

Robert Hooke

Born: July 18, 1635, Freshwater, Isle of Wight, United Kingdom

Died: March 3, 1703, Gresham College, London, England



Isaac Newton, one of the most famous scientists of all time, once said: “If I have seen further it is by standing on the shoulders of giants” (Burgan, 2007). While relatively little-known, Robert Hooke is one of these giants. An inventor, a musician, an artist, an architect, and one of the most productive scientists of all time, Robert Hooke is one of the best kept secrets in history.

Birth and Childhood

Robert Hooke was born in the year 1635 on July 18th, in a town called Freshwater. Freshwater is located on the Isle of Wight, a small island off the southern coast of the United Kingdom, between England and France (Inwood, 2003). Robert’s father, John, served as the minister of the local church. Robert had three brothers, each of whom also became ministers. It was expected that each of the boys would become a minister, like their father, but Robert was so sick as a child that his parents did not think he would survive to adulthood (O’Conner & Robertson, 2002).



Isle of Wight, England

Because his parents did not think he would survive, Robert was allowed to do almost anything he wanted as a child. Robert got headaches that were so painful he couldn’t go to school, and so he spent most of his time painting, playing music, and tinkering with toys, trying to create new inventions (O’Connor & Robertson, 2002). Young Robert was so good at inventing things that he even assembled a working clock, all by himself (Whitrow, 1938).

Adolescence & Young Adulthood

When he was 14 years old, Robert's parents send him to live in London. After seeing how talented he was at drawing and painting, they believed that Robert might be able to make a living as an artist. He first studied art with a well-known artist named Peter Lely, who had done portraits of kings and queens. By the time he was 18, he had decided not to study art anymore, as the smell of the oil paints made his headaches even worse (Whitrow, 1938). He then moved to Christ Church College in Oxford, England, where he studied a variety of subjects and became a member of the choir. Robert was able to join the choir in part because he was such a talented organ player (West, 2014). During his years at Oxford, he studied many things, learning Latin, Greek, and several Asian languages. He continued to develop his interest in inventing things, creating more than thirty different designs for a human flying machine (Whitrow, 1938).



Robert Hooke's parents believed he could make a living as an artist.



Hooke worked as an assistant to Robert Boyle

When he was twenty-two, Hooke began to work as a paid assistant for the renowned scientist, Robert Boyle. During his time with Boyle, Hooke invented a large number of scientific tools, including the air pump that made Boyle famous (Whitrow, 1938). Hooke and Boyle did lots of experiments together using this air pump to either add more air into a space (and thus increase the pressure) or remove air from a space (decreasing the pressure). In some experiments, they tested how animals would function in very high pressure. They discovered that neither bees nor butterflies could fly in a high-pressure space, but snails seemed to function just fine (West, 2014).

In 1662, when Hooke was 27 years old, he was appointed "curator of experiments" for the Royal Society, a prestigious scientific institution. His job as curator was to perform three or four experiments at each of the weekly meetings of the Royal Society in front of the other members, to stimulate discussion. After three years of performing experiments in this role, Hooke was given a permanent annual salary and a place to live in nearby Gresham College. He would go on to teach geometry at Gresham College until his death (Whitrow, 1938).

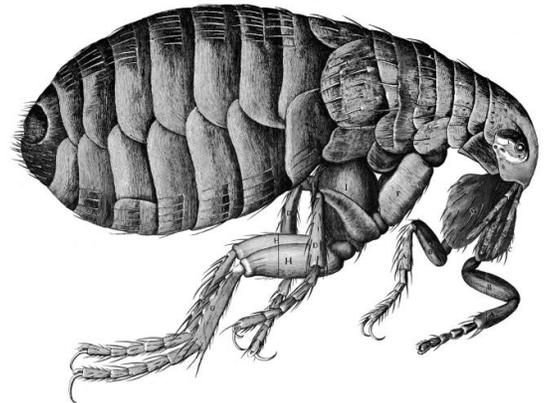
Working for the Royal Society



Hooke's microscope, which he used to make the observations detailed in *Micrographia*.

The task of designing and performing three or four experiments for the Royal Society every single week was an incredible challenge, requiring a lot of work. But Robert was uniquely well-suited for the role: he believed that anything could be studied using experiments, and had many ideas for study subjects. He was also very good at building inventions to use for the experiments, and managed this job almost every week for over 40 years (O'Connor & Robertson, 2002). Hooke was the most confident scientist in the Royal Society, and when he was away or unable to perform experiments for the Royal Society's weekly meeting, the other members were often nervous or embarrassed to do experiments without him (Whitrow, 1938).

