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# In This Issue

## MULTILINEAR MODELS IN SPECTROSCOPY

In fluorescence spectroscopy, a specimen is illuminated with light of a particular wavelength, and the light emitted at other wavelengths is measured in order to reveal molecular characteristics of the specimen. In their article, Leurgans and Ross consider examples in which fluorescence intensity is a function of three independent variables: the excitation wavelength, the emission wavelength and the concentration of a "fluorescence quencher," which is added to decrease fluorescence. The expected absorbtance (which is the emitted fraction of the intensity of the beam) is modeled as a trilinear function of the independent variables. Parameters of the model are estimated using nonlinear least-squares.

The trilinear function of interest may be represented as a three-way array. Leurgans and Ross review relevant theory of multiway arrays and focus on the so-called PARAFAC model developed for psychometric applications, which provides a decomposition for a three-way array (analogous to the singular value decomposition for matrices) by imposing certain conditions on the components. They discuss features of this model and model-fitting algorithms that are special to spectroscopic applications. In commenting on the paper, Jan deLeeuw notes that these applications are "exceptional" in that the explicit form of the model comes from scientific knowledge, whereas applications of similar techniques in other areas are often exploratory. He supplies additional references about several aspects of research on multiway arrays and raises the issue of stability of estimates. Pieter Kroonenberg further supplements the paper in his discussion by reviewing the related research in the pychometrics literature. Donald Burdick suggests that there is insight to be gained by adopting tensor notation and reexpressing certain results geometrically.

## U.S. GOVERNMENT CONTRIBUTIONS TO STATISTICS

Prior to 1933, relatively little use was made of probability sampling by the U.S. Government, according to the historical survey by Duncan and Shelton. A strong demand for information came from Roosevelt's New Deal, while a contemporaneous article by Jerzy Neyman on sampling theory, published in the *Journal of the Royal Statistical Society*, was very influential. Several important applications were carried out in the Federal Government in the following eight years. By the end of that time, probability sampling was fully accepted at the Bureau of the Census and Morris Hansen and William Hurwitz had joined its staff. Duncan and Shelton review the substantial contributions made by Hansen and Hurwitz. (See also the article by and interview with Hansen in the May 1987 issue of *Statistical Science*.) They then trace other U.S. Governmental statistical activities outside the Bureau of the Census by focusing on a few illustrative examples. The last section of their article discusses the status of governmental statistics from 1976 up to the present and calls for a reconstitution of the Federal statistical system so that the kind of progress made in an earlier era might be achieved again in the future.

## ESTHER SEIDEN

Esther Seiden was born in Poland in 1908. In an interview conducted by Ester Samuel-Cahn, she describes diverse experiences that ultimately led to statistical scholarship. She was educated in Poland through graduate studies in logic, but, having been raised in a Zionist home, she felt strongly that she should move to Palestine and was able to emigrate by enrolling at Hebrew University in 1935. While continuing her studies when she could, she taught high school and worked for the Jewish defense force, the "Haganah," then eventually found her way to Berkeley in 1947 and received her Ph.D. in Statistics in 1949. Seiden describes her thesis work and subsequent research, which was concerned mainly with the existence of certain Latin Squares and related mathematical problems arising from the theory of experimental design. She traveled widely and held faculty positions at several institutions in the U.S., including Michigan State University from 1960 to 1978, when she returned to Hebrew University.

## FISHER'S FIDUCIAL ARGUMENT

R. A. Fisher generated many of the ideas most fundamental to modern Statistics, yet his own notion of what ought to be fundamental to inference, his fiducial argument, has had little impact. In a pair of articles continuing the commemoration of Fisher's birth, Teddy Seidenfeld and S. L. Zabell discuss the failure of fiducial inference. (These are based on lectures delivered at a special session of the 1990 meeting of the American Association for the Advancement of Science; articles based on lectures given there by Samuel Karlin and C. R. Rao were published in the February issue.) Seidenfeld reviews the basic argument and the way it may be applied in several examples, including one introduced by Buehler and Feddersen in 1963, which he discusses from the point of view of finitely-additive probability. Zabell sketches the evolution of Fisher's fiducial argument, which was dramatic: Fisher began with a notion essentially the same as Neyman's approach to confidence, but later tried to construct fiducial inference via conditioning. Zabell notes that the Buehler and Feddersen example refuted Fisher's final and most clearly articulated attempt at justification. Along the way, many of Fisher's battles with particular individuals, and their apparent effects on his thinking, are discussed. Both Seidenfeld and Zabell close their papers by returning to Fisher's goal of obtaining probability statements as inferences without introducing prior distributions and note that novel variations on the theme may continue to emerge.

## HERBERT SOLOMON

The 1939 Mathematics Club at City College in New York was a remarkable cohort: many of its members would go on to become prominent mathematicians and statisticians, including Herbert Solomon. In this interview, conducted by Paul Switzer, Solomon discusses his work at Columbia University during World War II and U.S. Government sponsorship of research immediately following the war via the Office of Naval Research (where he served for four years and became the first head of its Statistics branch). He talks about his experiences in the Department of Statistics at Stanford University, which he joined in 1958, and his professional involvement, including his 1964–1965 stint as President of the Institute of Mathematical Statistics. Professor Solomon touches on his highly varied research career, mentioning some of the application-based sources for the problems he worked on.

*Robert E. Kass*