

## Newton's Hair

MARK S. LESNEY

## For most of his life, the great lawgiver of physics was more obsessed with alchemy than apples.

Isaac Newton (1642–1727) was fully a man of his times. Although he might be considered to be the founder of modern physics, Newton himself was not a physicist. His life was equally if not more dedicated to alchemy—itsself a strange amalgam of meta- more than plain physics, with a huge dollop of old-fashioned mortar-and-pestle “chymistry” thrown in.

Not only did Newton's alchemy transform and infuse his developing concepts of the physical laws that he so famously elucidated, but it also seems to have taken its toll in the whole of his life and on his sanity, because researchers examining strands of hair from Newton found them to be heavily contaminated with mercury.

This discovery was touted as a possible explanation of the natural philosopher's periods of near-madness and depression and was given as proof positive of his lifelong obsession with alchemy—a practice in which mercury was a fundamental component. Although, it was not as if any further proof was needed beyond his laboratory remnants and the voluminous alchemical writings and library that he left behind.

### Noteworthy Endeavors

Newton's “secret” life of what we would call pseudoscience first became common knowledge because of an auction at Sotheby's of London in 1936 when the noted economist John Maynard Keynes bought a collection of Newton's notebooks that had long been deemed by the Royal Society to have no scientific interest.

In 1942, Keynes published his observations about the notebooks, spicing his report with the now famous comment that “Newton was not the first of the Age of Reason, he was the last of the magicians.” The purchased notebooks were filled with Newton's alchemical obsession and showed that for decades, the Father of Physics wandered through the mysticism of obscure affinities, male and female forces,

and the promise of the philosopher's stone.

Yet this information seemed to have little transformative impact on the Newton mystique. Newton's position as the founder of much of modern science was so powerful that a tawdry “hobby” like alchemy was seen as no bar to treating him as a mechan-



ical philosopher—a true Enlightenment figure whose minor scientific warts should not obscure his greatness. This was not surprising, because the mid-20th century was a time when science took itself deadly seriously. The producers of the atom bomb and the purveyors of prosperity and progress (and protection) in a Cold War world could not be seen as tainted by superstition or outside influences like politics or religion. Rather, scientists were considered the miners of a universal truth, perfect in their logic, mathematics, and adherence to the crystallized image of the scientific method. No wonder Newton's pivotal reputation as the man of logic and mathematics—the quintessential scientist—had to be preserved.

### Newton's Alchemy

It was well after Keynes's revelation that in-depth scholarship convinced the historical community to accept the image of a new Newton as alchemist, curmudgeon, theologian, and bureaucrat, with the physics

that we so admire today thrown into the mix, but not the most substantial part.

Newton wrote more than 1 million words on the subject of alchemy. None of these efforts were published in his lifetime but remained hidden in his notebooks and in private manuscripts circulated among like-minded colleagues such as Robert Boyle—himself an ardent alchemist.

Newton owned every available alchemical text, translated more than a few himself, and extensively annotated others in his collection.

As pointed out in Richard Westfall's biography of Newton, “His earliest experiments, based on Boyle . . . attempted to extract the mercury from various metals. In the intellectual world of alchemy, mercury—not common quicksilver, but the mercury of the philosophers, was the common first matter from which all metals were formed. Liberating it from its fixed form in metals, cleansing it of contaminating feces, was equivalent to vivifying it and making it fit for the Work.”

Newton also experimented with the “regulus of antimony”, which was the ore stibnite, from which the now-named metal antimony is produced. This ore was considered invaluable to alchemy because of its utility in refining gold. And yet, despite the fact that Newton worked extensively on alchemical pursuits throughout the 1660s and 1670s, none of his writings seem to express an interest in producing gold—the cliché goal of alchemists—but rather in understanding the mysteries of nature that he believed were contained within the powers of alchemical transmutation.

