

Engines of Our Ingenuity



No. 119: J. WILLARD GIBBS

[by John H. Lienhard](#)

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Today we meet the greatest scientist America has produced. The University of Houston's College of Engineering presents this series about the machines that make our civilization run, and the people whose ingenuity created them.

Historians don't like superlatives. It's too easy to be wrong when you use words like first and best. Yet I shall introduce you to the greatest American scientist, and he's someone you may never even have heard of. His name

is [Josiah Willard Gibbs](#).

Gibbs was born in New Haven, Connecticut, in 1839. He lived his entire life in the same house and died there in 1903. He was the seventh in an unbroken line of American academics stretching all the way back to the 17th century. His father was a noted professor of linguistics at Yale.

And what did Gibbs do? Well, he created the entire subject of chemical thermodynamics. He wrote vector analysis. He invented statistical mechanics and developed it as far as it would go before quantum mechanics could take it further. Other great scientists contribute to fields. Gibbs created three entire fields -- pulled them out of his empyrean mind and gave them life.

He did nothing to invite fame -- hardly traveled, didn't collaborate, never married, and published most of his stuff in the obscure *Transactions of the Connecticut Philosophical Society*. Outwardly, he was dry and colorless.

Gibbs studied at Yale, where he took one of

the first doctorates offered in the United States -- America's very first PhD in mechanical engineering. His thesis dealt with shaping gear teeth. After that he taught at Yale and worked on the design of railway equipment -- brake systems -- that sort of thing. From 1866 to '69 he studied mathematics and physics in Paris, Berlin, and Heidelberg. It was the only real trip he ever took.

He was 34 years old by the time he published his first paper, and it was still later that his abilities started to become apparent. When his work on thermodynamics attracted attention, Johns Hopkins offered him a position. Up to then, Yale hadn't been paying him. Now, at least, they put him on the payroll.

Gibbs' work is spatial -- like good engineering work. It moves in a surrealistic multidimensional landscape. People who join him in his voyage of the mind find it seductively beautiful. Since his death, 20th-century scientists have peeled him like an artichoke -- under each layer lies what they'd missed the first time.

J. Willard Gibbs's life may have been wrapped in plain gray -- faculty meetings, committees, classes -- a quiet professor doing obscure things. He received no major grants -- no Nobel prize. But it was his edifice that Einstein and Fermi completed. He rewrote science. He changed history. He was our greatest scientist.

I'm John Lienhard, at the University of Houston, where we're interested in the way inventive minds work.

(Theme music)

A remarkably rich account of Gibbs' seemingly gray life was written by a noted American poet: Rukeyser, M., *Willard Gibbs*. Garden City, N.J.: Doubleday Duran and Co., Inc., 1942.

For more on Gibbs early work with gears and his capacity for spatial visualization, see [Episode 1483](#).

See also, *Commentary on the Writings of J. W.*

Gibbs. Volumes 1 and II (Edited by F. G. Donnan and A. Haas) New Haven: Yale University Press, 1936. [119, 1483]

For more on Gibbs, see the following website:

<http://www-groups.dcs.st-and.ac.uk/~history/Mathematicians/Gibbs.html>.

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