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Commentary

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Book and Media Recommendations: *Proof: The Science of Booze*; *Stuff Matters: Exploring the Marvelous Materials That Shape Our Man-Made World*; *Wizards, Aliens, and Starships: Physics and Math in Fantasy and Science Fiction*; and *Houston, We Have a Narrative: Why Science Needs Story*

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ABSTRACT: Four books are reviewed: *Proof: The Science of Booze*, by Adam Rogers; *Stuff Matters: Exploring the Marvelous Materials That Shape Our Man-Made World*, by Mark Miodownik; *Wizards, Aliens, and Starships: Physics and Math in Fantasy and Science Fiction*, by Charles Adler; and *Houston, We Have a Narrative: Why Science Needs Story*, by Randy Olsen.

KEYWORDS: *General Public, Interdisciplinary/Multidisciplinary, History/Philosophy, Public Understanding/Outreach, Professional Development*

At the end of a long day of thinking about chemistry teaching and learning, I like to relax with good beer, a chocolate-y treat, and maybe something fun to read—likely about more chemistry or science. I recently had the pleasure of reading four books that explored my favorite indulgences. I drank a hearty stout and read *Proof: The Science of Booze*.[1] Rogers's book describes the topics behind the production and consumption of alcoholic beverages. I sampled some chocolate (ok, a lot of chocolate) and read *Stuff Matters: Exploring the Marvelous Materials That Shape Our Man-Made World*,[2] which not only discusses the chemistry of chocolate but also the composition and function of other everyday materials. Then, to explore the composition of books and stories themselves, I read *Wizards, Aliens, and Starships: Physics and Math in Fantasy and Science Fiction*,[3] which discusses the feasibility of plot points in various fiction works, and *Houston, We Have a Narrative: Why Science Needs Story*,[4] which describes the structure of stories and offers advice to scientists for how they might employ narrative techniques in their communication. Tuck in with your beverage and treat of choice, and I will offer some suggestions for your reading list.

PROOF: THE SCIENCE OF BOOZE

Although some book retailers have classified *Proof: The Science of Booze*[1] as a cookbook (Figure 1), you'll have to look elsewhere if you are interested in cocktail recipes or pairing recommendations. Instead, Adam Rogers explores the science of alcoholic beverages from production to consumption. Long-time readers may recognize some elements and themes from his writings on the topic for *Wired Magazine*.[5] Rogers's passion for the subject is readily apparent, and although he comes off a bit snooty at times regarding his drink preferences, he's a lovable snob who wants you to join the club, too.

Rogers begins with the production of alcoholic beverages, with chapters on yeast, sugar, fermentation, distillation, and aging. He describes historical methods for alcohol production and key technological advancements, balancing the human and societal aspects of progress with the scientific concepts. In the chapter about yeast, Rogers cycles between the efforts of the scientists who contributed to our current understanding of yeast and the present-day efforts to "domesticate" the organism. The temporal shifts built a sense of mysteries and a compelling foundation to lay down the science concepts. The science is written at about a high-school level and often suffers from oversimplification. For example, Rogers builds a justification of the difference in behavior of top-fermenting and bottom-fermenting yeast on the fact that "top-fermenting yeasts repel water", and in the chapter about sugar, he describes energy as stored in bonds.

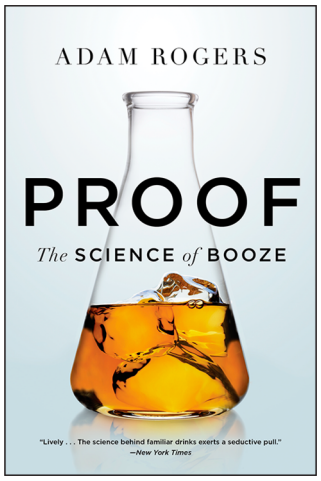

Figure 1. *Proof: The Science of Booze*[1] cover image provided by Houghton Mifflin Harcourt and reproduced with permission.

