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Book Review

ACTUARIES AS HEROES

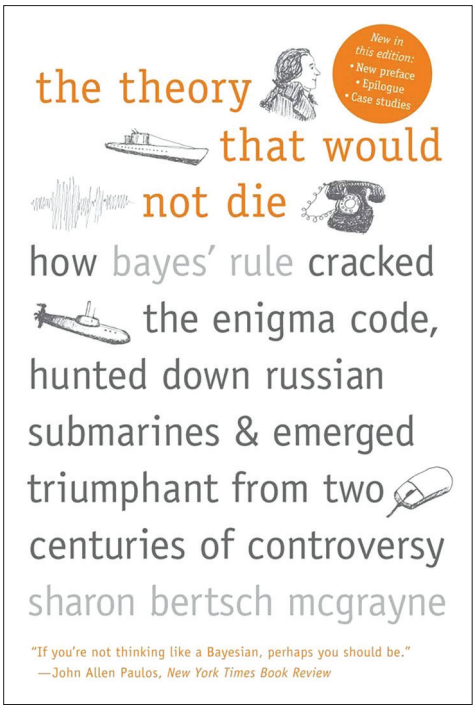
BY JAY M. JAFFE

IT ISN'T OFTEN that a book is written with an actuary as one of its heroes. But Sharon Bertsch McGrayne's recent publication is a must read for any actuary or others interested in learning not only about Bayes' rule and its history but also how this theorem has shaped our world for the past 200 years. *The Theory That Would Not Die: How Bayes' Rule Cracked the Enigma Code, Hunted Down Russian Submarines and Emerged Triumphant from Two Centuries of Controversy* also explains how actuaries have been some of the main users of Bayes' rule to address real-world problems.

I became aware of this book because of an editorial I wrote in the August/September 2013 edition of *The Actuary*. The article described my vision that actuaries would begin to use their talents to help address many societal issues. One of the areas I mentioned was autism. An actuarial friend from a long time ago wrote to me about *The Theory That Would Not Die* and how actuaries had used Bayes' rule in the past and suggested that this methodology might be helpful in finding ways to attack autism. I quickly downloaded a Kindle version of the book and began reading.

The book starts by describing Bayes' rule as "a simple, one-line theorem: by updating our initial belief about something with objective new information, we get a new and improved belief." The Rev. Thomas Bayes made his discovery sometime during the 1740s but it didn't get published until years later, after his death, when Richard Price was asked to review his papers and discovered the essay. Bayes' rule was rediscovered by Pierre Simon Laplace in the 1770s. Eventually, as indicated by the title of the book, the story moves into other areas where Bayes' rule has been instrumental in solving problems. Bayes' rule played a major role in unraveling the Nazi's Enigma code during World War II, tracking down submarines and lost nuclear bombs, and helping uncover the causes of certain sicknesses, as well as contributing to solving numerous modern problems. The book also describes several of the historical battles between frequentists and Bayesians, which occurred during the two centuries following the discovery of Bayes' rule.

At several places throughout the book, the author mentions the contributions of Italian actuary and mathematician Bruno de Finetti. But the main actuarial star of *The Theory That Would Not Die* is Arthur Bailey. Bailey graduated from the University of Michigan in 1928 where he studied statistics in the math department. During the 1940s, he developed his belief that the actuaries' "beloved Credibility formula was derived from Bayes' theorem."



There's another episode in the book about the time an actuary by the name of L.H.

Book Mark!

If you've read a book you think fellow actuaries would be interested in, send in the title, the author and a short write-up on the key highlights for our readership audience. Or, if you prefer to submit a book review for publication in *The Actuary*, send it to the **actuary@soa.org** for consideration.

Jay M. Jaffe

To my friend Blaine,

thanks for taking the time to send your email. I greatly enjoyed *The Theory That Would Not Die* and its stories of the history and applications of Bayes' rule as well as renewing my connection with the book's actuarial and nonactuarial heroes. I'm headed to London in a few weeks and because of you I've already made plans to make a long-delayed visit to Bletchley Park[1] and see how Bayes' rule helped the Allies win WWII. A

Longley-Cook was asked by the president of his insurance company to predict the probability that two planes would collide in midair. This was a very practical question because of the rapid growth in air travel in the years following World War II. Early in 1955, Longley-Cook sent the president a statement to expect "anything from 0 to 4 air carrier-to-air carrier collisions over the next ten years." Longley-Cook's prediction was prescient. In 1957, two passenger planes collided over the Grand Canyon and a few years later there was another collision in New York City. Bayes' rule had helped Longley-Cook derive a solution to a problem without prior experience. (A few years later, Longley-Cook published *An Introduction to Credibility Theory*, which I still review on occasion.)

There is another interesting actuarial sideline to the Grand Canyon plane collision incident. Years ago, I heard the story about an insurer that limited the number of executives on any single plane. This was a common risk management practice at the time. Because of a late meeting in Los Angeles, several employees of this company, including a well-known actuary, missed their separate flights. Their original two flights were the planes that collided over the Grand Canyon.

Besides its information about Bayes' rule and the stories of actuaries' contributions to the advancement of Bayes' rule, *The Theory That Would Not Die* was a trip down memory lane. Several of the people who have been influential in Bayes' rule during the past 50 years were either known to me personally or just a degree or two of separation away. The book provided me with new insight into their lives and accomplishments. For example, while in graduate school, the work of Harvard professors Robert Schlaifer and Howard Raiffa was taught to me by a professor who had been their student. Around Cambridge (MA not UK) these two Harvard profs were the walking gods of the new ways to use math in business. I recall we used a mimeographed textbook written by Schlaifer and Raiffa made available to us prepublication because of my teacher's connection with the pair.

An even closer connection is another brilliant person by the name of Albert Madansky. I first met Al while we both were working for an attorney as experts in a legal matter. I had no idea of his influence on the world and the extent of his accomplishments. As a young man, Al worked at RAND Corp. and used his expertise to predict the probability of nuclear accidents, which was a hot topic back then. His post-RAND life is also filled with many accomplishments, some of which are described in *The Theory That Would Not Die*. He returned to the Booth Graduate School of Business at the University of Chicago and a career addressing many practical business problems.

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END NOTE

[1] During World War II, Bletchley Park was the site of the United Kingdom's main decryption establishment, the Government Code and Cypher School (GC&CS), where ciphers and codes of several Axis countries were decrypted, most importantly the ciphers generated by the German Enigma and Lorenz machines.