Newton seemed happy as an experimental alchemist, as reported by his nephew, Humphrey Newton. As related by R. S. Westfall in his biography of Newton, Sir Isaac worked in his laboratory “with a great deal of satisfaction & Delight.” Said laboratory was “well furnished with Chymical Materials, as Bodyes, Receivers, Heads, Crucibles . . . in w<sup>ch</sup> he fus'd his Metals,” the transmuting of which “being his Chief Design, for w<sup>ch</sup> Purpose Antimony was a great Ingredient.” And, it is not as if Newton suddenly became a physicist and abandoned

his prior “unscientific” alchemical pursuits. According to Westfall, Newton interrupted his arcane research for 2 to 3 years to produce the *Principia*, in which his laws of gravity and motion were unveiled, only to take alchemy back up again immediately thereafter. He produced the bulk of his writings on the subject well after finishing his great scientific opus. In the 1690s, Newton worked on his final alchemical work, *Praxis*, which was rife with references to his experiments on “the net, the oak, the sulphuric ammoniac, the doves of Diana, and the star regulus of Mars”—all alchemical references to metals, ores, and chemical processes. But soon afterward, he seemed to become disillusioned with alchemy. This appeared to coincide with a serious mental breakdown that various scholars have attributed to his shattered relationship with his young protégé, the minor mathematician Nicholas Fatio de Duillier.

But Newton’s hair has also been invoked as proof of another explanation. His symptoms, including “sleeplessness, digestive upset, loss of memory, paranoid delusions” are consistent with chronic mercury poisoning. In 1979, significant amounts of mercury (as well as lead) were found in a sample of his desiccated hair. The debate between psychological or psychochemical-induced aberration continues. But regardless of whether he was driven temporarily insane by his alchemical experiments, his hair is considered added evidence that they were a routine part of his life.

### Alchemy and Apples

A key question that science historians continue to debate is the role of Newton’s alchemical ideas on the development of his laws of universal gravitation and motion. Certainly, most scholars believe that it made Newton more open to developing the concept of gravity as a strange affinitive “force” that could have an instantaneous and universal effect across vast distances, and even in a vacuum. His contemporaries were trapped in a world where mechanical contact—matter in motion—was the only way in which effects could be transferred. No superstitious “forces” were allowed. It was a theory that required a universal plenum, like water in a river, to transfer any ripples from one spot to another.

Descartes’ mechanical explanation of gravity, for example, was a hand-waving proposition, without mathematical backing, that when a ball was thrown up into the air, it was not mysteriously “attract-

ed” to the earth, but rather it was slapped down by ricochet from the moving plenum around the planet. Similarly, he theorized that planets were maintained in orbit around the sun by being held and pushed by a somewhat circular ripple of the plenum that surrounded the solar system and held it moving and in place.

### The God in the Machine

Despite the influence that alchemy had on Newton’s scientific development and theories, one other factor cannot be ignored in his creation of a new physics—his religion. Theology ultimately played a greater role in Newton’s life than alchemy or physics. A Christian apostate and adherer to the then-proscribed “Arian heresy” that Christ was not divine, Newton still took very seriously his own birth on Christmas Day. He felt that it gave him a level of prophetic responsibility that, if not equal to Christ, was certainly cut from the same cloth, and that it was his own particular role from the start to reveal God’s universal laws to all humankind.

This, in part, might have had much to do with his obsession with alchemy. The mysterious forces of alchemy and their links to lost ancient knowledge, some of it in the Hermetic and Hebraic magic traditions, resonated far better to his sense of the immanent participation of God in the world than the ping-pong models of matter in motion that the mechanical philosophers espoused. To Newton, the forces of alchemy were like the hand of God manipulating matter, and, in fact, one of his views of gravity (self-excised from his scientific publications) was that it was caused by direct divine input into nature.

That it took an interest in alchemy and theology to create the scientific paradigm that served as the foundation of modern Western science should not be surprising. Still, knowing the causes cannot detract from the impact of the effects. Sir Isaac is still “Newton”, after all.

### Suggested Reading

Westfall, R. S. *Never at Rest*; Cambridge University Press: Cambridge, 1980.

White, M. *Isaac Newton: The Last Sorcerer*; Addison-Wesley: New York, 1997.

The Newton Project; [www.newtonproject.ic.ac.uk](http://www.newtonproject.ic.ac.uk).

**Mark S. Lesney** is a senior associate editor of *Today’s Chemist at Work*. Send your comments or questions about this article to [tcaw@acs.org](mailto:tcaw@acs.org) or to the Editorial Office address on page 3. ♦