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The second half of the book concerns consumption: a drink's flavor, the immediate physical and mental effects of consumption, and finally, hangovers. These chapters continued a theme the author explores in earlier chapters: there are many interesting questions that science has not been able to answer yet, such as the specific mechanisms of hangovers, let alone how to cure them. Although Rogers examines the latest developments on these questions, he revels in the unknown, pointing out many inadequacies of our current knowledge. *Proof's* utility for teaching about science may not be in the discussion of scientific principles, but in its portrayal of the nature of science as an iterative, messy, human, process of finding out more things that we do not know. And if you are fond of booze, it will teach you a lot about that, too.

STUFF MATTERS: EXPLORING THE MARVELOUS MATERIALS THAT SHAPE OUR MAN-MADE WORLD

Stuff Matters: Exploring the Marvelous Materials That Shape Our Man-Made World[2] (Figure 2) continued my education on the

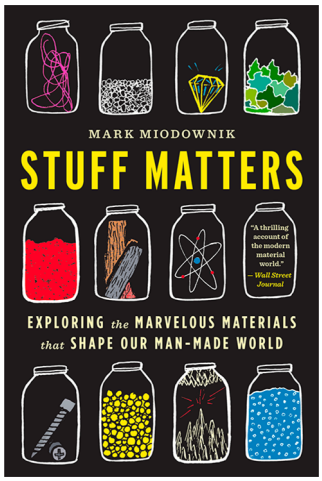

Figure 2. *Stuff Matters: Exploring the Marvelous Materials That Shape Our Man-Made World*[2] cover image provided by Houghton Mifflin Harcourt and reproduced with permission.

innumerable variables that affect the outcome of fermentation—but of cocoa beans to make chocolate instead of grain to make alcohol. In the chapter "Delicious", Mark Miodownik describes how chocolate is made, how we taste it, and chocolate's place in our culture. Each chapter of *Stuff Matters* is titled with an adjective that reflects the author's personal relationship with the salient material: "Marvelous" for foam, "Invisible" for glass, "Trusted" for paper, and so on. Each chapter describes the history, scientific principles, and societal function of the particular material. *Stuff Matters* is masterfully framed, with a vivid event in each chapter to draw the reader's attention to the specific form and function of each material. None is quite so dramatic as the introduction to the book: the author describes his own stabbing as a teenager, which led to his fascination with steel ("Indomitable"). For "Imaginative", Miodownik wrote a screenplay in the Western genre to showcase the invention of synthetic polymers, convincingly arguing why all moviegoers owe a debt to plastics.

A photograph of the author having tea on a terrace begins each chapter, with the salient material highlighted somewhere in the picture. This gave a sense of cohesiveness to the otherwise unrelated chapters. The text is well served by photos to emphasize the substances' macroscopic properties and illustrations of their particulate-level characteristics. The scientific explanations are sometimes uneven, with a sophisticated description of bonding and electronics for carbon allotropes, but a nonexplanation of "atoms dancing" and building "bridges" for the process of firing porcelain. The science content was written for the layperson, yet it yielded many insights into materials that had not yet garnered attention from me. In "Fundamental", Miodownik elucidates why concrete was used to build the still-standing Pantheon dome two thousand years ago, but could not be used to build skyscrapers and bridges until modern times. By the end of the chapter, I was persuaded by Miodownik's case that concrete is an underappreciated material (ref 2, p 252): "Like bone, we prefer it on the inside; when it sticks out we are repulsed". The allegories and introspection about the meaning of each material in our society provides a nice balance to the science content.

WIZARDS, ALIENS, AND STARSHIPS: PHYSICS AND MATH IN FANTASY AND SCIENCE FICTION

In *Wizards, Aliens, and Starships*: *Physics and Math in Fantasy and Science Fiction*,[3] Charles Adler combines his enthusiasm for science fiction and fantasy novels and physics by exploring the plausibility of the plot points of various fictional works. However, it seems that he may have leaned on his own preferences too much when selecting texts, omitting any mention of works by many notable authors, including Ray Bradbury, Orson Scott Card, Jules Verne, George R. R. Martin, J. R. R. Tolkien, Frank Herbert, and Kurt Vonnegut.

