



The history of science is about people such as Paul Dirac, as well as the discoveries they made.

BIOGRAPHY

The scientist within

Richard Holmes celebrates today's revival of science biography, a tradition spanning 300 years.

Nearly two decades on from the explosion in popular-science publishing, books by luminaries such as Stephen Hawking and Richard Dawkins are still selling in six figures, and authors such as Brian Cox and Rebecca Skloot are drawing a younger generation of readers. But I am struck by a new emphasis — on popular-science biography. As I learned while researching my book *The Age of Wonder* (Harper, 2008), the “life scientific” can be an extraordinarily gripping adventure.

There is a noble tradition of science biography stretching back to the 1600s. Recently, a fresh hunger to understand the making of science through the making of scientists has

emerged. We want to read about scientific work as part of a life story — to know what makes a scientist tick, and what set them ticking. We are intrigued to learn that Dawkins, the eminent biologist and atheist, had “a normal Anglican upbringing”, was inspired by the Dr Doolittle books and taught in 1960s San Francisco, in the time of flower power and demonstrations against the war in Vietnam.

The form is currently undergoing unprecedented transformation. Biographers are tackling highly complex and challenging areas such as X-ray crystallography, general relativity and quantum physics, explaining them as pure adventures of the human spirit.

We see this in spellbinding biographies, from Georgina Ferry's *Dorothy Hodgkin* (Granta; 1998) and Walter Isaacson's *Einstein* (Simon & Schuster, 2007) to Graham Farmelo's award-winning biography of Paul Dirac, *The Strangest Man* (Faber and Faber, 2009) — which drew praise from readers as varied as Michael Frayn, Tom Stoppard and Martin Rees.

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THE EVOLUTION OF A THEORY

A whole spectrum of books on Charles Darwin, published to mark the 2009 bicentenary of his birth, illuminated the debate surrounding the emergence and implications of evolutionary theory. Led by Janet Browne, who treated *On The Origin* itself as a biographical subject, and Adrian Desmond and James Moore, who looked at Darwin's work on human origins, this biographic experimentation expanded in original ways. Rebecca Stott's *Darwin's Ghosts* (Bloomsbury, 2012), for example, is a prequel consisting of vivid portraits of early evolutionists, starting with Aristotle doing marine biology on the isle of Lesbos.

Stott's book is part of a growing trend for group biographies of scientists. These use teamwork, competition and personal rivalry to reframe science as a kind of social history. Outstanding examples cover groupings in every century. Arabic trailblazers of the ‘dark’ ages and people of the early medieval period star in Jim Al-Khalili's *Pathfinders* (Allan Lane, 2010). Lisa Jardine's *Ingenious Pursuits* (Little, Brown and Co., 1999) focuses on seventeenth-century European natural philosophers, and Jenny Uglow's *The Lunar Men* (Faber and Faber, 2002) displays the enlightened industrialists of the eighteenth century. We can relish the pioneering efforts of nineteenth-century palaeontologists in Deborah Cadbury's *The Dinosaur Hunters* (Fourth Estate, 2000), and marvel at the groundbreaking work of twentieth-century physicists in Manjit Kumar's *Quantum* (Icon Books, 2008).

Mathematics could be seen as the hardest nut to crack biographically because of its abstract language. Yet Simon Singh rendered it thrilling in his treasure-hunt of a group biography over four centuries, *Fermat's Last Theorem* (Fourth Estate, 1997).

PROFILE PIONEERS

But what of that earlier tradition of science biography? The word ‘scientist’ was coined only in 1834, and there is a popular misconception that individual scientific ‘lives’ — such as Henry Mayhew's *Young Humphry Davy* (1855) — are essentially a Victorian creation. In fact, as with literary biography, these go back well over 300 years. In the

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1680s, John Aubrey wrote *Brief Lives* of William Harvey, Edmund Halley and Robert Boyle, as well as of Shakespeare and Milton.

A surprising pioneer of the form in the eighteenth century was Samuel Johnson. Along with his dictionary and *The Lives of the Most Eminent English Poets* (1781), Johnson also wrote *The Life of Dr Herman Boerhaave* (1739), a vivid short biography of the great Dutch botanist and medical doctor who founded clinical teaching at Leiden, improved diagnostic techniques and isolated urea.

Johnson perceived that Boerhaave's childhood was essential to his adult science. He writes, for instance, of Boerhaave's gruesome teenage leg ulcer: "his own pain taught him to compassionate others, and his experience of the inefficacy of the methods then in use, incited him to attempt the discovery of others more certain."

