

empowerment, it does suggest that women had at least a stronger position in terms of inheriting property and positions of influence from previous generations. This finding also chimes with the descriptions of Roman authors including Caesar and Tacitus who were astonished at the role of women in Celtic Britain.

### Changing times

Ethnographic studies of current matrilineal societies show that these offer more autonomy for women and a better balance of power compared with the patrilinear societies we are used to, even though they don't necessarily support a matriarchy, as Yaming Huang from Lanzhou University, China and colleagues report (*iScience* (2025) 28, 111926). As matrilineal societies are rare and believed to be declining, Huang and colleagues studied the recent changes in a set of 17 Tibetan villages that traditionally had a matrilineal inheritance structure.

Conducting comprehensive interviews with the villagers as well as an economic game both in 2015 and in 2021, the researchers found that the default of favouring females in inheritance and in gift-giving is disappearing. The researchers linked this change to the decline of traditional agriculture, which had favoured matrilinear organisation. Pastoralism, by contrast, favoured men, whereas families engaging in non-traditional occupations had no gender bias in inheritance or gift-giving.

The changes happening within the lifespan of the people interviewed for this study demonstrate that sex-based social structures can change rapidly compared with archaeology's timescales. Unaware of this possibility, researchers of the 19<sup>th</sup> and 20<sup>th</sup> century had often assumed a person buried with insignia of power, warfare or spiritualism to be male.

Ancient DNA sequencing is now being applied at a large scale to multiple prehistoric burials and can reliably inform us on the chromosomal sex of the individuals concerned. Additional information on kinship between the individuals, read in conjunction with the archaeological finds, such as grave gifts, offers a new opportunity to recognise the importance and societal roles of ancient women.

Michael Gross is a science writer based at Oxford. He can be contacted via his web page at [www.michaelgross.co.uk](http://www.michaelgross.co.uk)

## Book review

### Francis Crick: A thoughtful biography to savour

Peter A. Lawrence

*Crick: A Mind in Motion — From DNA to the Brain*

Matthew Cobb  
(Profile Books, London; 2025)  
ISBN: 978-1-800811-058

*"His aim was not just to make discoveries about two of the major riddles of science, he was also driven (...) to understand our true place in the Universe, shorn of superstition and religion."*

Matthew Cobb has given us a scintillating biography of Francis Crick. *Crick: A Mind in Motion — From DNA to the Brain* is an engaging and inspiring read! Most of the credit belongs to Francis Crick himself (he "was anything but dull") and to the seismic effects of his discoveries. But credit also goes to the biographer; over the last 20 years, Matthew Cobb has written four books on the history of science. He has developed a form of analytical storytelling that is captivating. Even though his method is founded in picky and detailed research, Cobb is never boring. Time and time again, he condenses a mass of letters and bitty information into a gripping and involving story. The tales within may be personal and fun (viz the delightful description of Francis and Odile's early relationship and marriage) or deeply thoughtful, such as his attempt to define and describe Francis' unique method of scientific enquiry. There were many fascinating elements to Francis' full and kaleidoscopic life apart from his incomparable contributions to molecular biology, his encounter with and subsequent close friendship with Rosalind Franklin, his interest in beat poetry, his years of research on how the brain builds consciousness, his merrymaking and his infinite variety of friends. Above all, Cobb manages

to keep important questions upfront in his analysis, in his text and in the reader's mind.

### The most poignant story in the history of science

Here, I can only touch on a few topics. The crucial steps in the discovery of the DNA structure did not take long, weeks rather than months, and yet "the double helix eventually revolutionised our understanding of life, utterly transformed science and medicine, and slowly and ineluctably altered Crick's life forever".

Too many have an uninformed opinion on this drama. There are different takes described in several books. There is a theatre play, a film that every student of life should see (the drama-documentary *Life Story*<sup>1</sup> or *The Race for the Double Helix*), plus a huge amount of material on social media. Much of the mix of opinions is built around Rosalind Franklin. Rather than study her tragically short life with respect to both her legacy and the facts, many misuse her for political purposes. Franklin's best biographer Brenda Maddox summarises: "Franklin's premature death, combined with misogynist treatment by the male scientific establishment, cast her as a feminist icon. This myth overshadowed her intellectual strength and independence both as a scientist and as an individual."

