

## New books & media

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points to standard references for more involved proofs.

The book is divided into two broad sections. The first, Fundamentals, covers topics such as random variables, limit theorems, Markov chains, Monte Carlo methods, stochastic processes, and stochastic differential equations. The second section, Advanced Topics, has chapters on path integrals, random fields, rare events, statistical mechanics, and chemical reaction kinetics.

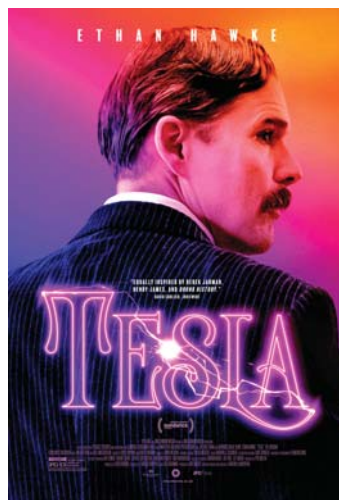
Most of the applied material promised in the title is contained in the second half of the book, which is oriented toward physical and chemical systems. Theory and applications have had a long interplay in the study of such systems. The authors review some basic results in statistical physics and chemical kinetics to give the reader an understanding of how stochastic tools can lead to meaningful conclusions and descriptions. Almost all readers will find a novel calculation or approach in the material.

One revealing perspective of a given graduate-level text is the last chapter, in which the authors usually open the throttle on a subject of their interest. In *Applied Stochastic Analysis*, the last chapter is an introduction to chemical kinetics. E, Li, and Vanden-Eijnden introduce the major ways that the formalism of stochastic processes can be used to create macroscopic dynamical models of interacting chemicals. The authors cover macroscopic ordinary differential equation models and then develop Poisson-driven stochastic differential equations to model individual molecule counts before moving on to cover diffusion limits. They then bring the theory of stationary distributions to bear, followed by a multiscale analysis. The time spent understanding the entire presentation is well worth it. Stewart Ethier and Thomas Kurtz's definitive 1986 book *Markov Processes: Characterization and Convergence* develops a lot of machinery used in this chapter; *Applied Stochastic Analysis* shows why that machinery is important.

This book gives students of stochastics or mathematical physics a wonderfully solid starting point and is likely to be a favorite among physicists. By the end of it, readers should have a solid understanding of core tools in stochastic analysis.

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## NEW BOOKS & MEDIA



### Tesla

Michael Almereyda (writer, director, and producer)  
IFC Films, 2020

Starring Ethan Hawke as the titular character, *Tesla* centers on the conflict between inventors Nikola Tesla and Thomas Edison over which electricity supply system should prevail: AC or DC? Although nominally a biopic, director Michael Almereyda's version is decidedly quirky, with J. P. Morgan's daughter Anne (Eve Hewson) using a laptop to pull up Google search results on Tesla and Hawke as Tesla at one point singing the Tears for Fears song "Everybody Wants to Rule the World." Winner of the Alfred P. Sloan Feature Film Prize at the 2020 Sundance Film Festival, *Tesla* is an intriguing take on the enigmatic inventor.

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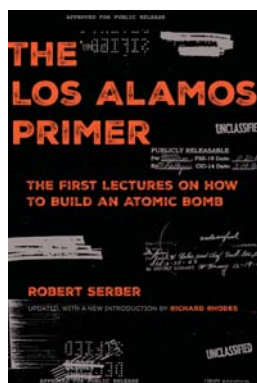
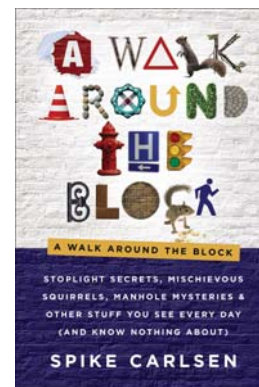
### A Walk Around the Block

Stoplight Secrets, Mischievous Squirrels, Manhole Mysteries and Other Stuff You See Every Day (and Know Nothing About)

Spike Carlsen  
HarperOne/HarperCollins, 2020. \$24.99

Inspired by frozen pipes one winter to learn where the water in his home comes from, author Spike Carlsen embarked on a quest to learn about the world outside his front door. Carlsen, a former carpenter, has since descended into sewers, toured electricity-generating plants and recycling centers, visited a US Postal Service processing and distribution center, and performed numerous other investigations into such everyday things as bicycles and asphalt. A mix of history, technology, personal profiles, and even the etymology of terms, including "fire plug" and "Bluetooth," *A Walk Around the Block* is an entertaining and informative read aimed at a general audience.

