an image as an iconic, eccentric inventor through his showmanship and connections with the media.

Morus emphasizes that Tesla was a great inventor with a gift for visualizing new apparatuses and accurately imagining how a new instrument would work in response to various stimuli. But *Nikola Tesla and the Electrical Future* also shows that the man was not a traditional scientist or engineer. He appreciated only his version of the future and downplayed major breakthroughs by others; for instance, he dismissed the "illusion of Hertzian waves" and declared that "there is no such element as Radium." Furthermore, although Tesla's visions always held great promise for the future of society, they often lacked the details necessary to make his imagined future a reality.

Nikola Tesla and the Electrical Future is not simply another biography of Tesla, but rather, a scholarly study of him in the context of his place and time. In a seamless and comprehensive narrative, Morus successfully weaves together Tesla's personal life with the cultural influences that shaped it and illuminates a very complex person. The clear and engaging writing is a pleasure to read. Although the book was written for a general audience, it would also serve nicely as supplemental reading in a course on the history of technology.

Morus concludes the book by examining how our ideas about the art of invention have and have not changed since Tesla's day. The melding of invention with business has strengthened over the years, while the role of individualism has waned. Nonetheless, inventiveness—the cornerstone of Tesla's life and afterlife—can have far-reaching and perhaps unintended consequences. There is an important lesson here for all of us.

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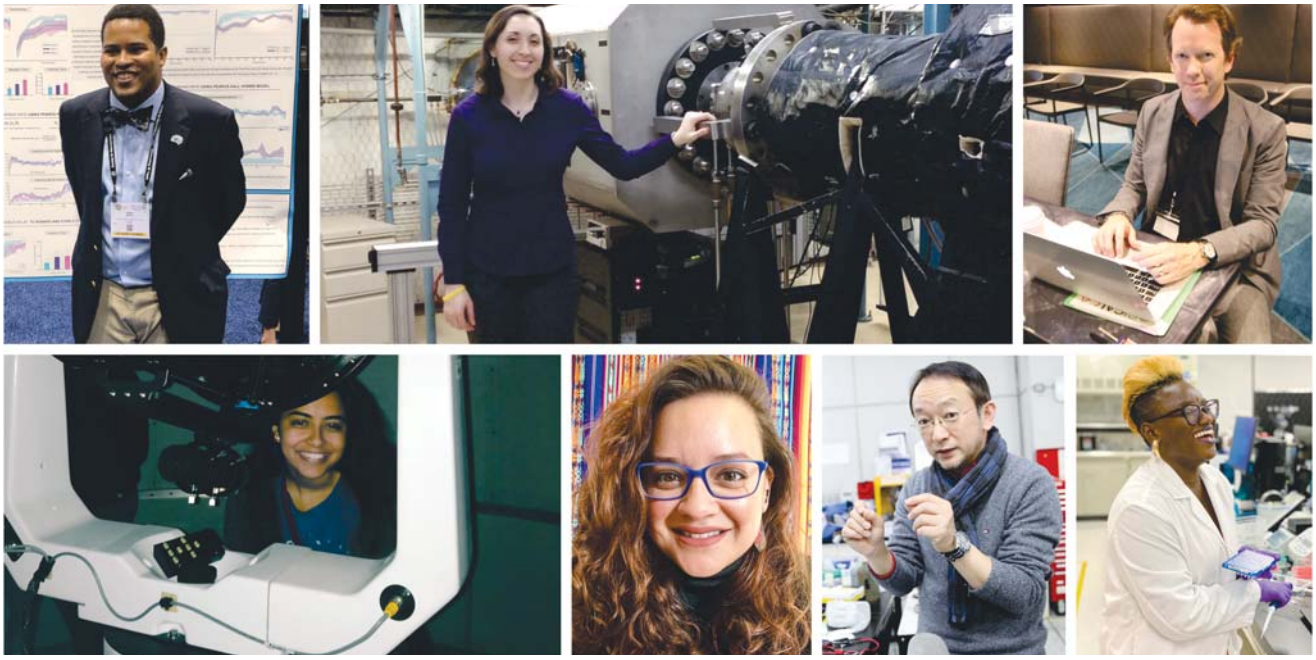

A COLLAGE OF REAL SCIENTISTS—and just one tie. Clockwise from top left: Jared Boyce, Nicole Sharp, Sean Carroll, Danielle Twum, Yeom Han-Woong, Ximena Cid, and Suchi Narayanan. (Photo of Nicole Sharp by Kelley Sharp; Sean Carroll by Sgerbic, CC BY-SA 4.0; Danielle Twum by Susana Jett; Yeom Han-Woong by Rickinasia, CC BY-SA 4.0; and Suchi Narayanan by Orion Lyau. All others provided by their subjects.)

Essays from a career in science writing

Real Scientists Don't Wear Ties
When Science Meets Culture
Sidney Perkowitz
Jenny Stanford Publishing, 2019.
$29.95

How can scientists share their insights with laypeople in a way that encourages audience members to reframe their perspective? Sidney Perkowitz, a popular science writer and professor of solid-state physics, has been attacking that question from all angles since his retirement from academia in 1990. His new book *Real Scientists Don't Wear Ties: When Science Meets Culture* is an anthology of 50 essays he wrote between 1989 and 2018. The pieces are diverse in form and subject; articles explaining research concepts and technological innovations sit beside musings on science's relationship with art and society. Over the course of the collection, Perkowitz triumphs, entertains, and stumbles, illustrating the full breadth of his career writing for the public.

