

A clash of cosmologists

It's not easy to write a biography of a single individual, but in his new book, Paul Halpern—a physicist, writer, and historian of science—tackles two: the astronomers George Gamow (1904–68) and Fred Hoyle (1915–2001). As if that weren't enough, Halpern also covers the history of both 20th-century cosmology and the universe itself. Despite that seemingly major degree of difficulty, *Flashes of Creation: George Gamow, Fred Hoyle, and the Great Big Bang Debate* is a remarkable success.

Halpern's book is based on years spent combing through archives and oral histories and conducting interviews. It includes memories from the astronomers' family members: Hoyle's two children, Elizabeth and Geoffrey, the latter of whom wrote several science-fiction novels with his father, and Gamow's son, Rustem Igor, who died last year. Halpern expertly blends those personal details with pertinent information from the published scientific literature at a level appropriate for anyone who cares about science and its practitioners.

Considering the enormous number of hours Halpern must have spent researching and writing, I should perhaps be ashamed to admit that I read it all in one afternoon, scribbling purple notes in the margins. But it really is a page-turner.

Parts of Halpern's story have been covered in more specialized works. Hoyle wrote a 1994 autobiography, *Home Is Where the Wind Blows: Chapters from a Cosmologist's Life*, and there are two other biographies of him. Gamow also wrote an informal autobiography, *My World Line* (1970), and the late Karl Hufbauer wrote a very informative sketch of him for the National Academy of Sciences' 2009 *Biographical Memoirs*.

P. J. E. Peebles recently published his insider's take on how cosmology developed in the 20th century, *Cosmology's Century: An Inside History of Our Modern Understanding of the Universe* (2020). Those interested in the history of competing cosmological theories can consult the historian Helge Kragh's *Cosmology and Controversy: The Historical Development of Two Theories of the Universe* (1996). And every

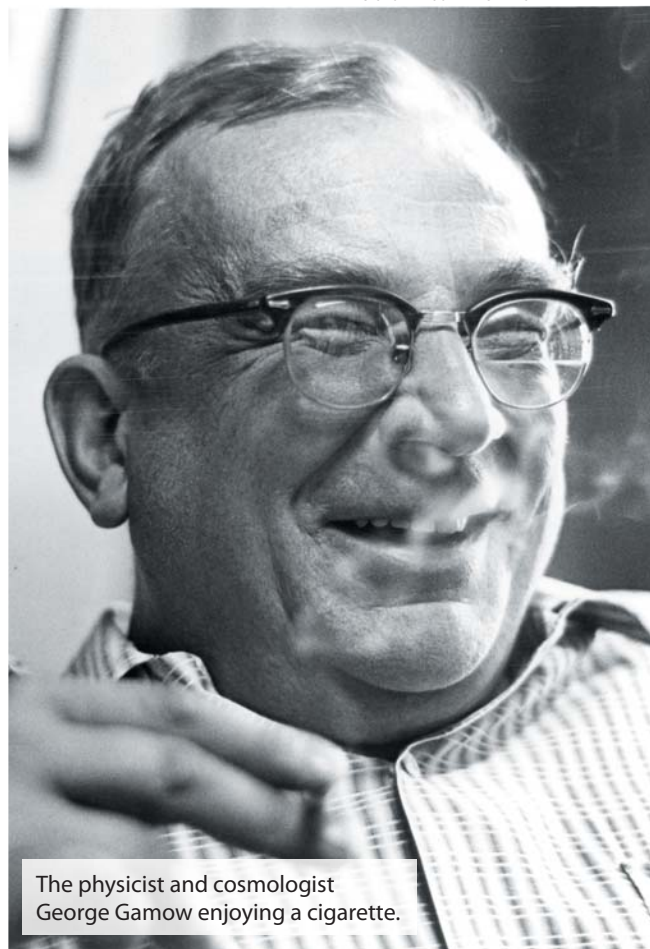
introductory astronomy textbook on the planet aspires to tell you the history of the universe from the Big Bang to the present.

What makes *Flashes of Creation* special is the broader perspective it takes on the topics and individuals covered in those works. What are the takeaways from that approach? One is Gamow's crucial role in advocating for what would eventually become known as the Big Bang theory: He firmly believed that the universe had changed with time and that significant nuclear processing had occurred early on. That is true, but strictly speaking, the model does not require an initial singularity or bang, only expansion and cooling from very high density and temperature. For that reason, I have always preferred to use the term "evolutionary universe" rather than Big Bang.

