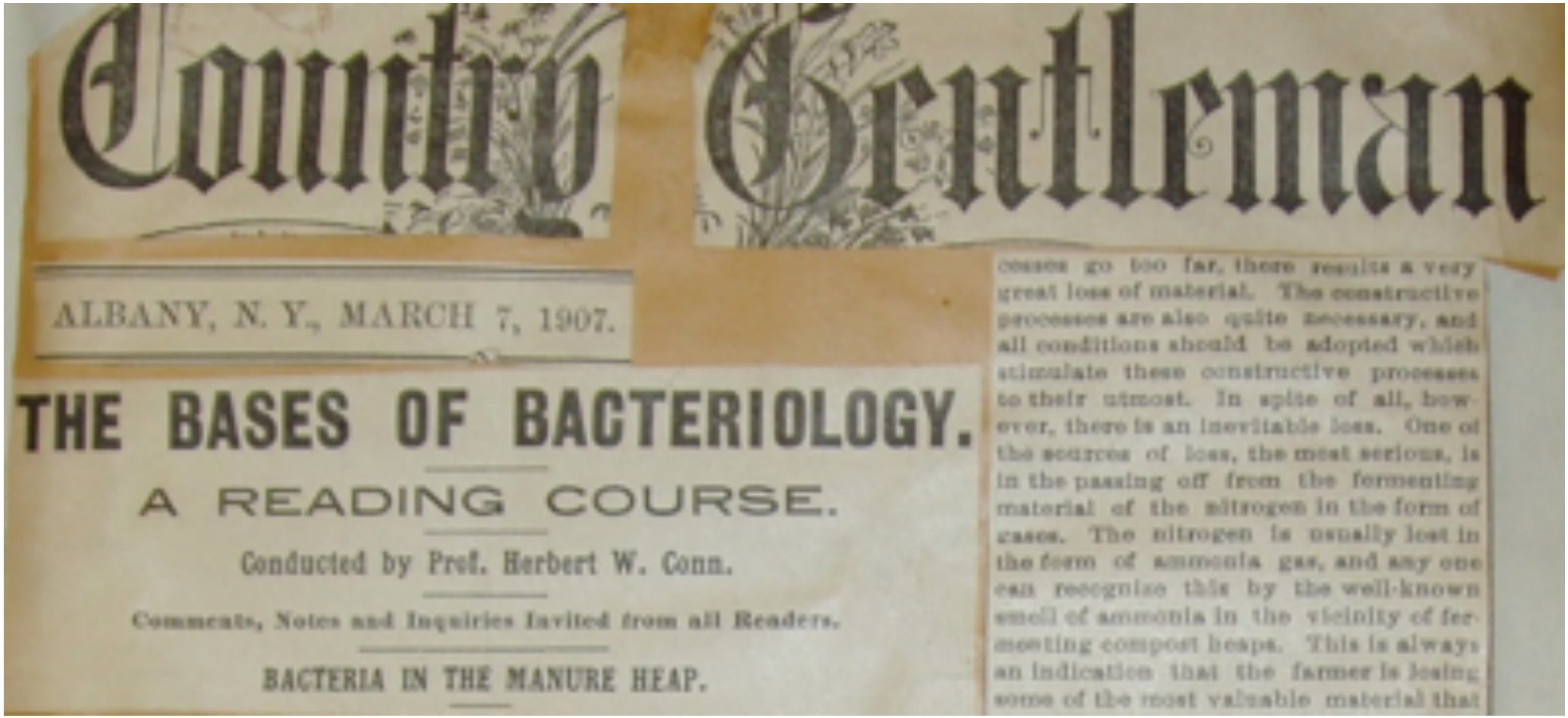
Simsbury, May 1.

An interesting meeting was held by the dairy committee of the Farmington Valley Farmers' Association, at the high school, last evening. Warren F. Sheldon, a former pastor of the Methodist Episcopal Church here, but now connected with Wesleyan University, spoke briefly of Wesleyan and the work done there, and then introduced Prof. H. W. Conn. Professor Conn has been for years working with the bacteria of milk.

"Bacteria are like fairies," said Professor Conn, "in that they are capable of great good as well as of mischief." Continuing, the professor explained the size and shape and appearance of bacteria. They are so

Conn frequently spoke about the importance of microbes in agriculture and industry. He tried to convince the public that most microbes are harmless.

Article from May 2, 1915 *Hartford Courant*



Country Gentleman

ALBANY, N. Y., MARCH 7, 1907.

THE BASES OF BACTERIOLOGY.

A READING COURSE.

Conducted by Prof. Herbert W. Conn.

Comments, Notes and Inquiries Invited from all Readers.

BACTERIA IN THE MANURE HEAP.

cesses go too far, there results a very great loss of material. The constructive processes are also quite necessary, and all conditions should be adopted which stimulate these constructive processes to their utmost. In spite of all, however, there is an inevitable loss. One of the sources of loss, the most serious, is in the passing off from the fermenting material of the nitrogen in the form of gases. The nitrogen is usually lost in the form of ammonia gas, and any one can recognize this by the well-known smell of ammonia in the vicinity of fermenting compost heaps. This is always an indication that the farmer is losing some of the most valuable material that

