

that brings home the significance of Bell inequalities and the subsequent experiments that verify the quantum-predicted correlations that violate them. It is only a metaphor, since the experimental correlations are not the superquantum correlations predicted by a PR box. As far as we physicists know, there are no quinos, no doubt to the disappointment of many young readers. But it is characteristic of comics to stretch what is possible to engage the reader's attention and imagination, and quinos are a significant improvement on the misleading metaphor of spooky action at a distance.

The "late great" physicists of the Copenhagen school—and their critics—appear in part two of *Totally Random*. Each group tries to convince the reader of how quantum mechanics describes—or fails to describe—our world. Their quoted views bring home the lack of consensus on quantum foundations that has by now persisted for nearly a century.

The quoin metaphor proves its worth in the final part of the book; it gives a real feeling for what quantum cryptography, computation, and teleportation are and how they are possible. I could quibble with some of the details here, but overall I have never seen such a simple and faithful account of the underlying principles.

Jeffrey Bub is a professor in both the philosophy department and the Joint Center for Quantum Information and Computer Science at the University of Maryland. He has published three scholarly books and numerous papers on the conceptual foundations of quantum mechanics. Unlike those works, *Totally Random* contains no mathematics. Its contents will be accessible to the interested reader who knows no quantum mechanics, and the authors thank six teenagers for their help in keeping it that way.

I would have loved this book as a teenager myself, and although it is unlikely to top the young adult reading charts, I expect it will inspire some to join the next generation of physicists and philosophers. As a reader of PHYSICS TODAY, you may want to buy copies for your family or friends. But don't part with the book without first reading it yourself, for it will surely give you a deeper appreciation of both the peculiarity and the power of quantum mechanics.

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SCIENTIFIC MONTHLY (1920). PD-US

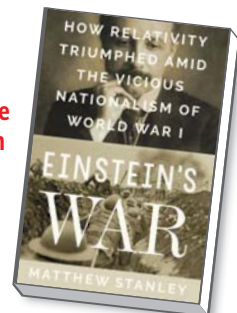
Eddington and Einstein, scientists and wartime visionaries

On 29 May 1919, two British expeditions observed a solar eclipse to test a key prediction of Einstein's general theory of relativity: that the Sun's gravity would bend light from distant stars. The announcement of favorable results catapulted Albert Einstein to a level of worldwide fame that has fascinated and perplexed scientists and historians ever since. Matthew Stanley's *Einstein's War: How Relativity Triumphed Amid the Vicious Nationalism of World War I* is a welcome contribution to this year's centenary of the famous eclipse.

Einstein's War focuses on two protagonists: Einstein himself and British astronomer Arthur Eddington. Stanley, a historian of science at New York University, weaves the two biographies deftly, tracing their individual career paths and scientific achievements. He handles the science ably, but his treatment of the social and political context stands out. The devastating carnage of World War I and the extreme nationalism that engulfed the hostile nations provide the dra-

Einstein's War
How Relativity
Triumphed Amid the
Vicious Nationalism
of World War I

Matthew Stanley
Dutton/Penguin
Random House,
2019. \$28.00



matic backdrop to the author's narrative.

Stanley paints a vivid picture of both Eddington's wartime life as a Quaker pacifist in Cambridge, UK, and Einstein's isolation as a pacifist and internationalist in Berlin. One hundred years later, it is hard to imagine the brutality of the Great War and the vicious hatreds that it engendered among the citizens, including scientists, of the hostile nations. Stanley brings those realities to light and shows how Einstein and Eddington were two lonely beacons of sanity and humanity in a sea of vitriol and hatred.