Similarly, William Stukeley in his *Life of Newton* (1752) is careful to cite "the extraordinary pregnancy of his genius, whilst a boy". Stukeley gives vivid descriptions of Newton's boyish windmills, counter levers and water clocks. Stukeley also relates the first known version of the young Newton's famous vision of "universal gravitation" in the orchard at Woolsthorpe, Lincolnshire, as he contemplates the falling of an apple from a tree: "Why sh^d it not go sideways, or upwards? but constantly to the earth's centre? ... there must be a drawing power in matter. & the sum of the drawing power in the matter of the earth must be in the earth's center, not in any side of the earth." (Stukeley's original manuscript, one of the treasures of the Royal Society, can be read at <http://royalsociety.org/library/moments/newton-apple>).

The growing fascination with scientific biography in the nineteenth century is illustrated by the supplements to the fourth, fifth and sixth editions of the *Encyclopaedia Britannica*, completed in 1824. Of 165 lives selected for individual treatment, 35% were broadly scientific. Another landmark was David Brewster's *The Life of Sir Isaac Newton* (1831), which presented the natural philosopher as a secular saint, "the high-priest of science" and a man of universal genius. Like Stukeley, Brewster emphasized the originality of mind revealed by Newton's boyhood. Brewster also gave the idea of scientific childhood a new, metaphorical dimension.

It was his superb final chapter that called attention to Newton's now celebrated remark about the mysterious, shifting infinity of scientific truth: "...to myself I seem to have been only like a boy playing on the seashore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great Ocean of truth lay all undiscovered before me." Newton may

here have been adapting an image from Book IV of Milton's *Paradise Regained* — the observation that "wise men" may think themselves "deep versed" in research, yet in reality may be "as children gathering pebbles on the shore".

SETBACKS AND SERENDIPITIES

In what ways do biographies, whether written last year or in the seventeenth century, throw light on science and scientists? The Royal Society, announcing a historic symposium, Writing Scientific Biography, in 2008, observed that such works "show us the human face of science: the motivations, set-backs, serendipities and moments of enlightenment in the quest for knowledge".

I think they do more. First, they show the crucial shaping power of childhood and youth, where the scientific vocation and vision begin to emerge. Second, they examine the nature of the creative breakthrough. Eureka moments are only one manifestation. Discovery may equally be the product of painful years of research, experiment and thought, as with Darwin or Dirac. Or it may be the result of a short but intense period of competition and rivalry, as with Francis Crick, James Watson, Rosalind Franklin and Linus Pauling, in the race to discover the structure of DNA.

Third, biographies point to the importance of the inner, imaginative and emotional life. They contradict the fallacy that all scientists are icy rationalists. The great US physicist Richard Feynman played the bongos. The famously elusive chemist Henry Cavendish was a secret member of the notorious Cat and Bagpipes Club. Michael Faraday was an elder of the Sandemanian church. James Clerk Maxwell wrote Scottish poetry and accompanied himself on the guitar. Alan Turing was an outstanding marathon runner. All these traits and

characteristics can be linked to the energies that both inspired and occasionally impeded their research.

Fourth, biographies show that error and uncertainty are central to discovery, in a way that is lost in 'the literature', that official record of scientific endeavour. Victorian histories of science tended to propose models of unbroken, cumulative progress, which encouraged the alarming triumphalism of classical science in the early twentieth century. Contemporary 'scientism' has perhaps inherited something of this bias. By contrast, individual biography reveals doubt, scepticism and the historically shifting

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boundaries of interpretation and truth. The forthcoming life of the nuclear physicist J. Robert Oppenheimer by Ray Monk (the inspired biographer of Ludwig Wittgenstein and Bertrand Russell)

reveals just such a powerful field of political, financial and ethical ambiguities surrounding US science during the cold war.

Biographies can also probe originality and disputed cases of priority, as in the "discovery" of oxygen by Antoine Lavoisier, or Joseph Priestley or Carl Scheele; or the theory of evolution by Darwin or Alfred Russel Wallace. They show that at particular times, certain areas of science are intensely active and open to discovery — currently, cosmology, neuroscience and nanotechnology — while others are comparatively dormant. It is in these active areas that the linked forces of teamwork and rivalry are most fiercely alive, and their consequences can be best understood.

In *The Strangest Man*, for instance, Graham Farmelo memorably compares the development of quantum mechanics in the 1920s by a team of 50 physicists to "a group of construction workers" labouring on an enormous building site occupying much of northern Europe. "Virtually all the builders were male, under thirty, intensely competitive and craving the respect of their peers as well as the blessing of posterity."

So science is always a story. A detective story, perhaps; a mystery story; a love story; even, on occasion, a ghost story (the Higgs boson?). But always a story of human lives. And that is what seems to fascinate us — again. ■

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Samuel Johnson wrote a biography of medic Herman Boerhaave in 1739.