That appellation also contrasts well with that of its rival: the steady-state model, which assumes that the appearance, contents, and conditions of the universe have always been the same when considered over large distance scales. Hoyle was the firmest supporter of the steady-state model, and to a considerable extent, it was also his invention, although Hermann Bondi and Thomas Gold proposed something similar.

But the steady-state theory was always a minority view among the global astronomical community. When it was first proposed, many astronomers did not take cosmology seriously; by the time they did, only Hoyle and a few of his close associates were still championing the model.

Is the volume free of omissions or errors? No, how could it be? And that's what my purple pen is for. In terms of the former, Halpern's overview of Edwin Hubble's life gives the impression that the skilled observer went straight to the Mount Wilson Observatory after finish-



The physicist and cosmologist George Gamow enjoying a cigarette.

Flashes of Creation
George Gamow,
Fred Hoyle,
and the Great
Big Bang
Debate

Paul Halpern
Basic Books, 2021.
\$30.00



ing his doctoral work at the University of Chicago in 1917. But that's not quite what happened. Hubble, in fact, rushed to complete his dissertation that year because the US had just entered World War I, and he wanted to volunteer for the army and get to Europe before the war was over. Although he made it to Europe, he did not see combat.

Regarding errors, the situation is a bit more complicated. Many books and articles, including the prepublication version of *Flashes of Creation*, credit Hoyle for hypothesizing that the carbon-12 nucleus

had to have an excited state at about 7.68 mega-electron volts if three helium atoms were to fuse to carbon in stars. In that telling of the story, Hoyle then persuaded the nuclear-physics group at Caltech to look for the state.

In fact, as the Caltech team carefully noted in their 1953 paper, “The 7.68-Mev state in C^{12} ,” they looked for and found a state that had been detected on three previous occasions (and which had not

been found in two other instances). Hoyle did not tell them to look for that state; as they noted in the paper, he pointed out its “astrophysical significance.” Fortunately, Halpern rectified his depiction of that incident in the published version of the book.

I am indebted to Halpern for pointing out the significance of many things that happened between Gamow and Hoyle—although I think he missed that both were

members of the International Astronomical Union’s former Commission 35: Stellar Constitution for several triennia—and between the universe and its investigators over the years. Other readers will surely feel similarly. So grab your purple pen, enjoy the unusual heroes and some unusual photographs, and read!

Virginia Trimble

University of California, Irvine

G. D. Falksen, a science-fiction author, wearing a steampunk-style outfit that features an arm mechanism designed by the artist Thomas Willeford.

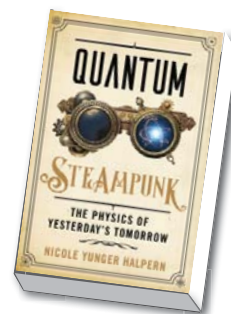


TYRUS FLYNN/CC BY-SA 3.0

Quantum Steampunk The Physics of Yesterday's Tomorrow

Nicole Yunger Halpern

Johns Hopkins U. Press,
2022. \$29.95



tum thermodynamics in layman’s terms. The field has boomed in the past 15 years, in part thanks to Yunger Halpern: Despite her youth, she has already authored an impressive number of highly cited papers, some in collaboration with respected experts and renowned pioneers.

Steampunk is a literary and artistic genre in which Victorian-era settings are juxtaposed with futuristic technologies. Yunger Halpern argues that quantum (or quantum information) thermodynamics has a “steampunk aesthetic” because it applies physical concepts developed in the 19th century to cutting-edge quantum information science. To illustrate that idea, Yunger Halpern precedes each chapter with a short skit written in the style of fin de siècle British English that tells a brief story about Audrey and Baxter, the Victorian-era ancestors of quantum physics protagonists Alice and Bob. By adding literary flair to otherwise dry technical content, Yunger Halpern masterfully conveys in simple terms the variety of complex ideas that characterize the different subfields of quantum thermodynamics. Even if they lack the technical background needed to grasp all the details she discusses, lay readers will learn a lot and gain a clear picture of the goals, tools, and aims of those subfields.

It may seem churlish not to give *Quantum Steampunk* my full blessing. But I hesitate to do so because I wish Yunger Halpern had discussed subfields from

Quantum thermodynamics, today

After hearing the impressive lecture Nicole Yunger Halpern delivered in Barcelona, Spain, upon receiving the biennial Ilya Prigogine Prize for Thermodynamics in 2019—the first time the prestigious award was given for a PhD thesis on quantum thermodynamics—

I knew she would shine in the years to come. Only a few years later, Yunger Halpern has followed through on that promise with an entertaining book, *Quantum Steampunk: The Physics of Yesterday’s Tomorrow*, that explains the essence and secrets of the many facets of quan-