Cobb supports Maddox's perspective. He describes the discovery of DNA as a drama of real-life science that is thought to be well known, but he revisits the primary sources, and new and interesting aspects are detailed. He tells us how Watson and Crick did wrong Franklin but not in the devastating way usually presented. It is his opinion that Franklin made contributions as valuable as the three selected for the Nobel Prize and that she "deserves to be remembered not as the victim of the double helix, but as an equal contributor to the solution of the structure"<sup>2</sup>.

In discussing this overheated issue, everyone should remember that Franklin died before the Nobel prizes were allocated. Also, Cobb describes from letters how she took



**Odile and Francis:** The couple at their desert house in Borrego Springs, taken in 2002, just two years before he died. (Photo: © Peter A. Lawrence.)

up with Odile and Francis Crick, who became close personal friends right up to her death in 1958. She often stayed with them in their house in Cambridge, she went on trips with them and she involved Francis in many of her scientific decisions. Odile and Rosalind had a common interest in fashion, and they had serious fun together. Cobb tells the story of this friendship in interesting detail, one of many intriguing aspects around the Cricks' marriage — a marriage that lasted until the end (see photo).

Cobb has deep psychological insight and, as in his books about the history of science, he uses this sense to raise his game well above a description of events. We

gain from his understanding of personal interactions, motivations and ambitions, so that the book reaches further into Crick's life and explains how and why his discoveries have affected our own. His style is eloquent and lucid. Here is just one example of many:

The broken relationship between Franklin and Maurice Wilkins is a fateful element in the DNA story. Cobb explains:

"He was introverted and generally diffident; she was outgoing and intellectually combative. He took her vivacity as a form of aggression; she viewed his reserve as a sign of mediocrity. He was alarmed by her; she was scornful of him. And, thanks

to Randall, he believed she was working for him while she thought she was completely independent. As a result of their utterly different personalities and outlooks, compounded by Randall's lack of frankness, they were soon barely on speaking terms (...) As Watson has said several times, had that barrier not existed, we would undoubtedly speak of the Franklin-Wilkins structure."

There are other personal matters discussed by Cobb. One concerns the many women in Francis' life: Odile "knew of Crick's many brief affairs, and her letters to him suggest that she was either amused or interested by them and that she also sometimes profited from their arrangement." Not one of his lovers decided to kiss and tell, presumably because of their respect for him. One wrote: "my meeting you was one of the nicest things that has ever happened to me. I do not regret a single wonderful minute". Francis kept the letters he received, but his side of the correspondence is unknown. For this reason, and for the privacy of the women and their families, Cobb decided to write about other things: "given that these affairs do not provide any direct insight into Crick's thinking, the names and the details are simply not our business".

### Crick's strategies in discovery

Cobb has thought about Francis' almost uncanny ability to see through noise, to latch on to key observations and to draw new and fundamental conclusions. Now looking back, these conclusions may seem as if they were obvious. But that is because they have become entrenched in our current worldview, and we don't remember the uncertainty and fog from which they arose. There are plenty of important examples: Cobb selects his favourite instance of Francis' prescience from the 1953 paper by Watson and Crick where he wrote "it therefore seems likely that the precise sequence of the bases is the code which carries the genetical information"<sup>3</sup>.

Several more instances can be found in the legendary lecture Francis gave in 1957. To bring this to life, Cobb and most everyone else quote

Francois Jacob, who was there: “tall, florid, with long sideburns, Crick looked like the Englishman seen in illustrations to nineteenth-century books about Phileas Fogg or the English opium eater. He talked incessantly. With evident pleasure and volubly, as if he was afraid he would not have enough time to get everything out. Going over his demonstration again to be sure it was understood. Breaking up his sentences with loud laughter. Setting off again with renewed vigour at a speed I often had trouble keeping up with. (...) Crick was dazzling”<sup>4</sup>. Francis concentrated on the flow of information from the DNA to the proteins and discussed the molecules involved. He drew the right conclusions and made the right predictions. He introduced a “central dogma” that, even if oddly named (apparently Francis was not clear what a dogma is), nevertheless cut through the confusion to describe the elemental molecular logic of life.

In a humdinger chapter, Cobb describes the cracking of the DNA code (translated into the sequence of amino acids). We enjoy the results of Cobb’s stone-turning, which illustrates the many crucial parts Francis played in this exciting detective story.