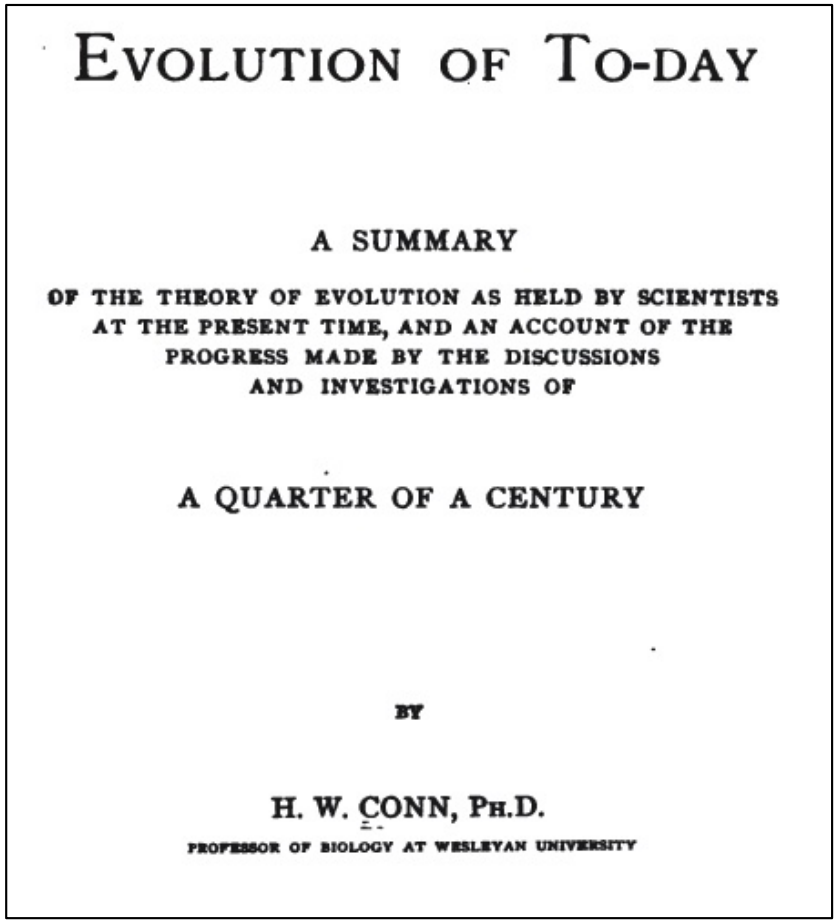
Conn wrote a series of articles in a rural newspaper as a "Reading Course" to educate farmers about the importance of microbes to agriculture.

This was a 1907 version of an on-line course!

"I dreamed that the visible universe is the physical person of God; that the vast worlds that we see twinkling millions of miles apart in the fields of space are the blood-corpuscles in His veins; and that we and the other creatures are the microbes that charge with multitudinous life the corpuscles."

Mark Twain discussing a dream with a missionary from India in "Following the Equator," 1898

Conn wrote several books and articles explaining the latest research on evolution. The details of how natural selection works were hotly debated at the time, but the fact of evolution was accepted by scientists.



EVOLUTION OF TO-DAY

A SUMMARY

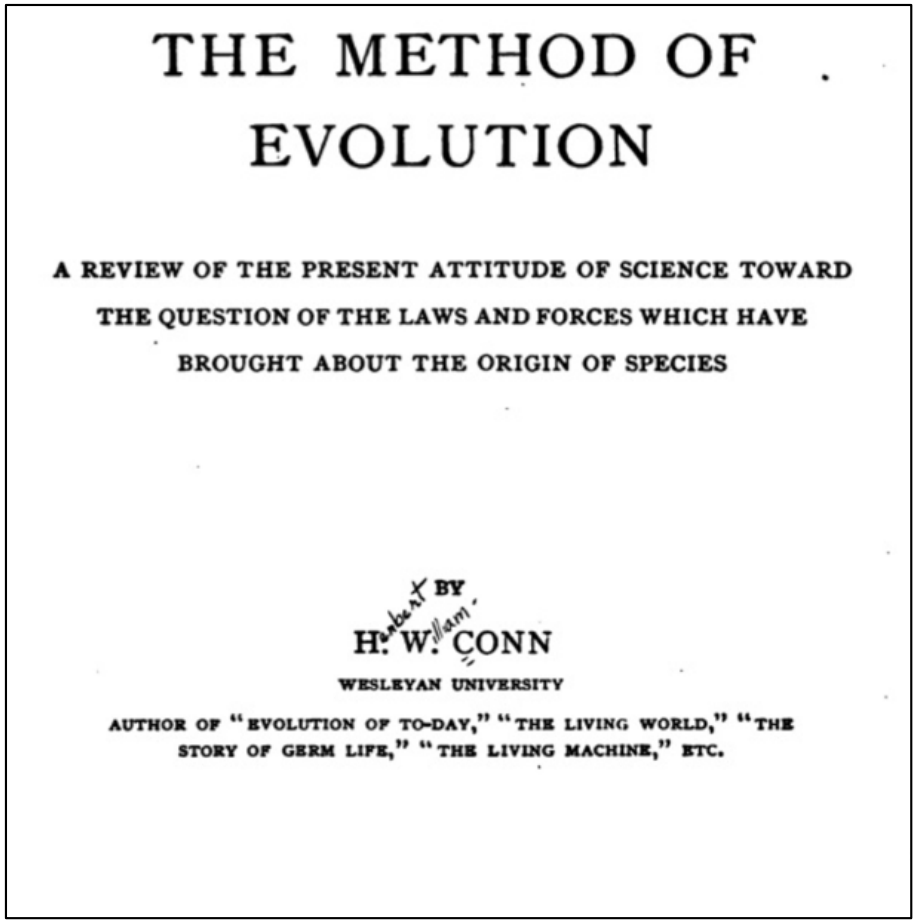
OF THE THEORY OF EVOLUTION AS HELD BY SCIENTISTS AT THE PRESENT TIME, AND AN ACCOUNT OF THE PROGRESS MADE BY THE DISCUSSIONS AND INVESTIGATIONS OF

A QUARTER OF A CENTURY

BY

H. W. CONN, PH.D.

PROFESSOR OF BIOLOGY AT WESLEYAN UNIVERSITY



THE METHOD OF EVOLUTION

A REVIEW OF THE PRESENT ATTITUDE OF SCIENCE TOWARD THE QUESTION OF THE LAWS AND FORCES WHICH HAVE BROUGHT ABOUT THE ORIGIN OF SPECIES

