JOURNAL OF CHEMICAL EDUCATION

Commentary

pubs.acs.org/jchemeduc

Book and Media Recommendations: *Brief Candle in the Dark*; *Seven Brief Lessons on Physics*; and *The Wright Brothers*

Hal Harris*

Department of Chemistry and Biochemistry, University of Missouri—St. Louis, St. Louis, Missouri 63121, United States

ABSTRACT: Three books are reviewed: *Brief Candle in the Dark*, by Richard Dawkins; *Seven Brief Lessons on Physics*, by Carlo Rovelli; and *The Wright Brothers*, by David McCullough.

KEYWORDS: *History/Philosophy, General Public, Interdisciplinary/Multidisciplinary*

Very few students of science are exposed to the last part of the so-called "scientific method", wherein controversial views are defended from attack by peers and sometimes the public. Biologist Richard Dawkins has had plenty of such experience, as he describes in the second part of his autobiography, *A Brief Candle in the Dark*. The scientific method seems to have been elided from Carlo Rovelli's *Seven Brief Lessons on Physics*, a surprise national bestseller, whose excellent writing and poetical images raise it far above the norm for popular science. Science is not the intended focus of David McCullough's history of *The Wright Brothers*, but their story exemplifies the way in which science (and technology) advances.

BRIEF CANDLE IN THE DARK

The author of *Brief Candle in the Dark: My Life in Science*,[1] Oxford Professor of Biology Richard Dawkins, is probably more infamous as a leading spokesperson for atheism (*The God Delusion*[2] was a bestseller for many weeks in 2006) than he is famous for his distinguished contributions in biology, which include the seminal *The Selfish Gene*.[3] As a science popularizer, he has also had best-sellers with *The Extended Phenotype*,[4] *The Blind Watchmaker*,[5] *Climbing Mount Improbable*,[6] and *River Out of Eden*,[7] each of which elucidates and/or extends the mechanisms of evolution. *Brief Candle in the Dark*[1] is a kind of continuation of the autobiography that began with his 2013 book, *An Appetite for Wonder*.[8] The title is an homage to Carl Sagan's *The Demon-Haunted World: Science as a Candle in the Dark*,[9] which is, in my opinion, the most powerful manifesto of science.

An Appetite for Wonder[8] describes Dawkins's formative years, the first eight of which were in colonial Kenya, and his introduction to the Oxford tutorial system, under which he blossomed as an intellectual, and where he published *The Selfish Gene*.[3] *Brief Candle in the Dark*[1] is a collection of reminiscences about the personal side of this international science celebrity. Dawkins enjoys the limelight and revels in a good argument. With *The Selfish Gene*, he moved the locus of natural selection from the organism to its molecules, and with *The Extended Phenotype*,[4] he showed how the process of evolution can be manifested beyond the cell, beyond the organism, beyond the collective, and even into the physical world. *River Out of Eden*[7] is a beautiful little extended essay that looks back along the highway of evolution that links both our species and each of us as an individual to our genetic origins, through our mitochondrial DNA.

Each of these Dawkins books has generated its own wake of criticism, sometimes from his peers, sometimes from creationists, sometimes from religious believers. *Brief Candle in the Dark* (Figure 1) is Dawkins's personal, virtually conversational, account of each of those controversies and how he has dealt with them. His personal life is intertwined with an extraordinary cast of personalities, including both Nobel-winning scientists such as Francis Crick, Niko Tinbergen, and Richard Leaky and intellectuals such as Carl Sagan, David Attenborough, Douglas Adams, Peter Medawar, Jared Diamond, and Christopher Hitchins. A remarkable collection of photographs is included.

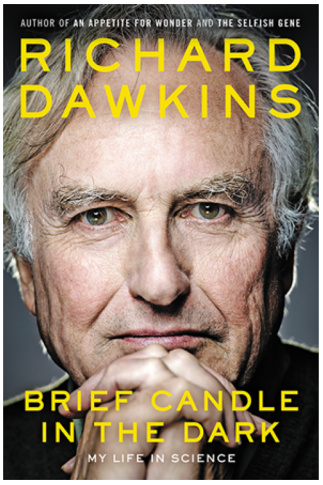

Figure 1. *Brief Candle in the Dark: My Life in Science*[1] cover image provided by Ecco Press and reproduced with permission.

SEVEN BRIEF LESSONS ON PHYSICS

Theoretical physicist Carlo Rovelli is head of the Quantum Gravity group at Aix-Marseilles University in southern France.

Received: May 17, 2016
Revised: June 19, 2016

DOI: 10.1021/acs.jchemed.6b00359
J. Chem. Educ. XXXX, XXX, XXX−XXX

His unlikely *New York Times* best-selling book, *Seven Brief Lessons on Physics*,[10] is a translation of a collection of essays he wrote for the Italian business newspaper, *Il Sole24 Ore*, in order to bring to laypersons the wonder and beauty of modern science. It eschews all of the mathematics and almost all of the justification for what we think physics tells us about the universe. Rovelli very ambitiously begins with the general theory of relativity and writes an additional chapter each on the topics, in order, of quantum mechanics, cosmology, elementary particles, quantum gravity, the heat of black holes, and, finally, the place of humans in all of this. Given the immensity of the subject matter, it does not seem possible that the task can be accomplished in only just over 80 small pages.

