

John Wilder Tukey: Statistical Inventor, Discoverer and Revolutionary

Howard Wainer

The four articles that follow are part of a celebration of the life and work of John Wilder Tukey (1915–2000)—a polymath whose work, though centered in statistics, spanned many arenas. He was also an avid folk dancer, bird watcher, reader of mysteries and science fiction, dedicated husband and the best mentor any student could ever hope for.

Frank Anscombe, John's nephew, begins the celebration with a biography that mixes public facts with family observations, providing as rounded a portrait of its remarkable subject as has ever been produced.

John often described himself as a data analyst. David Hoaglin, who wrote his Ph.D. thesis under Tukey and who formed a major part of what John called The Cambridge Writing Machine, next provides a brief overview of some of Tukey's data analysis inventions and, more importantly, points out the change in attitude that his work generated toward the recognition of the honorable place that data analysis ought to occupy in the world of science.

Karen Kafadar, another of John's eminent graduate students, tells us about Tukey and robustness—the two words go together so naturally that it seems almost redundant to use them both, like Newtonian physics.

As it did for most people alive during that time, World War II had a profound effect on Tukey's career. At the time, as a young mathematician, he joined Princeton's Fire Control Research Office, which did very applied work on ways to make weapons more effective. Tukey thus came into close contact with a community of some of the best statisticians in the country. The recommendations they were asked to make were based on data. Within this milieu, Tukey found a home. He enjoyed the work and produced a torrent of inventions that allowed him and his co-workers to accomplish their tasks better. At the end of the war, he shifted his academic focus to the statistical wing of the Department of Mathematics and, at the

same time, joined AT&T Bell Telephone Labs. Joining Bell Labs was very much an extension of his Fire Control work. He was hired at Bell Labs by Henrik Bode, head of military systems and best man at his wedding, to co-design the general elements of Nike, the world's first anti-aircraft (surface-to-air) missile. Military work was very much John's wartime entree to Bell Labs, although he did many other things there in the fullness of time.

Colin Mallows, a long-term colleague of Tukey's at Bell Labs, discusses the impact of 40 years of John's work at Bell Labs, including, but not limited to, his development of fast Fourier transforms and other tools for spectrum analysis.

Webster says to celebrate is “to observe a notable occasion with festivities” and “to demonstrate satisfaction by festivities or other deviations from routine; to hold up for public acclaim.” This tribute from *Statistical Science* dedicated to the work of one man is anything but routine, and I hope that these articles evoke memories of other festive times. John's life was his work, so as you read these articles, in a very real way you will sense John's presence. However, because he was a very private man, I hope that “holding him up for public acclaim” does not render him acutely uncomfortable. Causing John discomfort on an occasion in his honor seems grossly unjust. Perhaps, as he looks down upon us, he will endure the ordeal with less embarrassment if I am brief.

All of us, formally or informally, have been, and usually remain, John's students. Thus I find it more than a little ironic that today we honor John for, among his other accomplishments, having spawned us. Nevertheless, for better or for worse, he did it and hence must accept the consequences for his actions. Describing some of those past actions forms the content of my remarks here today.

The other authors today discuss the power and brilliance of John's technical contributions, so, I, instead, would like to focus on a different aspect of John's character: his kindness and his devotion to service. Throughout his life John lent his genius to countless important public service projects, from aiding the war

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effort in the 1940s, to contributing to the discontinuance of nuclear weapons tests, to studying the impact of fluorocarbons on the stratosphere, to assessing the validity of methodology in sex research, to measuring the efficacy of the U.S. educational system; the list goes on and on. In the 35 years I knew him, he even found time in his busy schedule to help with much smaller, more personal projects as well.

A letter sent to him on his 85th birthday from Ying Wang, the Director of Pfizer's Statistical Consulting group, nicely illustrates John's genius and kindness:

I am writing to wish you good health and continued happiness.

Many years ago I was a summer student at Bell Labs. During a lunch meeting you suggested a research topic on the multivariate Behrens–Fisher problem.

You kindly wrote down the idea on a tiny paper napkin, and gave me half of your pie for dessert. The idea led to my Ph.D. thesis

at the University of Chicago under David Wallace. The dessert added to my memory of that occasion.

With warm wishes and deep appreciation.

To his very last day, at the end of any conversation we ever had, he always finished with, “Is there anything else I can help you with?” If the answer was “yes,” the conversation went on longer; often a great deal longer. However, I will not. Instead let me end with the remarkably apt homage that Robert Whittington paid to Sir Thomas More almost 500 years ago:

More is a man of angel's wit and learning;
I know not his fellow.
And as time requireth,
A man of marvelous breadth and pastimes. . .
And sometimes gravity.
A man for all seasons.

John Wilder Tukey was a man of remarkable qualities—a man, indeed, for *all* seasons.