BY

H. W. CONN

WESLEYAN UNIVERSITY

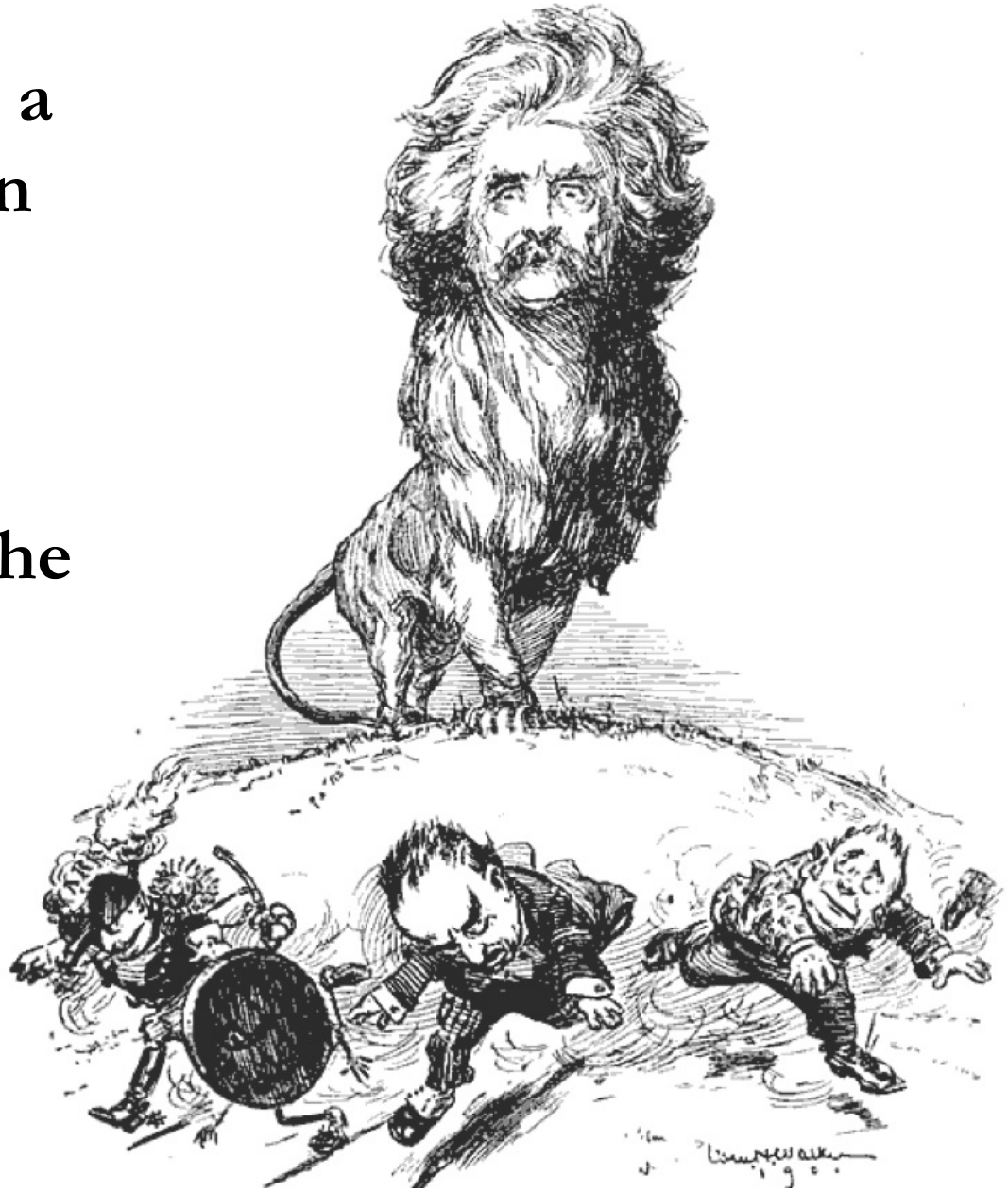
AUTHOR OF "EVOLUTION OF TO-DAY," "THE LIVING WORLD," "THE STORY OF GERM LIFE," "THE LIVING MACHINE," ETC.

Twain decried the rampant imperialism of his day.

Twain is portrayed here in a 1901 *Life* magazine cartoon as the Lion of Saint Mark after his speech at Saint Mark's condemning American imperialism in the Philippines.

"I am an anti-imperialist. I am opposed to having the eagle put its talons on any other land."

