Milton Friedman (1912-2006)
by Stephen Stigler

When Milton Friedman died at the age of 94 on November 16, 2006, the world press recounted at length his life as one of the premier economists of the twentieth century, citing his work on monetary economics and price theory, and his influential espousal of free market economic policy. Unmentioned in these accounts was Friedman's early research in mathematical statistics and his strong early relationship with statistical societies.

Friedman was born in Brooklyn, New York on July 31, 1912, and he attended Rutgers University from 1929, graduating with a A.B. degree in 1932. At Rutgers, he studied advanced mathematics, and Arthur F. Burns (later Chairman of the Federal Reserve Board) awakened in him an interest in economics. Friedman continued his education with graduate study at the University of Chicago and Columbia University; with wartime diversions he did not receive his PhD until 1946, from Columbia University. At the University of Chicago he encountered economists Frank Knight, Jacob Viner, and econometrician Henry Schultz, as well as several unusually capable fellow students, and Schultz was instrumental in arranging a fellowship for him during the 1933-34 year to work with Harold Hotelling at Columbia. Hotelling was then at age 38 at the peak of his powers, with a steady stream of pathbreaking papers in both mathematical economics and mathematical statistics. In 1936 Hotelling published (with Margaret Pabst) a paper in the Annals of Mathematical Statistics on rank correlation methods, and Friedman followed with a paper the next year in JASA (32: 675-701), "The use of ranks to avoid the assumption of normality implicit in the analysis of variance." This paper presented what is now called in all texts and statistical packages "Friedman's Test" for the two-way analysis of variance. In a subsequent Annals paper (1940; 11: 86-92) he examined the efficiency of his test in comparison to some competitors. Friedman's test was the forerunner and direct inspiration for the subsequent development of rank procedures by Wilcoxon, Mann, Whitney, Kruskal, Wallis, and others.

When Jerzy Neyman visited the U.S. in 1937 for his now-famous series of Lectures and Conferences at the U.S. Department of Agriculture, Friedman was in the audience asking penetrating questions, as the published notes indicate. For example, when Neyman noted as a criticism of maximum likelihood as a principle that the MLE for the variance of a normal distribution had the undesirable property of being biased, Friedman pointed out that if the likelihood being maximized was that of the statistic s^2 (as would be the case if "maximum likelihood" were in effect applied twice), the resulting estimator (namely s^2) would be unbiased, a point Neyman grudgingly granted.

During the war, Friedman worked with the Statistical Research Group at Columbia University, a group that was led by W. Allen Wallis and included ten who served as President of the IMS: Harold Hotelling, Jimmie Savage, Abraham Wald, Jacob Wolfowitz, Fred Mosteller, Abraham Girschick, Herbert Solomon, and Al Bowker, together with John Tukey and Sam Wilks who were with a collaborating group at Princeton. During that period Friedman worked on problems in experimental design and sampling inspection, and he played a direct role in inspiring Wald's work on sequential analysis (See W. A. Wallis's 1980 account in JASA 75: 320-335).

Friedman also played a role in the growing attention to statistical education by statisticians during this period, first at the University of Wisconsin (where he held a visiting

position, 1940-41), and later when, at the behest of Hotelling, he played a major role in drafting the IMS report on "The Teaching of Statistics," published in the Annals in 1948 (19: 95-115).

Friedman's early mastery of statistical theory was important to his subsequent work in economics. He acquired a deep understanding of the regression phenomenon and variance components from Hotelling in the 1930s, and this was crucial to his influential work on the consumption function (with the separation of permanent and transitory components) in the 1950s. Nonetheless, after the war his focus turned almost exclusively to economics. He wrote in a 1976 letter to me that, "My highpoint as a mathematical statistician was VE Day in 1945."

Friedman remained current with developments in statistics throughout his professional life. He spent the year 1953-54 as a Fulbright lecturer at Gonville and Caius College of Cambridge University, where he got to know Ronald Fisher quite well. In his memoir Two Lucky People, written with his wife Rose (Univ. Chicago Press, 1998), he remarked (p. 273) that he had met four people he would label geniuses, all mathematical statisticians: Ronald Fisher, Jimmie Savage, Harold Hotelling, and John Tukey.

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For a longer account of Friedman's work in statistics,
go to http://www.stat.uchicago.edu/faculty/stigler/publications.html.