The war had ended when British

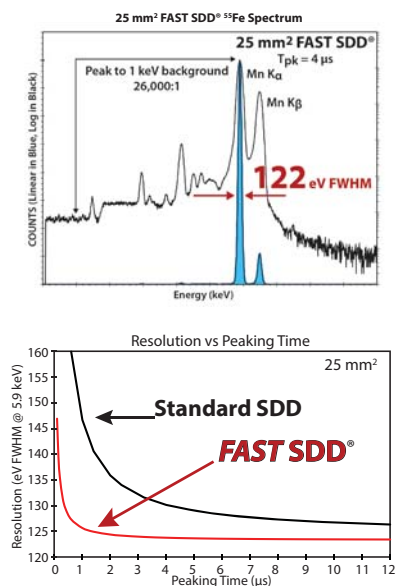
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astronomers returned from their eclipse expeditions and announced results that supported general relativity. The now-famous headline "Revolution in science" in London's *Times* triggered a media frenzy that catapulted Einstein to world fame.

According to Stanley, Eddington orchestrated a campaign to convince scientists, the media, and the public that the eclipse observation was a "crucial test" to decide between two competing theories of gravitation: Isaac Newton's and Einstein's. Stanley concludes, "If Eddington had not cared about pacifism, we would not have had the relativity revolution in 1919. . . . The world had just the right conditions for Einstein's sudden catapulting to fame. The horrors of the war, and pacifists' reactions to them, forged the intricate, fragile network that made relativity what it was."

There is no doubt Eddington was pleased that Einstein was a pacifist and internationalist or that he saw the potential for rekindling international collaboration with the eclipse expeditions. However, Stanley's thesis that Eddington masterminded the 1919 eclipse observation to maximize publicity for Einstein and his theory is a distortion of historical events.

Stanley claims that Eddington had to persuade Astronomer Royal Frank Dyson "that relativity was scientifically important even if it might be wrong" and that "technical interest and personal friendship seem to have been enough for Dyson to join in on Eddington's project" to test light bending at the 1919 eclipse. In fact, it was Dyson, then the chair of the Joint Permanent Eclipse Committee, and his colleague Herbert Hall Turner who made the decision to test light bending and invited Eddington to sit in on the committee's meetings.

Stanley also asserts that Eddington and Dyson made "extensive efforts . . . to get regular press coverage of the expeditions even before they found any results." But newspapers regularly covered eclipse expeditions, and this one was no exception. Reporters typically sought interviews with the scientists involved and often commissioned them to write articles about their work. The appearance of a few articles authored by Dyson or his colleagues did not constitute a publicity campaign.

Einstein's War also glosses over the in-

tense competition between British and American astronomers to be the first to publish definitive results. When the *New York Times* covered the British eclipse results under the headline "Lights all askew in the heavens," Stanley claims that it "was virtually the first mention of Einstein in the *New York Times*—he was a person of little consequence until this moment."

In fact, a year earlier, the *New York Times* had commissioned William Wallace Campbell, director of the Lick Observatory in California, to write an article about his eclipse expedition to Golden-dale, Washington. Published on 10 June 1918, it included a subheading of "Test of the Einstein theory," under which Campbell wrote, "It is hoped that the measured positions of the recorded stars will serve as a test of correctness or falsity of the so-called Einstein theory of relativity, a subject which has occupied a foremost position in the speculation of physicists and others during the last decade." The press's interest had been primed well before Eddington and Dyson made any plans for the 1919 eclipse.

Interestingly, US astronomers seem to have believed that the British orchestrated events to bring publicity to Einstein. For instance, in a 1920 letter, Lick astronomer William Hammond Wright complained to Mount Wilson Observatory director George Ellery Hale, "I suppose we have all been worrying lately over the 'Einstein effect' chiefly as a result of the publicity which has been accorded to its so-called confirmation by the English Eclipse observations." Yale astronomer Ernest Brown visited the University of Cambridge in 1920 and confronted Eddington. Brown later wrote to a colleague, "Eddington told me that the booming of the relativity business was entirely the work of the London Times. Neither the Royal [Society] nor the [Royal Astronomical Society] was responsible for the big advertisement it got. . . . Our criticisms of the apparent advertising methods of the R.S. fall to the ground."

Historical inaccuracies aside, there is much to admire in Stanley's book. In today's world of rising nationalism and xenophobia, his gripping story of two visionaries rising above national hatreds is as refreshing as it is important.

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