Real Scientists Don't Wear Ties has

three sections—Science, Technology, and Culture—which could be read independently but also flow well if read continuously. In the first, Perkowitz breaks down scientific ideas from quantum entanglement to the meaning of the fundamental constants. Each article stands alone, but all describe complicated ideas for an audience of nonscientists. The book ends up repeating explanations of major concepts such as quantum principles, particle physics, and gravitation, although Perkowitz's prose contains enough vivid metaphors to keep the reading enjoyable. For instance, one stellar essay draws parallels between the ancient four elements—earth, air, water, and fire—and the modern understanding of materials science; it shows how Greek and Enlightenment philosophers were right and wrong about our universe. Here and elsewhere, Perkowitz balances gradual pacing for learners with getting to the point for more knowledgeable readers.

The middle section, Technology, transitions from raw science to real-world application and touches on topics from space travel to artificial intelligence to genetic engineering. Standout essays include an ambitiously concise cultural history of lasers and a personal tale of cataract surgery—a story linked to the lives of artists like Monet, who could paint into old age because of advancing medical technology. In his musings, Perkowitz doesn't shy away from politically thorny topics. One piece tracks eugenics from Nazis to the sci-fi film *Gattaca*; another one, discussing predictive policing by computer algorithms, includes interviews with police officers, software developers, and civil rights activists. Even on controversial topics, Perkowitz delivers valuable and nonpartisan information. He shows how new technology can change society and why we all ought to be aware of applications on the horizon.

Perkowitz is at his loftiest in the last section, Culture, which covers wide ground from humor to fine art to popular media. These final essays draw freewheeling parallels between scientific and artistic perspectives, analyze scientific realism in movies, and discuss the development of genres like science fiction. No matter your feelings about how science is portrayed in pop culture, there's no question that the average person hears more about science through media channels than from scientists themselves. Perkowitz lays out how society (mis)understands research and researchers, which helps us in the physics community relate to our audience and address possible misconceptions immediately.

Given the chronological span of this anthology, it's no surprise some essays have aged poorly. The title essay, "Real Scientists Don't Wear Ties" (1991), on how scientists "reveal themselves by their dress," is the oddest in that regard. I can swallow—wincingly—the title, an out-of-context quote from a woman describing a physics conference crowd. What reads more crudely, after a long exposition about beards and pocket protectors, is a gendered reference to female physicists' clothing. Perkowitz writes that though women "suffer in their choices for insignia of rank," they often communicate "nuances of position and success to other women" through jewelry. Nearly three

decades later, physics is marginally more gender balanced, and happily we are also more receptive to a wider range of gender expressions. Female, non-binary, and male physicists are now more welcome to be "real scientists" in whichever choices of dress they prefer.

Such dips are contextualized by glimmers of self-importance, such as the author's self-portrait cover and the almost boastful material in the foreword. Furthermore, although the content of *Real Scientists Don't Wear Ties* is diverse, the collection can feel repetitive. Most of the essays have a structure derived from the recipe Perkowitz outlines in the introduction: They start with an anecdote, move to "a look at the history of the subject," and include "plentiful application of metaphor." Still, for scientists trying their own hand at public communication, Perkowitz's style is a good one to study.

The book's grandiose yet comprehensive overviews of science topics bring to mind another recent book, *Liquid Rules: The Delightful and Dangerous Substances That Flow Through Our Lives* (2019) by materials scientist Mark Miodownik (see the review by Michelle Driscoll, PHYSICS TODAY, August 2019, page 54). That book also explains a wealth of scientific concepts, but uses the theme of examining liquids on an airplane to make the topics cohere into a single narrative. In comparison, *Real Scientists Don't Wear Ties* feels scattered at times. However, readers of all backgrounds will still benefit from the engaging prose in Perkowitz's diverse collection. Let us hope that if more physicists read this book, more of us will be convinced to distill our own research and ideas into writing for public consumption.

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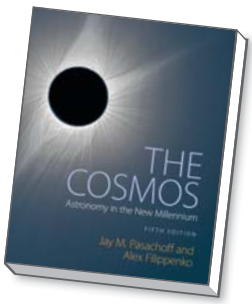
A descriptive overview of astronomy

The Cosmos
Astronomy in the New Millennium
Jay Pasachoff and Alex Filippenko
Cambridge U. Press, 2019 (5th ed.). $79.99 (paper)



Introductory astronomy is one of the most popular general education STEM (science, technology, engineering, and mathematics) classes at colleges and universities. Most students who enroll in it are nonscience majors, and astronomy is the last, or perhaps only, college-level science course they will ever take. *The Cosmos: Astronomy in the New Millennium*, now in its fifth edition, offers a descriptive presentation of astronomy with that audience in mind. Authors Jay Pasachoff and Alex Filippenko are accomplished astronomers, celebrated educators, and champions of science popularization. Their experience communicating science to nonprofessionals is evident in the updated edition of *The Cosmos*, a comprehensive, easy-to-read survey of astronomy appropriate for use in a general-education science course.

The diverse array of topics presented in *The Cosmos* allows professors great flex-