That brevity is one of the characteristics that have made the book so popular. Another is the fact that Rovelli often uses near-poetry and evocative allusions in his descriptions. Consider what he says about particles:

> *Even if we observe a small, empty region of space in which there are no atoms, we still detect a minute swarming of these [miniscule moving wavelets]. There is no such thing as a real void, one that is completely empty. Just as the calmest sea looked at closely sways and trembles, however slightly, so the fields that form the world are subject to minute fluctuations, and it is possible to imagine its basic particles have brief and ephemeral existences, continually created and destroyed by these movements.*

Descriptions like this can convey the essence of the concept to readers whose own understanding of physics is almost surely Aristotelian. Rovelli has jumped his audience at least two scientific paradigms beyond the knowledge brought by the typical reader, but he does so in a way that is far more comfortable than would be a more scientific explanation.

For my money, I would prefer to be provided with some evidence or logical justification for the strange picture of the world that modern physics requires. To me, the allure of science and of physics, in particular, is in the voyage more so than the destination. While lots of people consider themselves fans of science, very few are interested in actually learning it. For them, never mind—Rovelli presents a very poetical version of physics, appealing to the imagination, but providing none of the evidence in the form of experiments, mathematics, or reason that would connect seemingly impossible conclusions to their justifications. One could also argue that Rovelli's viewpoint is somewhat parochial, giving space to his own specialty, loop quantum gravity, but omitting other forefront viewpoints, such as the string theory of particles.

THE WRIGHT BROTHERS

What can you and your students learn from David McCullough's best-selling history of *The Wright Brothers*[11] (Figure 2)? I think most readers will be as surprised as was I, that one of the reasons for their success, in contrast to their many predecessors and competitors, was that they spent hundreds of hours observing and recording exactly how birds fly. Their years-long campaign to fly like the birds began with a "literature search", obtaining every scientific paper that would be useful to the enterprise. Wilbur wrote to the Smithsonian Institution in 1899, "I wish to avail myself of all that is already known", and was rewarded with a generous collection of books and pamphlets from the Smithsonian itself, and from foreign sources.

Another reason for success was their ability to work creatively with their hands, building and modifying wood, wire, cloth, and thread, and the primitive engines of the time—testing and modifying over and over. They did their own photography, developing glass plate photographs taken at Kitty Hawk in their own darkroom in a shed behind the bicycle shop when they got home for winter. Large amounts of new science had to be invented, as well. These self-trained bicycle mechanics proved that the aerodynamic tables that had been prepared by the supposed experts in the field—Langley, Chanute, and Lilienthal—were not only untrustworthy in their details but so blatantly wrong as to be worthless. That led them to design and construct their own wind tunnel in Dayton, Ohio, where they experimented with wing shapes and lift/drag factors for every component. They discovered that there was no existing literature on the performance of propellers, requiring them to make their own extensive measurements. What should be the size and pitch of the blades, and how fast should they turn? No systematic study had been done before the Wrights.

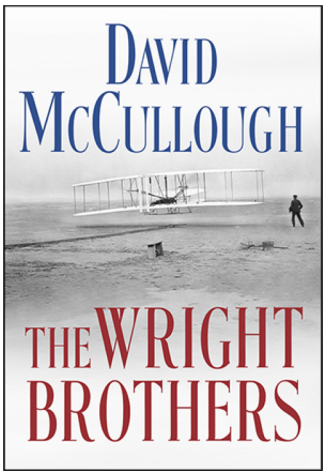

Figure 2. *The Wright Brothers*[11] cover image provided by Simon & Schuster and reproduced with permission.

McCullough is an excellent storyteller. While he did not intentionally focus on the scientific and technological triumph of the first aviators, the history he portrays revolves around an extraordinary scientific story.

AUTHOR INFORMATION

Corresponding Author

*E-mail: hharris@umsl.edu.

Notes

The author declares no competing financial interest.

REFERENCES

(1) Dawkins, R. *Brief Candle in the Dark: My Life in Science*; Ecco Press: New York, 2015.
(2) Dawkins, R. *The God Delusion*; Bantam Books: New York, 2006.
(3) Dawkins, R. *The Selfish Gene*; Oxford University Press: Oxford, U.K., 1976.
(4) Dawkins, R. *The Extended Phenotype*; Oxford University Press: Oxford, U.K., 1982.
(5) Dawkins, R. *The Blind Watchmaker*; W. W. Norton: New York, 1986.
(6) Dawkins, R. *Climbing Mount Improbable*; W. W. Norton: New York, 1996.
(7) Dawkins, R. *River Out of Eden*; Basic Books: New York, 1995.
(8) Dawkins, R. *An Appetite for Wonder: The Making of a Scientist*; Bantam Books: New York, 2013.

DOI: 10.1021/acs.jchemed.6b00359
J. Chem. Educ. XXXX, XXX, XXX−XXX

(9) Sagan, C. *The Demon-Haunted World: Science as a Candle in the Dark*; Random House: New York, 1995.
(10) Rovelli, C. *Seven Brief Lessons on Physics*; Riverhead Books: New York, 2016.
(11) McCullough, D. *The Wright Brothers*; Simon & Schuster: New York, 2015.

DOI: 10.1021/acs.jchemed.6b00359
J. Chem. Educ. XXXX, XXX, XXX−XXX