

The Honorable Erich L. Lehmann

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The year 2007 marks a concurrence of important statistical anniversaries. It is the 350th anniversary of the publication of the first printed work on mathematical probability, the short tract that Christian Huygens wrote following a visit to Paris, where he learned of the investigations of Fermat and Pascal. Also, 2007 is the 150th year since the birth of Karl Pearson, father of the Chi-square test and much else. And related to both those events, it is also the year our teacher, friend, and colleague Erich Lehmann celebrates his 90th birthday. Christian Huygen's tract served as the textbook on probability for over a half century, helping to form that subject. Karl Pearson inaugurated an important species of hypothesis testing. Both then have important similarities to Erich Lehmann. But rather than further explore those analogies immediately, I would like to characterize an important part of Erich's ongoing research by looking back to a more modern document.

The University of Chicago, rare among research universities, gives honorary degrees only in recognition of scholarly contributions of the highest order. We do not use those degrees to honor movie stars, philanthropists, or even heads of state (at least not over the past 80 years). There is a partial exception: we do so honor the departing Chair of our Board of Trustees. But that is the limit of the exceptions. We do not use this device to honor work done at Chicago; our major financial supporters are recognized in other ways; and discreet inquiries on behalf of politicians, celebrities, popular artists, and several heads of state have been politely turned aside, however meritorious they may have been on other grounds. Scholarship is the only coin of our realm.

One of the fields where this practice has been actively pursued is statistics. The first degree our newly formed department granted was an honorary Doctorate of Science to Ronald Fisher, June 13, 1952. This was followed over the next 31 years by degrees to Harold Hotelling (1955), Jerzy Neyman (1959), Maurice Bartlett (1966), John Tukey (1969), and Fred Mosteller (1973). In 1990, in anticipation of our University's centennial celebration beginning the following year, the Department undertook to resume this practice after several years by proposing an honorary degree for Erich Lehmann.

The procedure for granting honorary degrees at Chicago is a bit involved. After getting departmental agreement (an easy matter in this case) it is necessary to prepare a detailed case to be submitted to a cross-university committee appointed for this task. Exacting standards are upheld and only a fraction of proposals are given the nod of approval. Local legend has it that when someone proposed the Queen of England for a degree, it was turned back with a request for her list of publications. The procedure is like that for hiring a senior scholar from outside the university: several letters of recommendation must be solicited, the evidence must be assembled and carefully presented, all with an uncertain outcome. And unlike senior hires, even if the proposal is successful and the offer accepted, you do not get to keep the candidate!

In preparing Erich's case we solicited letters from a dozen of the top international statistical scholars over the past half-century. All of these were glowing testaments to an amazingly influential body of work, as well as to Erich's collegial role in helping to build modern mathematical statistics. To buttress the case we did a careful citation study to document quantitatively the pervasive influence of Erich's articles and books. To our eye there was no doubt, but all this needed to be presented to a demanding committee of some of the university's best professors, regrettably none with more than a superficial knowledge of our subject. It is that memo which I will now present.

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23 April 1990

Memo to Committee on Honorary Degrees

On behalf of the Department of Statistics, and with their unanimous endorsement, I wish to nominate Erich L. Lehmann for an Honorary Degree. We believe he would be an exceptionally appropriate candidate for a Centennial Honorary Degree at the convocation of October 1991; alternatively he could be considered for an earlier convocation, such as June 1991. Prior to his retirement in 1988, Lehmann was Professor of Statistics at the University of California at Berkeley, where he remains extremely active.

Great scientists can be roughly classified as one of two types: those whose primary achievement was a single brilliant discovery, and those who have over the course of a life's work constructed a discipline, a school. Lehmann has made many important discoveries, but he is more of the second type than the first. In the years after the Second World War, the dominant paradigm in American mathematical statistics was the decision theoretic school of Jerzy Neyman (Sc.D., Chicago, 1959) and Abraham Wald. Wald died tragically in 1950 and Neyman's attention was absorbed by other matters after the mid-1950's. While many hands played a role in the prospering of this approach over 1950–1980, it is arguable that the chief architect of the expansion of the paradigm, and the one most responsible for its immense international influence over that period, was Erich Lehmann.

There is an interesting historical parallel to Lehmann's role in this school of thought. In the 1650's Pascal and Fermat founded probability theory. Yet they taught few and published little. It was Christian Huygens's 1657 tract that was responsible for the form in which these ideas were disseminated for half a century, and their widespread application in mathematics, philosophy, and science. Similarly, it was Lehmann's mimeographed lecture notes of estimation (1950, widely circulated and reproduced, but only published as a book in 1983) and Lehmann's book on hypothesis testing (1959) that provided the form in which the Neyman-Wald approach came to dominate a major portion of the mathematical world. Not all of the results are Lehmann's (though many are), but the arrangement, the elegant seamless presentation, the coherency of the whole, are his in a way that has not been true in many sciences. To a large degree, Erich Lehmann created the curriculum of the world's graduate programs in mathematical statistics over the period 1960–1980. Lehmann has personally supervised over 50 Ph.D. dissertations, and he counts among his students some of the most influential statisticians in the United States, Europe, and Asia.

The focus of the school that is so associated with Lehmann is the application of decision theory to statistical problems, the construction of a calculus of optimal statistical procedures. In one simple setting, parametric estimation, an objective criterion ("a loss function") is defined and an attempt is made within a framework

of stochastic models to seek the best procedure, or at any rate to determine an order for the available procedures. The pitfalls of this approach are many: In all but the simplest problems, the mathematical difficulties can be immense, and the specification of models and objective criteria that capture the essence of the scientific problem is rarely straightforward. The success of Lehmann and his school has been due to the balance they have maintained in creating a system of mathematical structures of sufficient richness to encompass a large range of practical problems, yet not so amorphously vague that a true discipline could not be constructed around them. Mathematics flourishes in the detailed exploration of constrained spaces with widely accepted rules; statistics flourishes with the flexibility to treat the infinite variety of problems in the real world. Lehmann's genius has been his ability to reconcile these divergent goals and build a school that has enriched both sides.

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To this was appended the letters and the citation study.

The proposal was successful; we were delighted when Erich accepted and both he and Julie attended the special Convocation on October 3, 1991, celebrating the University's Centennial. Their visit was the occasion for several parties, dinners, toasts, and culminated in a grand ceremony in Rockefeller Chapel [yes, we do recognize donors in other ways], attended by dignitaries representing the great universities of the world. The citation on Erich's degree read:

Your research on the application of decision theory to statistical problems has helped create and organize modern mathematical statistics; your elegant treatises have guided the curricula of a majority of the nation's graduate programs and given shape to the discipline, and your teaching has inspired a generation of scholars.

Erich has received many other honors, of course, including an earlier honorary degree at the University of Leiden. And we have since 1991 given more honorary degrees; to Charles Stein (1992), Ulf Grenander (1994), Bradley Efron (1995), David Aldous (2000), Persi Diaconis (2003), and Grace Wahba (2007). The occasion of Erich's University of Chicago degree retains a special place in our memories. So too, to those of us who took his classes (in my case some 40 years ago) does the memory of his careful and supremely clear lectures, and his papers and books that helped shape the modern statistical world. For all that and more, we may toast this extraordinary scholar on the 90th anniversary of his birth!