Mark Twain, *New York Herald*, October 15, 1900



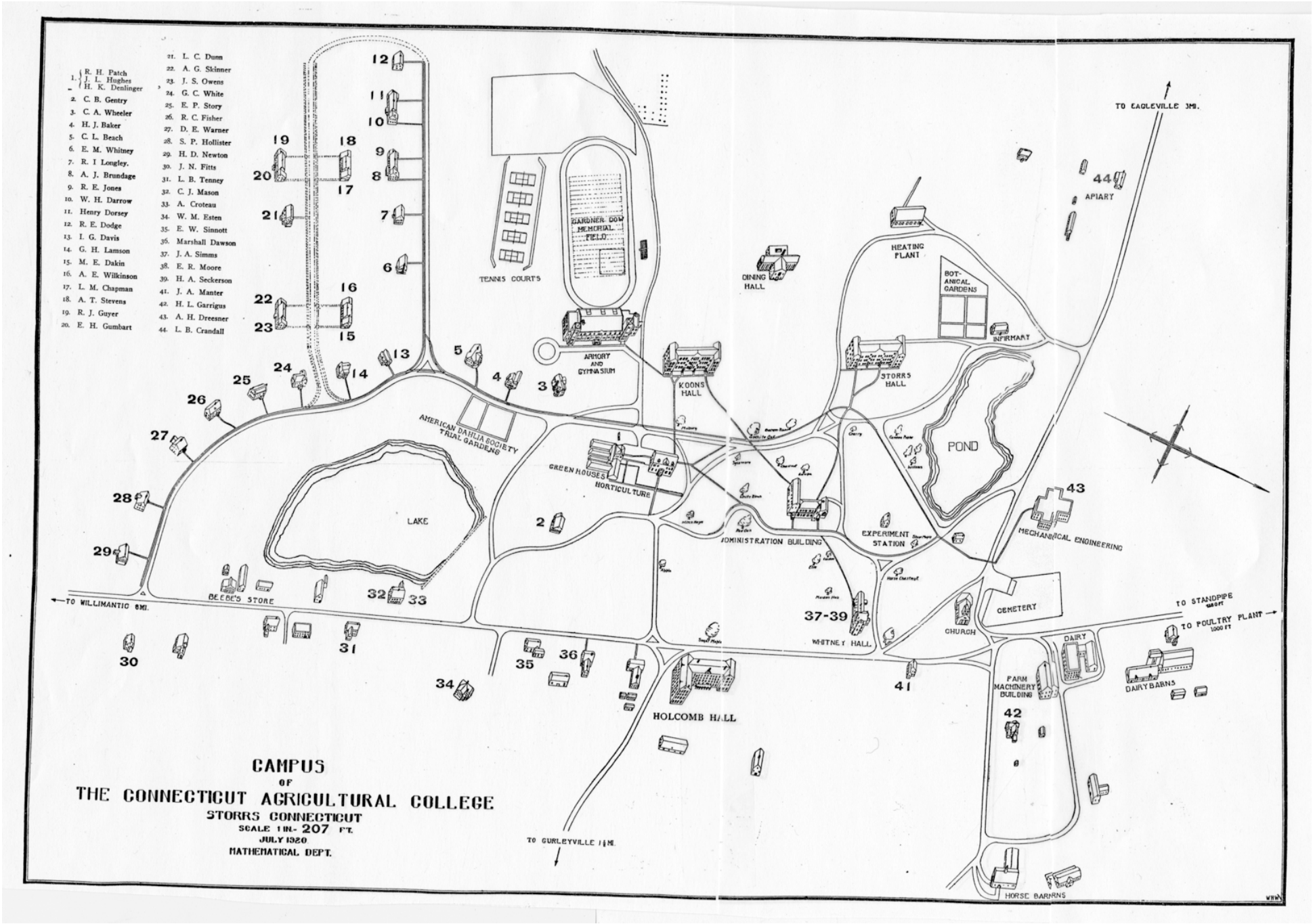
Regarding the spreading of "civilization" in Twain's microbe world by monarchies conquering other nations:

"In honor of this good work many of our microbe nations have come to speak of pus and civilization as being substantially the same thing."

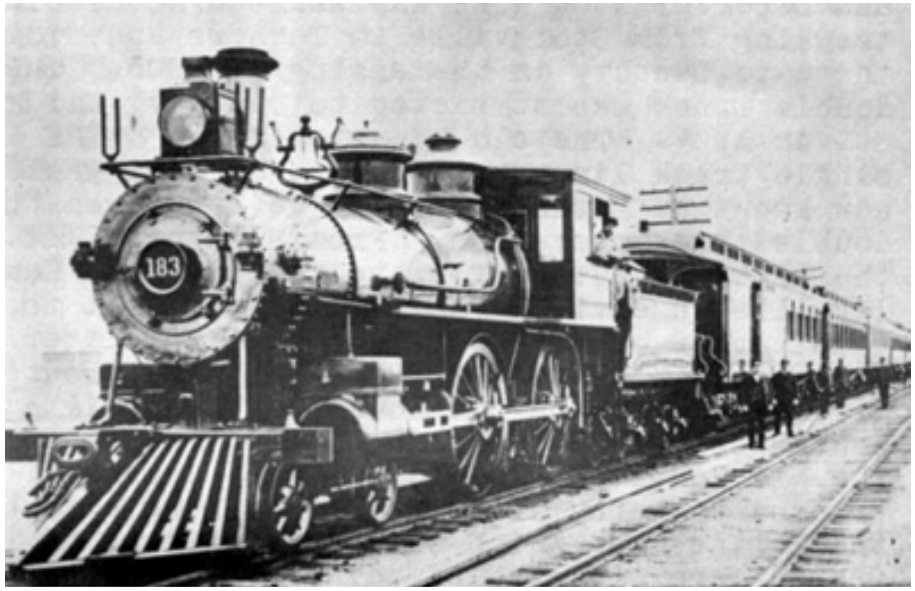
Huck in Mark Twain's "3000 Years Among the Microbes"

The Clemens family home in Hartford, CT 1872-1891

Map of the Connecticut Agricultural College, 1920



Map from Archives & Special Collections at the Thomas J. Dodd Research Center, University of Connecticut



Conn took a train, sometimes weekly, the 30 miles from Middletown to Willimantic, Connecticut on the Air Line using trains such as the White Train (left). That Line was so named because it was the shortest distance "as the crow flies" from New York City to Boston.