During this time, Hooke was incredibly productive. He moved from topic to topic, studying the air, barometric pressure, falling bodies, how water freezes, how musical strings vibrate, how pendulums work, and many other topics. When he was 30 years old, he published his first and only major work, called the *Micrographia*, a series of sixty detailed "Observations," which consisted of pictures and descriptions of tiny objects as seen under a microscope. In the book, Hooke included such curiosities as the head of a fly, a flea, an ant, a bee stinger, the teeth of a snail, human hair, the surface of leaves, a section of cork, a mold colony, seaweed, and even peacock feathers (Gest, 2005). Hooke's beautiful drawings, a skill he had developed in childhood, were a major reason the book became so popular (Hunter, 2010).



Hooke's drawing of a flea in *Micrographia*, showing the flea's many-jointed legs.



Rare portrait of Robert Hooke at Isle of Wight.

Personal Life and Struggles

Owing in part to his very sickly childhood, Hooke was continually plagued by illness and physical difficulties. He was described as a "lean, bent, and ugly man" (O'Connor & Robertson, 2002); as being "very crooked," hunched over, with a thin nose, a wide mouth, a sharp chin, and long, unkempt hair (Whitrow, 1938). No verified portraits of

Hooke survive today, perhaps because he was embarrassed to have his portrait drawn (O'Connor & Robertson, 2002).

Hooke was famously bad at math, which was one reason that, even though he had lots of ideas about subjects like astronomy, light, and gravity, he never published anything on these subjects. The math

involved was too difficult (Encyclopedia.com Editors, 2008). This lack of ability in math might have contributed to Hooke leaving many of his works unfinished. It may also explain why he constantly moved from topic to topic. Unlike his contemporary, Isaac Newton, who published many long, well thought out scientific books, Hooke couldn't keep his mind set on one topic and pursue it long enough to publish. This is one of the main reasons Hooke only produced one major work (Whitrow, 1938).

Another reason Hooke completed so few major works was that he was extremely protective of his work, and afraid of sharing or publishing it. Hooke kept more than 650 handwritten pages of records and notes locked away that weren't discovered until 2006, three hundred years after his death (Gest, 2009). Hooke had several long and bitter feuds with fellow scientists, believing they were taking credit for ideas they had stolen from him, including the design of a



Hooke was intensely private about his work. Over 650 handwritten pages of notes were only found three hundred years after his death.

spring-loaded clock that would have made Hooke rich and famous, as well as ideas about the movement of planets, the properties of light, and others. Things got particularly bad in 1686, when Robert was 51 years old. Isaac Newton, his greatest rival, presented Book I of his famous work, the *Principia*, in front of the Royal Society. Hooke protested that Newton had stolen his ideas, but nobody listened to him. A few months later, his niece and longtime companion, Grace, died, leaving him completely devastated. Though Hooke would continue to perform experiments, in the 15 years following Grace's death, his health rapidly deteriorated, and he became increasingly cynical and solitary. He died on March 3, 1703. The entire Royal Society attended his funeral (Encyclopedia.com Editors, 2008).

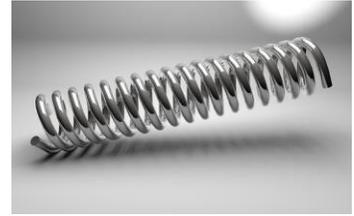
The Legacy of Robert Hooke

It's difficult to imagine just how important Robert Hooke was to the development of science. In the 17th century, what we now call science was called "natural philosophy," and it looked very different from science today. For example, Hooke's *Micrographia* was the first scientific "picture book." These days, science textbooks and science articles are full of pictures. But in the 17th century, this was uncommon (Gest, 2009). Not only did he use pictures, but Hooke was also one of the first to write very detailed descriptions of the experiments he performed, so that other scientists could reproduce his results (Gest, 2005). Today, this reproducibility is a cornerstone of scientific inquiry. These two

developments make him a very important figure in setting the precedent for how we do science today, over 300 years later.

Additional Facts About Robert Hooke

- Hooke is best known for the formulation of Hooke's Law, which states that "stress is proportional to strain." In other words, when a weight is attached to the end of a spring, how far the spring stretches will vary proportionally to the amount of weight you place on it. Twice as much weight will stretch a spring twice as far (Henry, 2004).
- Hooke was one of the first people to believe that the fossils hidden in rocks were the actual remains of creatures that were once alive, instead of just features of the rock that resembled animals (Henry, 2004).
- When London burned down in 1666, Robert Hooke completed a comprehensive plan to rebuild the city, and was appointed City Surveyor (Whitrow, 1938).
- Hooke was the first person to use the word *cell* to describe the "little boxes" he saw under the microscope that fit together to form biological tissues (Gest, 2005).
- Hooke was called "the Newton of mechanics" because he was so good at inventing things (Encyclopedia.com Editors, 2008).
- In 1676 a play came out called *The Virtuoso* that made fun of scientists, with the main character based on Hooke. Robert wrote in his diary that when he attended the play, "people almost pointed" at him (Encyclopedia.com Editors, 2008).



Hooke is best known for Hooke's Law describing the behavior of a spring.



Monument to the London Fire, designed by Robert Hooke

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