Commentary

It's the 21st century. Why are scientists still writing books?

For at least one week in September 2017, Neil deGrasse Tyson's *Astrophysics for People in a Hurry* (2017) was the top-selling book on Amazon and one of the most read e-books on the Amazon Kindle. And in 2016 geobiologist Hope Jahren's *Lab Girl* (2016) was not only selling well, it was also racking up awards, including the National Book Critics Circle Award for Autobiography.

That they and other working scientists even attempt to write books may seem a bit surprising, given the typical scientist's workload. Between teaching, conducting research, writing papers and countless grant proposals, mentoring students and postdocs, and giving talks at conferences, what little time remains might well be spent trying to avoid burnout (see Luigi Delle Site's Commentary, "Surviving scientist burnout," PHYSICS TODAY, September 2017, page 10).

As any book publisher can attest, scientists often balk at the opportunity to write a nonfiction book, be it a trade book for a general readership, a textbook, or even a professional monograph. In my role as acquisitions editor for the MIT Press, I once heard from a senior physicist who told me that "books seem to be so 20th century."

Yet scientists in the 21st century are still writing books about science, and people are still buying and reading them. Those scientist authors, I believe, are aware that the demand is increasing and that the internet, social media, and mobile devices can be an opportunity for, not an impediment to, book promotion and sales.

A recent Pew Research Center survey, *Book Reading 2016*, found that nearly three in four Americans read at least one book a year; that fraction has remained essentially unchanged since 2012. And when people reach for a book, it is still much more likely to be a traditional print copy than a digital product, according to the Pew survey. For all the complaints about their volume, weight, and high cost, textbooks aren't going away either.

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Many physics students continue to prefer paper textbooks over their electronic versions (see PHYSICS TODAY, August 2017, page 30).

Nonfiction books are an important source for acquiring any appreciable depth of knowledge. The value of textbooks is fairly evident: They are a useful guide to both lecturers and students and a handy reference for researchers and other professionals. Eventually, perhaps, textbooks may evolve into something that needn't be printed. The 21st-century textbook may be a bundle containing text, audio, video, and possibly virtual reality. But even then, those things, whatever we end up calling them, will still need authors.

In the arena of science-based trade books, Tyson's and Jahren's are not the only examples of success. Books by physicists Lisa Randall, Lawrence Krauss, Sean Carroll, and, of course, Stephen Hawking have also attracted broad readerships. Moreover, some lecturers have observed that trade science publications are valuable as accessible and engaging textbook alternatives or supplements in the classroom (see, for example, Joseph Ribaudo's Commentary, "How killer black holes saved astronomy," PHYSICS TODAY, July 2017, page 10).

Scientists who want to have a broad impact on students or on the public have at their disposal many 21st-century tools to engage with their potential audiences. Thousands tune in to science outreach coordinator Dianna Cowern's YouTube channel, *Physics Girl*. Tens of thousands follow atmospheric scientist J. Marshall Shepherd (@DrShepherd2013) on Twitter, and astrophysicist Katherine Mack (@AstroKatie) draws more than 200 000 followers on the microblogging platform. And blogs by atomic physicist Chad Orzel (*Uncertain Principles*) and astrophysicist Ethan Siegel (*Starts with a Bang*) receive millions of monthly visitors.

Even so, books remain an important medium in the stream of science knowledge. In fact, social media gives aspiring authors an opportunity to engage with potential readers, test out ideas, validate passages, and learn new information. No doubt a nontrivial percentage of Tyson's social media fans—more than 10 million on Twitter alone—have contributed to the high sales of *Astrophysics for People in a Hurry*. He dedicated the book to people "who are too busy to read fat books yet nonetheless seek a conduit to the cosmos." That such an audience exists is something he could have picked up from his Twitter fans.

Any scientist who has done public outreach—be it an article for a newspaper or magazine, a public lecture, or an interview for TV, radio, or podcast—may already have unwittingly drafted the core of a trade book. Carlo Rovelli's popular *Seven Brief Lessons on Physics* (2016) is based on essays he wrote for an Italian newspaper. And theoretical physicist Clifford Johnson has presented the essence of his experiences in explaining science to the public, including as a science consultant for blockbuster Hollywood movies, in his new book, *The Dialogues: Conversations About the Nature of the Universe* (2017), a graphic novel that he also illustrated.

Scientists thinking about authorship should have a clear idea why they want to write a book before making the commitment. It's true that writing a book can be time consuming. But for those who commit to the task for reasons that resonate with their core values and goals, the rewards can be immeasurable.

And for scientists who are almost ready to make the commitment, theoretical physicist and prolific author Steven Weinberg offers additional purpose. In his 3 April 2015 *Guardian* article "The 13 best science books for the general reader," Weinberg extolls the virtues of authors who "have done much to make science what some scientists have always hoped it would be: a part of the culture of our times."

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LETTERS

Improving undergraduate labs

Toni Feder's news story "Undergraduate labs lag in science and technology" (PHYSICS TODAY, April 2017, page 26) is a welcome analysis of the challenges facing advanced undergraduate physics laboratories and current efforts to provide effective solutions for undergraduate physics programs at US colleges and universities.

The Advanced Laboratory Physics Association (ALPhA) sponsors a laboratory immersion program in which physics faculty receive three days of dedicated instruction and hands-on experience with modern advanced undergraduate physics experiments. The goal is to provide enough training so that participants can implement the experiments at their own institutions.

Since the inception of the program, I have participated in nine immersions. Each was excellent, and I have implemented at least one experiment—and in one case, five—from each immersion I attended. The topics have been fascinating, and they included single-photon tests of quantum mechanics, external-cavity diode lasers, laser-induced fluorescence, Compton scattering, precision laser interferometry, Fourier methods, and saturated absorption spectroscopy.

At my small undergraduate institution—10 physics majors per year on average—the primary obstacle I faced in implementing those experiments was locating funds to purchase the equipment. Fortunately, the Jonathan F. Reichert Foundation started the ALPhA immersions equipment grant program, which has been a godsend to me and my students. Its support has allowed me to acquire a Leybold x-ray diffraction apparatus, a TeachSpin diode laser spectroscopy instrument, a Stanford Research lock-in amplifier, and a TeachSpin Fourier Methods system.

As a direct result of the efforts of ALPhA and the Reichert Foundation, I have implemented 13 advanced undergraduate physics experiments at my institution. Additionally, I proposed a new course, Advanced Laboratory in Physics, which was offered for the first time in the fall of 2017.

Some friends and colleagues suggest that after 30 years of professorial experience I should be thinking about retiring. I disagree. I am more excited now than ever, because I see my students' enthusiasm as they perform the new experiments. I look forward to many more years in the best job on the planet.

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The April 2017 issue of PHYSICS TODAY included a report by Toni Feder on the current poor state of student advanced physics labs and efforts by the Advanced Laboratory Physics Association to improve the situation. But a few aspects need discussion to complete our understanding of the situation.

Some colleges advertise that all their undergraduates have the opportunity to participate in faculty research projects. I wonder whether such arrangements are