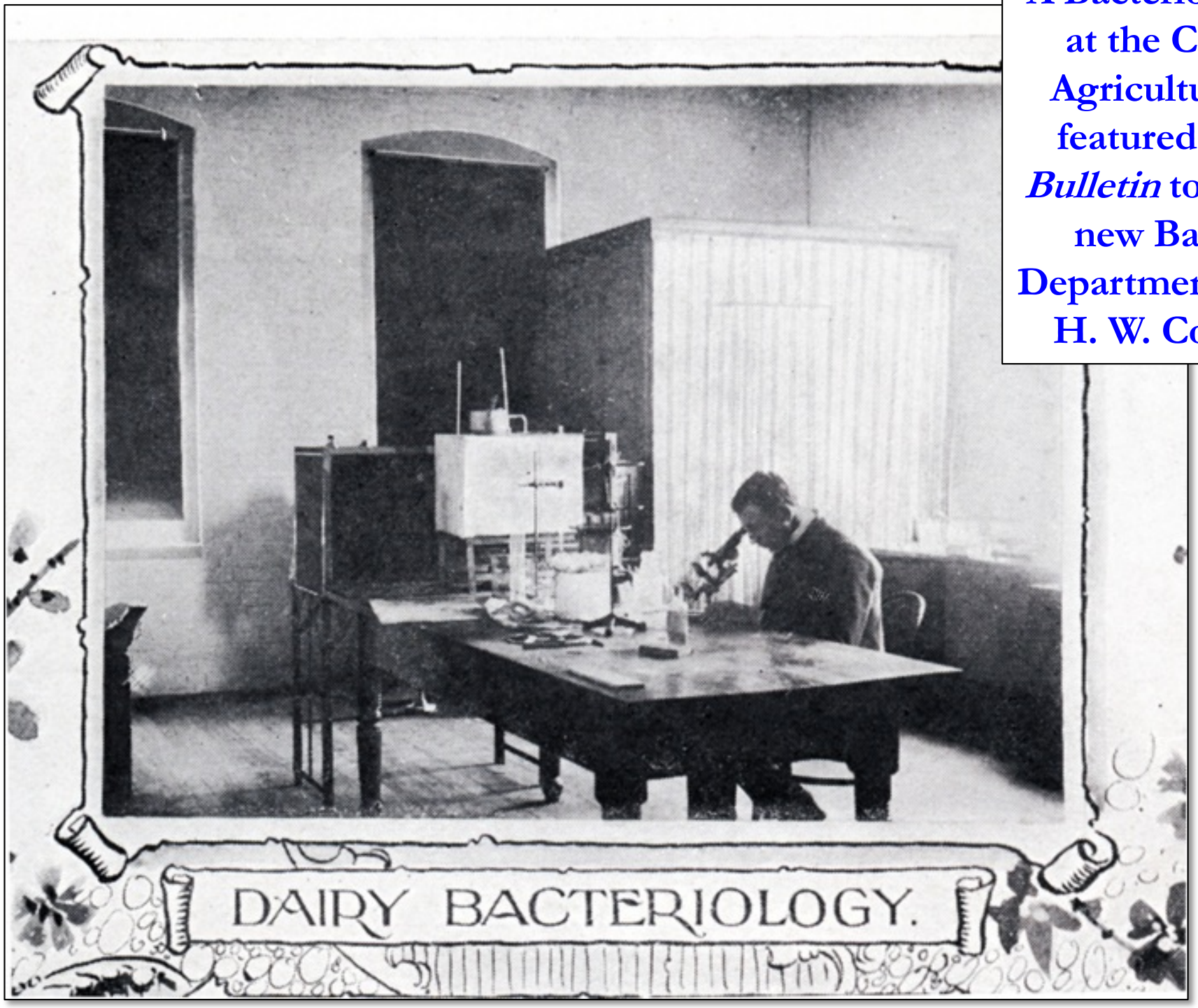
Conn arrived at the Willimantic station (right, circa 1909). From there he took a 9-mile carriage ride to the Storrs Agricultural Station, often with his fellow scientist, Dr. Wilbur Atwater.

Images from www.past-inc.org and freepages.history.rootsweb.ancestry.com

Buildings on the campus of the Connecticut Agricultural College, 1890's

From left, Grove Cottage, Gold Hall, Old Main, Chemistry Lab, and the Storrs Agricultural Experiment Station (location of H. W. Conn's laboratories).

From Archives & Special Collections at the Thomas J. Dodd Research Center, University of Connecticut



A Bacteriology student at the Connecticut Agricultural College featured in the 1904 *Bulletin* to promote the new Bacteriology Department founded by H. W. Conn in 1902.

From Archives & Special Collections at the Thomas J. Dodd Research Center, Univ. of Connecticut

A bacteriology teaching laboratory at the Storrs Agricultural College at the turn of the 20th century

Photo provided by Archives & Special Collections at the Thomas J. Dodd Research Center, Storrs, CT

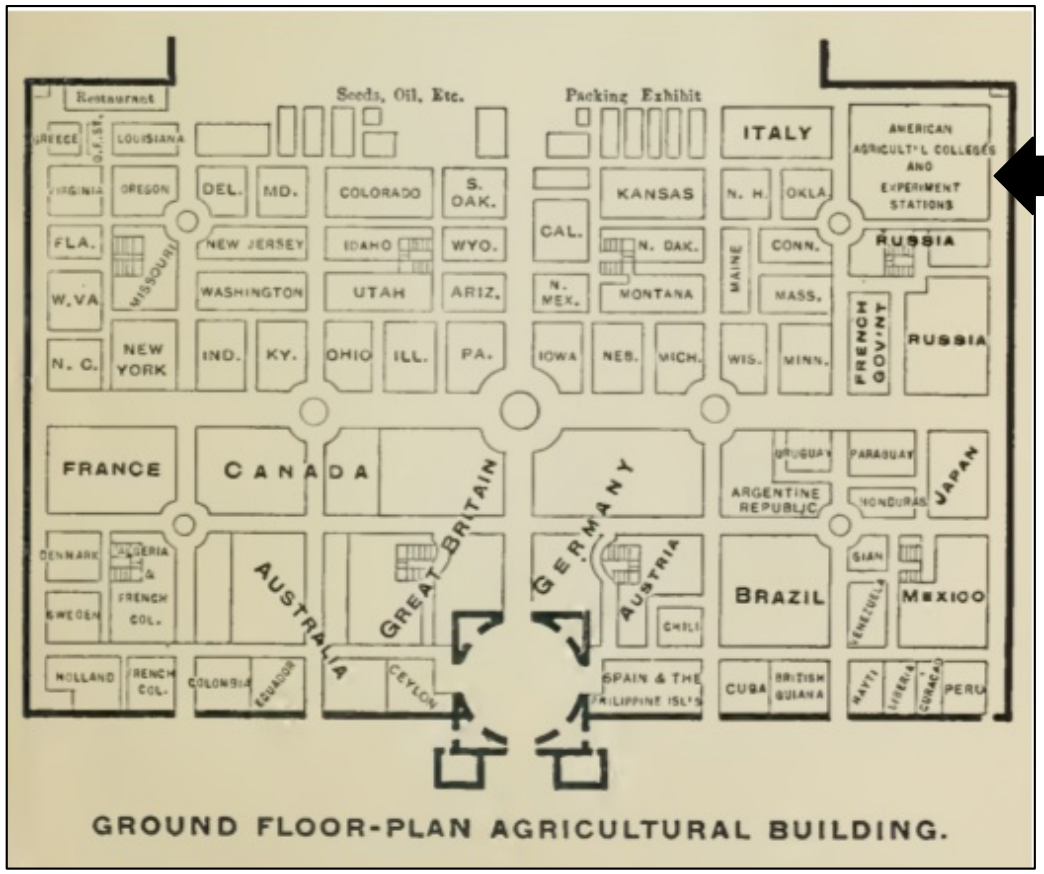
Agricultural Building, 1893 Chicago World's Fair
Site of H. W. Conn's butter bacteriology exhibit

Interior view of the US Dept. of Agriculture building at the 1893 Chicago World's Fair.