So, how did Crick do it? Was it some kind of alchemy? Throughout the book Cobb tries to find his answer. One factor was Francis’ signature approach to large problems, a tactic that Francis may have learnt from Linus Pauling’s success with the keratin structure. This was to trial solutions using differing subsets of the available information and to allow ‘intuition’ to help in the choice of which data to use and how to substitute for what was missing. I think others could try this more frequently because we often get mentally hung up and lean too much on a particular perspective or result; it is so easy to do. But he had other qualities that led him to the truth, plus his social abilities and his sense of fun that all helped him communicate with others. There was also a frankness and an amicable and collaborative impatience: “just try it!” Francis is famously supposed to have shouted when Jim was reluctant

to model the DNA with the bases inside. But overall we must leave his apparently unique foresight largely unexplained. Sometimes I even wonder if the human brain may have faculties that are, so far, hidden from us — for example, how can a severely autistic person see that the 8<sup>th</sup> of November 1623 was a Wednesday but have no idea how?

A golden period in Francis’ life began in the 1950s with DNA; from then he had years of scientific fun, plus a potpourri of just about everything else. He and Odile bought a lovely big house in Cambridge that Odile decorated with panache, they organised terrific parties and they befriended many, including Rosalind. He became a close intellectual collaborator with Sydney Brenner, and they moved towards solving the genetic code in the early 1960s. Cobb brilliantly describes this wonderful time, one part he entitles ‘*Et in Arcadia Ego*’ with reference to the tragedy of Rosalind’s death in 1958 and the other ‘An Apotheosis of Genetics’.

A large part of Francis’ later life was aimed at understanding the brain. He brought a no-nonsense scientific directness to a subject that can be dangerously close to philosophy. Again, he found several collaborators and, as before, these were young and congenial and had previous expertise in neurobiology, especially David Marr, Graeme Mitchison and Christof Koch. Cobb tackles this period bravely and finds much to marvel at. Many may be surprised that he deems Crick’s first paper on perception in 1979 comparable with his central dogma paper. Crick somehow sees through the noise and finds the signal, summarising his life’s scientific view: “there are often simple processes underlying the complexities of nature, but evolution has usually overlaid them with baroque modifications and additions. To see through to the underlying simplicity, which in most cases evolved rather early, is often extremely difficult.” Again, Cobb sees Francis as contributing game-changing perspectives. Cobb claims: “the ideas and insights he outlined still dominate the field, even though most neuroscientists have no idea

that Crick was the first to coherently articulate them”.

By the end, I had a much larger picture of Francis than is present in the other two biographies and even from knowing him quite well. Cobb found out so much, particularly from the letters. But he also described Crick’s life in terms of some larger questions. One of these asks what is the importance of individuals in the progress of science? There is an opinion that science advances rather like the tide comes in; individual water molecules do nothing in particular, each could just as well be replaced by another. And the opposite opinion, in accord with my insider experience, argues that breakthroughs come from individual insights that may be stimulated by specific experiments and improvements in techniques. That substantial changes to perspectives in science appear quite rarely and are regularly resisted by those invested in the status quo. That scientific knowledge is not predestined to progress and may move sideways or even in the wrong direction. Over time, aberrations in our understanding become smoothed away, for example by dead ends dying out.

In the history of modern science there cannot be a better example of the outstanding contribution of one individual, acting not alone but with his peers, as Francis Crick. This is a biography to savour, about a man who changed our world.

## DECLARATION OF INTERESTS

The author declares no competing interests.

## REFERENCES

1. Jackson, M. (1987). *Life Story* (A+E Networks, BBC, Horizon Films).
2. Cobb, M., and Comfort, N. (2023). What Rosalind Franklin truly contributed to the discovery of DNA’s structure. *Nature* 616, 657–660.
3. Watson, J.D., and Crick, F.H.C. (1953). Genetical implications of the structure of deoxyribonucleic acid. *Nature* 171, 964–967.
4. Jacob, F. (1988). *The Statue Within* (London: Unwin Hyman).

MRC Laboratory of Molecular Biology and Department of Zoology, University of Cambridge, Cambridge, UK.  
E-mail: [pal38@cam.ac.uk](mailto:pal38@cam.ac.uk)