Terence's Stuff: *Books Worth Reading*

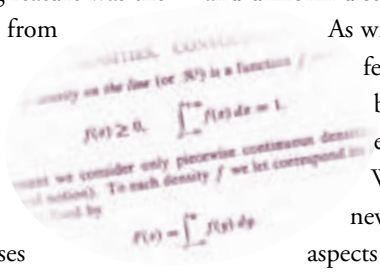
Terry Speed continues his regular column with a run-down of his favourite books, starting with a fellow named Feller. Read on…

What do you look for in a book? I like it to have something old, something new, not too much borrowed, and to be mostly true. I need to both see and like a book's treatment of something I think I know well, before I am inclined to trust it on other things. I also like to see lots I don't know; reading a whole book to discover the little islands of novelty amid oceans of familiarity does not appeal. I want my authors to stick to the topics they know well, for this gives me a better chance of getting an original viewpoint. I prefer to read books by authors who really know their field, scientists who I can trust. To these minimal prerequisites, I'd add readability, a good index, and several other things like this.

What books do I think worth reading? My all time favourites are the five editions by William Feller of *Introduction to Probability Theory and its Applications*, *Volume 1*, first edition 1950, second 1957, and third 1968, and *Volume 2*, first edition 1966, second 1971.

Why were Feller's books so great? I wasn't reading probability books in 1950 when *Volume 1* hit the bookstores, but it must have been quite an event. It had core chapters (1, 5, 6 and 9), most of which would have been accessible to any mathematics or statistics undergraduate, while there were starred sections and starred chapters to warn the beginner and challenge the eager. It presented clear and attractive, even exciting developments of topics which are often drearily treated in most books even now (combinatorics; the relationships between the hypergeometric, binomial, Poisson and normal; generating functions). Who do you think did most to publicize the birthdays problem, or the problem of estimating the number of fish in a lake (capture-recapture)? Feller. He also gave lucid expositions of topics not taught at the introductory level (random walks, Markov chains). And for the initiated the book expounded previously unpublished or only recently published research (including recurrent events).

The book's most striking feature was the vast number of applications from the literature, to areas like biology, including genetics (influential in my case), queuing theory, physics, gambling, quality control, and much more. The exercises were superb (answers at the back), and later editions had problems and complements of a theoretical character, which were really a guided tour into a corner of the research literature. Most importantly of all, of course, it was beautifully written, there were lots of footnotes and an excellent index. This was a scholarly book that was also introductory.



Another thing that greatly appealed to me—perhaps it was the fact that I was reading it in the 1960s—the author had a clear point of view. You couldn't fail to detect the fact that Feller didn't believe in ESP, believing that much of the evidence for it was based on poor probability experiments, or that the notion of contagion was "vague and misleading". The reader was always conscious that an important aspect of probability theory was to help him or her to be precise and correct, no matter how superficially contradictory or paradoxical a formulation might initially appear. Probability has a theoretical and an intuitive component, and Feller's took it upon himself to remove any dissonance between the two.

Volume 1 was restricted to discrete sample spaces, and after what seemed to be a very long gap of 16 years, *Volume 2* appeared, dealing with continuous sample spaces. This was a big event in my life, and I can still remember heading for the bookstore after I heard it had come in. I can't begin to explain how much I learned from *Volume 2*, and I don't have the space here to tell you much of what was in it. The very first chapter, concerning the exponential and uniform distributions, was a stunner. As with *Volume 1*, there were a few core chapters, and the book could be entered and enjoyed at many levels. We were treated to many new insights into familiar aspects of our subject. Issues of relevance to statistics—the normal, F and t distributions—were presented in a new and elegant ways. I fell in love with the random walk material, including accessible expositions of much recent research such as Spitzer's fluctuation theory and the Wiener-Hopf equation. I also liked the way Feller used probability to illuminate and simplify aspects of classical and functional analysis. These influenced my research for quite a while to come. My copy of the second edition of *Volume 2* was bought to celebrate a long-forgotten extension of a result in chapter XVIII.

Feller is not read much these days, any more than students of my day would read Uspensky or Poincaré. But maybe just one of my younger readers will be moved to try his books after reading this. If so, you won't regret it.

Next month I'll tell you about the other books that sit on my very short shelf of all time favourites.