Conn's dairy bacteriology exhibit showing butter making microbes was in this building.

Agriculture and the Fruits of her Labor, World's Fair, Chicago, U. S. A.
Agriculture y el fruto de la labor, Exposicion Universal, Chicago, E. U. A.

Floor plan of the Agricultural Building at the Chicago World's Columbia Exhibition showing the location of Conn's exhibit



Conn's exhibit displayed 40 cultures of his bacteria and demonstrated their effects on butter production. The exhibit was displayed in an upright case that held 40 large test tubes, each showing the effect of a pure culture growing in milk. In particular, Conn showcased two bacteria: sample #2 was a bacterium that gave cream the best flavor while sample #16 was a bacterium that created a putrid, sickening cream. Conn's display attracted much public attention and descriptions of the exhibit were covered in several Chicago newspapers.

Conn's Illustrations of Dairy Bacteria

From H. W. CONN'S *The Story of Germ Life, 1897*

FIG. 20.—Dairy bacterium producing red milk.

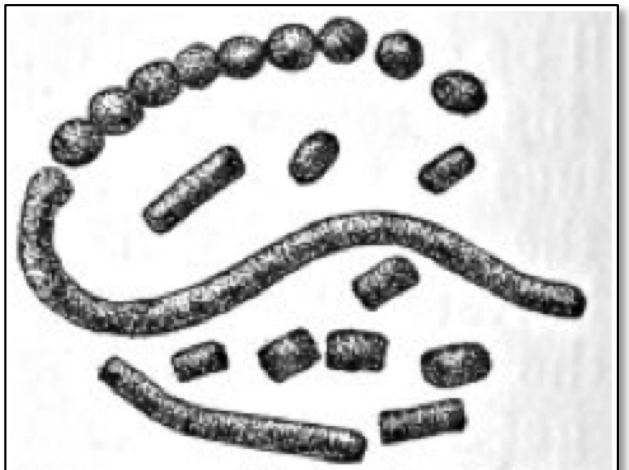


FIG. 21.—Dairy bacterium producing pleasant flavours in butter. This species has been used commercially for the ripening of cream.

FIG. 22. — Dairy bacterium producing pleasant aroma in butter.

H. W. Conn's Columbian Exhibition exhibit as described in the *Hartford Daily Courant* April 15, 1893

WESLEYAN UNIVERSITY.

Bacteria and Butter — Interesting World's Fair Exhibit.

Correspondence of The Courant.

Middletown, April 14.

Professor H. W. Conn of the department of biology will leave for Chicago next Wednesday. He will complete the preparations for the exhibit at the Columbian Exposition of the study of bacteriology as related to dairying. The exhibit will be given under the control of the government as a part of the work done in the government agricultural experiment stations. Professor Conn's department will include a bacteriological laboratory, combined with a dairy. The space taken up by the entire exhibit will be 150 by 150 feet in the agricultural building. Professor Conn has already isolated forty or fifty different species of bacteria from cream. His work at Chicago will be to show how different species of bacteria ripen cream, some species making good butter, some other species making poor butter. The final purpose of his work in bacteriology is to render practical, if possible, the making of butter from cream by the use of bacteria, which may be produced by culture. Professor Conn will return after two or three weeks, leaving the exhibit in charge of Eaton, '94, who is already in Chicago. Mr. Eaton will make four or five lots of butter a day by use of bacteria in cream, thus showing the process and variety of results when different species of bacteria are used. There will also be shown the effect of bacteria in milk culture, how the products of certain species of bacteria in milk causes it to sour and also give it differences of appearance in color.

The last senior debate for the year was held to-day. The subject was: "Resolved, that the new rule restricting the selection of foot-ball men for college teams to undergraduates is the best for foot-ball interests." Thorndike and Talmadge spoke on the affirmative side, against Thompson and Watson of the negative. The question was decided in the affirmative.

Conn co-founded the Society of American Bacteriologists, 1899.

"Three gentlemen: Prof. H. W. Conn, Prof. E. O. Jordan, and Prof. A. C. Abbott, at a meeting of American Naturalists in New York in 1898 determined…to bring them together for the purpose of organization at the meeting of Naturalists to be held in 1899."

Conn's mother predicted his ambitions:

"(Conn's) mother once told him that he never waited for things to turn up; he turned them up himself."

Did Twain and Conn ever meet?

We do not know. Twain left Hartford 7 years after Conn came to Middletown and returned to Connecticut in 1908 and died there in 1910. Twain socialized with a wealthier crowd than a Wesleyan professor could afford. They knew of one another's works. Perhaps they met at a speaking engagement. We may never know.

"The globe is a living creature, and the little stinking human race and the other animals are the vermin that infest it—the microbes."

Mark Twain, from his 1897 notebook

Twain writes *3,000 Years Among the Microbes*

Twain spent the summer of 1905 at the New Hampshire home of a friend and during that stay began to pen the story *3,000 Years among the Microbes*. Twain began writing his story on May 20, 1905. He initially expressed excitement about the work, telling his publisher in early June, "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 for a day on June 5, the first anniversary of the death of his wife, Livy. He resumed his work on the story, writing over 100,000 words until he stopped on June 23. Scattered notes about and brief additions to the story can be found in his notes in later years, but the story remained unpublished. It first came to print in 1967 in a compilation of his writings called *Mark Twain's Which Was the Dream? and Other Symbolic Writings of His Later Years* by John S. Tuckey.