Part I of *Wizards, Aliens, and Starships* (Figure 3) is "Potter Physics", wherein Adler explores instances in which authors'

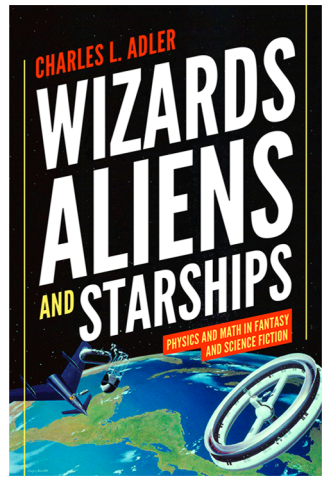

Figure 3. *Wizards, Aliens, and Starships*: *Physics and Math in Fantasy and Science Fiction*[3] cover image provided by Princeton University Press and reproduced with permission.

use of magic departs from the physical limits of our world. Although many of his examples are from the J. K. Rowling's *Harry Potter* series,[6] he also draws from *Star Trek*,[7] Heinlein,[8] *The Dresden Files*,[9] and many other works. In this first part, Adler shares enough context of the reference so that readers can appreciate the subsequent explanation of the science. This is not the case in the three other parts of the book, which discuss various aspects of space travel, alien life, and the future. In these latter parts, references to literary works serve to

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support his physics derivations and explanations, instead of vice versa. Instead of debunking plot points, Adler discusses existing technologies and what scientific and economic advances would be necessary for various scenarios to be plausible. I found myself wishing for footnotes while reading. Adler embeds all formulas and algebraic calculations within the body of the text and uses endnotes for his various side comments, leading to a somewhat choppy and disjointed reading experience. Yet his tone is casual and unassuming, which provides warmth to the math-heavy text. Adler's biggest strength is in his problem-solving approach. He provides great examples of back-of-the-envelope calculations and always points out the assumptions and limitations in his models. This book is clearly the product of tremendous literary and scientific research. The American Institute of Physics thought so, too, awarding it the Science Writing Award in 2015. Fans of the genres will discover material to add to their reading lists, instructors will find ideas for contextualizing physical science problems—in fact, Adler provides a Web site with additional problems for classroom use.[10]

HOUSTON, WE HAVE A NARRATIVE: WHY SCIENCE NEEDS STORY

While Adler wrote about how science functions within stories, Randy Olson presents a compelling argument for how to put stories within science in *Houston, We Have a Narrative: Why Science Needs Story*.[4] When Olson moved from a career as a professor of marine biology to writing and directing films in Hollywood, he discovered that the narrative form that writers use to attract moviegoers could benefit scientists who need to explain their research. This idea was first explored in another of Olson's books, also reviewed in this *Journal*.[11] In his book (Figure 4), he lays out three formats for scaffolding a story,

Figure 4. *Houston, We Have a Narrative: Why Science Needs Story*[4] cover image provided by University of Chicago Press and reproduced with permission.

ranging from an easy template for beginners to a complex form for more experienced storytellers. Olson gives several strong arguments for why and how researchers would benefit from intentionally framing their research in a narrative form, but the most convincing argument was the text itself: while he is explicitly *telling* you how to write nonfiction in a story form, he is *showing* you by doing it in his own book. As if by magic, story worked its charm on me; I could see and feel its power as I was reading. Olson incorporates many examples from both Hollywood and science to illustrate the principles of storytelling. In addition to giving individual researchers advice for how to improve their grant proposals, seminars, and manuscripts, Olson suggests ways that science departments can strengthen their research programs by focusing on a storytelling culture at an institutional level. This is a book not just to read, but to own so you can refer back to it and share it with your colleagues.

CONCLUDING REFLECTION

I have always enjoyed being able to understand the hows and whys of my everyday experiences, one of the reasons why I find chemistry to be so alluring. These books have provided a new way for me to think about my favorite movies, books, beverages, and the materials that make up my world. Any of these books would be worth adding to your summer reading list.

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Notes

The author declares no competing financial interest.

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