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### The Los Alamos Primer

The First Lectures on How to Build an Atomic Bomb

Robert Serber  
U. California Press, 2020. \$17.95 (paper)

In 1943, at the newly constructed Los Alamos Laboratory, physicist Robert Serber presented a series of lectures on the cutting-edge physics and engineering required to build a nuclear weapon. Fellow physicist Edward Condon took notes, which became known as *The Los Alamos Primer*. Classified until 1965, the information was first published in book form by the University of California Press in 1992, along with extensive annotations by Serber and an introduction by Pulitzer Prize-winning historian Richard Rhodes. Almost three decades later, this seminal work has been updated and reissued in paperback, with a new introduction by Rhodes.

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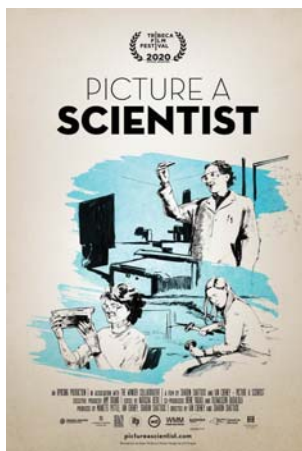
## Picture a Scientist

Sharon Shattuck and Ian Cheney

Uprising Production/Wonder Collaborative, 2020.

Most image searches for “scientist” return variations on the same theme: a man in a white lab coat. This engaging documentary tells the story of three women who break that mold. Molecular biologist Nancy Hopkins, chemist Raychelle Burks, and geologist Jane Willenbring share the joy of their scientific work and the problems they have encountered as women in male-dominated fields. The three are candid and powerful as they describe their experiences of discrimination. The most painful story is Willenbring’s; her graduate adviser viciously harassed her while doing fieldwork in the Antarctic in the early 2000s and did not face consequences for nearly two decades. Visit <http://pictureascientist.com> for more information on viewings and screenings.

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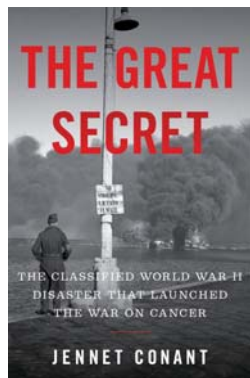
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## The Great Secret

The Classified World War II Disaster that Launched the War on Cancer

Jennet Conant

W. W. Norton, 2020. \$27.95

On 2 December 1943, Germany launched a devastating air attack on Allied forces at the port of Bari, Italy. Among the vessels destroyed was an American ship that carried a secret load of mustard gas; the deadly chemical poisoned hundreds of people. Although British and American officials initially denied the presence of mustard gas, whose use was barred by the Geneva Protocol, Lieutenant

Colonel Stewart Francis Alexander, an American doctor and chemical-weapons expert, discovered the truth. *The Great Secret* tells the riveting story of Alexander’s investigation of the Bari incident, his revelatory research regarding mustard gas’s destruction of white blood cells and potential use in chemotherapy, and the efforts to act on those findings by American oncologist Cornelius Rhoads, who in 1945 became director of one of the most advanced cancer centers in the world, the Sloan Kettering Institute.

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## Seeing into the Future

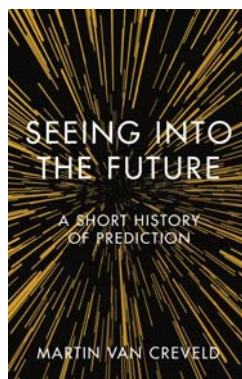
A Short History of Prediction

Martin van Creveld

Reaktion Books, 2020. \$24.00

What will the weather be like tomorrow, next week, next year? Will there be another war, famine, global pandemic? Will the stock market rise or fall? In *Seeing into the Future*, military historian and theorist Martin van Creveld provides an overview of some of the myriad methods humans have devised over the millennia to foretell what is to come, from the ancients’ use of prophecy and astrology to today’s mathematical algorithms. In addition to delving into when, where, why, and how those techniques originated, he discusses such questions as why prediction is so difficult, whether modern humans are any better at making predictions than our ancestors were, and whether knowing the future is a good thing.

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