Manuscript page from Mark Twain's *3,000 Years Among the Microbes*

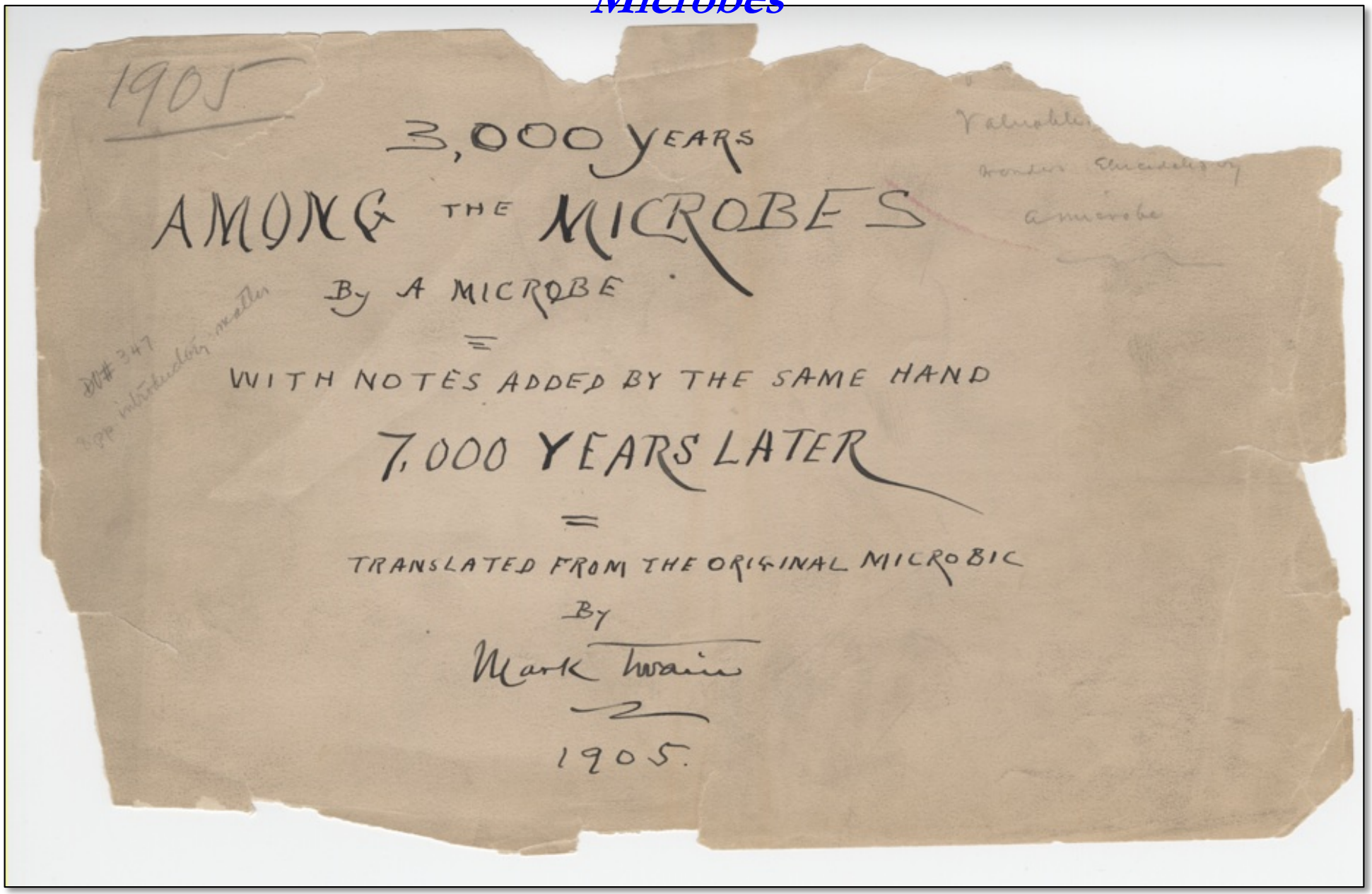
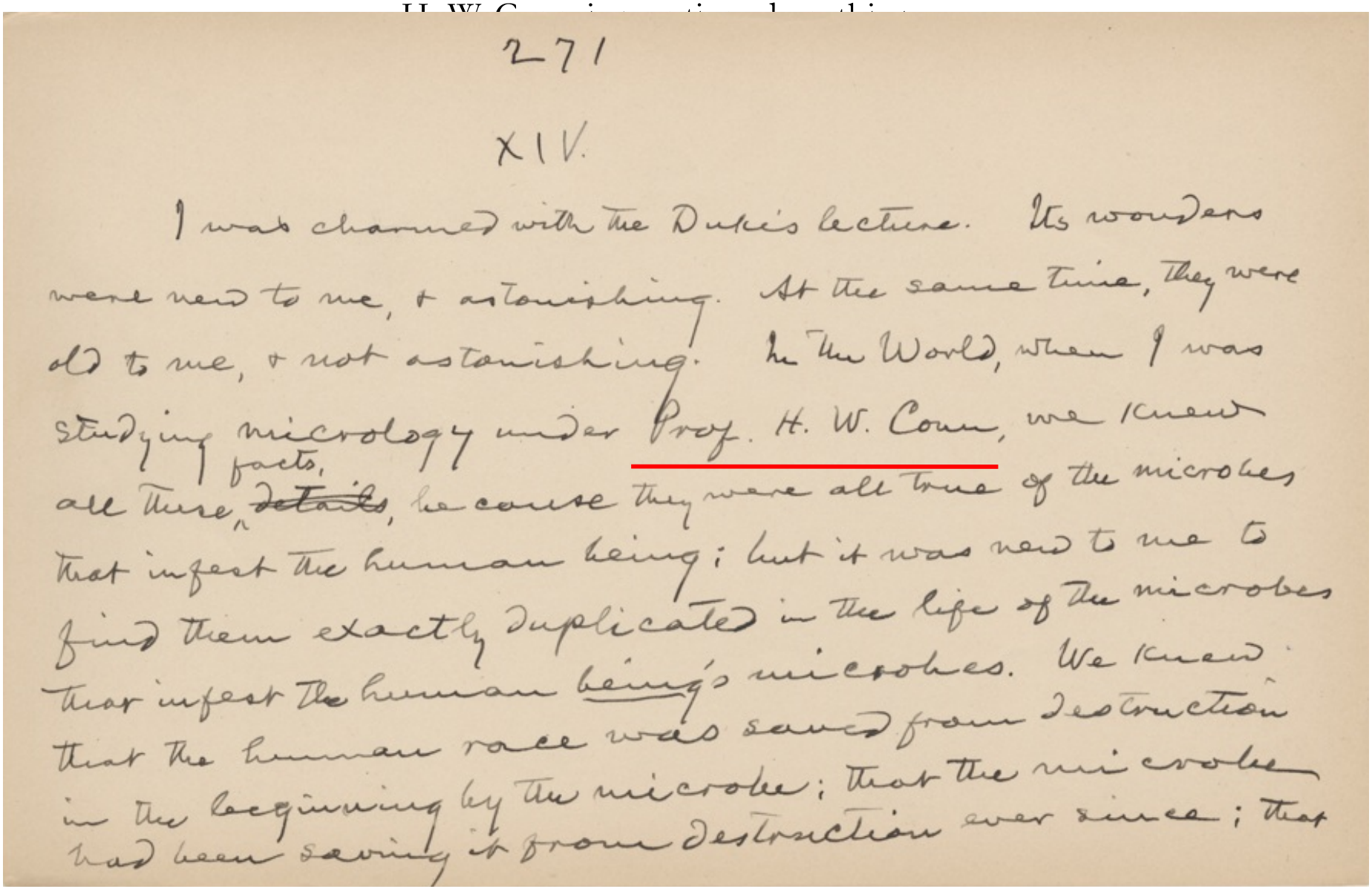


Image courtesy of the Mark Twain Project, The Bancroft Library, University of California, Berkeley

Manuscript page from Mark Twain's *3,000 Years Among the Microbes*



271

XIV.

I was charmed with the Duke's lecture. Its wonders were new to me, & astonishing. At the same time, they were old to me, & not astonishing. In the World, when I was studying micrology under Prof. H. W. Conn, we knew all these facts, ~~details~~, because they were all true of the microbes that infest the human being; but it was new to me to find them exactly duplicated in the life of the microbes that infest the human being's microbes. We knew that the human race was saved from destruction in the beginning by the microbe; that the microbe had been saving it from destruction ever since; that

Image courtesy of the Mark Twain Project, The Bancroft Library, University of California, Berkeley

Twain spent his final years in Redding, Connecticut in his home called

Slide courtesy of Brent Colley, Redding, CT
www.historyofredding.com/Twain-Redding.ppt

"I think we are only the microscopic trichina concealed in the blood of some vast creature's veins, and it is that vast creature that God concerns himself about and not us."

Mark Twain, from his 1884 notebook

Tributes to Herbert W. Conn

Testaments to his contributions to science, education, and public service

Journal of Bacteriology
September 1917

PROFESSOR H. W. CONN

W. M. ESTEN
Connecticut Agricultural College, Storrs, Connecticut

It is a pleasure to write of the life and work of a teacher with whom the writer was so pleasantly associated in both teaching and investigation for sixteen years. Professor Conn takes his place among the prominent biologists of the nineteenth century. His achievements are particularly interesting and noteworthy because they cover the pioneer period of the branches of science which he made his specialties. He was at the front

As a teacher, perhaps, he reached his highest achievement, as is attested to by more than two thousand students who came under his influence. His personal magnetism, polished English, interesting illustrations and illuminating suggestions captivated his listeners. His teaching was masterful, and with him it became an art. He was able to make a difficult subject easily

Dr. Conn's influence as a Christian gentleman who was always an exponent of right, teaching the profound philosophy of correct living, will long make itself felt among his many students, associates and friends.

PROF. HERBERT W. CONN DIES

Noted Bacteriologist Was a Professor at Wesleyan University.

Herbert William Conn, Connecticut State Bacteriologist, professor at Wesleyan University, and one of the best-known bacteriologists in the country, died yesterday at his home in Middletown, Conn. He was born in Fitchburg, Mass., in 1859, and was graduated from Boston University in 1881.

He was a specialist on the bacteriology of dairy products, and was lecturer at Trinity College, Hartford, from 1887 to 1889.

Professor Conn was a former President of the American Society of Bacteriologists and a member of the American Society of Naturalists. Among the scientific books of which he was the author were "Evolution of Today," "The Living World," "The Story of Germ Life," "The Living Machine," and 152 scientific memoirs.

New York Times, April 19, 1917

Herbert W. Conn, Ph. D.

Born January 10, 1859. Died April 18, 1917.

Prof. Herbert W. Conn of Middletown, Conn., died April 18, 1917. Doctor Conn was Professor of Biology, Wesleyan University, and in this connection organized the State Board of Health Laboratory in 1905 and continued as its director until the time of his death. In March, 1911, he was appointed by the New York Milk Committee as a member of the National Commission on Milk Standards and since then has given freely of his time and talents to the work of this commission. His interest in milk as a scientist was exceeded only by his humanitarian interest in standardizing milk to prevent unnecessary loss of infant life.

He was a director and a member of the Executive Committee of the American Public Health Association, and was affiliated with many other scientific organizations.

As a man of sterling character, as a pioneer health worker and as a scientist of national repute, we deeply mourn his loss.

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Those who made this exhibit possible

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The Dairy Building, location of the Bacteriology Department Connecticut Agricultural College, 1914

General Interior of the Agricultural Building at the Chicago World's Columbia Exhibition, 1893