JIRSS (2002)
Vol. 1, Nos. 1-2, pp 1-5

Welcoming Message to the JIRSS

Arnold Zellner

University of Chicago, 1101 East 58th Street, Chicago, Illinois 60637, USA.
(Arnold.Zellner@gsb.uchicago.edu)

It is a great honor to be invited to contribute to the first issue of the Journal of the Iranian Statistical Society. May the Journal and those associated with it have great success in attaining its goals and in furthering the progress of statistical science.

While there has been worldwide recognition of the important role that statistics and statisticians play in producing progress in science and decision-making, some including Berger (2000) and Cox (2002) have expressed concerns that the field of statistics may be taken over by workers in other sciences who have established many statistical disciplines, e.g., biometrics, cliometrics, econometrics, psychometrics, sociometrics, etc. Indeed Sir David Cox in his invited Deming Lecture, presented at the August 2002 Joint Statistical Meetings in New York, pointed to extremely important contributions to statistics made by the geneticist R.A. Fisher, the physicist H. Jeffreys and the versatile scientist P.S. Laplace. While competition among various fields of science is hardly new, it is of course important to understand such competition and to be a winner and not a loser.

How can statisticians continue to be successful in competition with workers in other fields? In my opinion, there has to be a stress on the central role of statistics in science in general and continued

statistical research to promote the progress of science. By being a catalyst for progress in science, statistics, statisticians and their journals will flourish and gain worldwide acclamation.

To accomplish this goal, it is important that statisticians understand science and its objectives. Since, as mentioned above, Sir David Cox, among many others, recognizes Sir Harold Jeffreys as a great scientist and statistician, it is worthwhile to consider Jeffreys' views on science and the role of statistics in scientific work. Note that there are many philosophers who have written about the philosophy of science. In this regard the following quotation, taken from my IMS Bulletin, Vol. 38, No. 3, 1989, 336-337, obituary for Sir Harold Jeffreys, formerly Plumian Professor at Cambridge University may be useful, that is:
"The Collected Papers of Sir Harold Jeffreys on Geophysics and Other Sciences was published in 1971 by Gordon & Breach, London, in six volumes. Volume 6 is entitled, Mathematics, Probability and Miscellaneous Other Sciences. As is evident, probability theory was just one area in which Jeffreys worked. This work reflected his broad-ranging experience in other areas of science. Since he began his research on probability theory after World War I , his contributions have been of fundamental importance to the philosophy of science, scientific method and theoretical and applied statistics. His major books in this area are Theory of Probability, 1939, and Scientific Inference, 1931. Later editions of both books have been published. The general nature of this research has been stated in the preface to the second edition of Scientific Inference as follows: "The general standpoint that scientific method can be understood if and only if a theory of epistemological probability is provided, remains unaltered. Consequently, I maintain that much that passes for theory of scientific method is either obscure, useless or actually misleading." In his book, Theory of Probability, Jeffreys presents a theory of epistemological probability, discusses its relevance for work in all areas of science and applies it to solve many practical, important statistical problems. Irving J. Good, who reviewed the 1961 edition of Theory of Probability, wrote that Jeffreys' book "... is of greater importance for the philosophy of science, and obviously of greater immediate practical importance, than nearly all the books on probability written by professional philosophers lumped together." See also Seymour Geisser (1980), Irving J. Good (1980) and Dennis Lindley (1980), [published in Zellner (1980)] wherein Jeffreys' research contributions

are discussed. Edwin T. Jaynes (1983,1984) regards Jeffreys' work to be a direct continuation of Laplace's research on Bayesian theory, applications and philosophy."

Thus, in Jeffreys' work, we have an axiom system for work in all the sciences that is rooted in probability theory. Further, in Chapter 7 of his book Probability Theory, he provides a critical evaluation of alternative definitions of probability, including, axiomatic, Venn's "objective" long run frequency, "subjective" degree of belief and betting definitions of Ramsay, et al., Fisher's hypothetical infinite population, etc. After a devastating critique of other definitions, he opts for a "reasonable degree of belief" definition, that is probability is a measure of an individual's degree of belief in a proposition and shows throughout his book how it can be used to solve estimation, prediction, testing, model comparison and other statistical problems. His solutions are compared to those provided by Fisher, Neyman, Pearson and others.

Hopefully, many papers in the new Journal will involve further comparisons of old and new Bayesian and non-Bayesian solutions to central statistical problems. Also, papers providing evaluations and possible extensions of Jeffreys' axiom system for probability theory would be welcome and could contribute to improved work in science. Further, recent research results in information theory involving new inference techniques and a new derivation of Bayes' theorem or learning model and generalizations of it, see Soofi (1994, 1996, 2000) for a review of such work and references, deserve attention in your new Journal in my opinion.

Last, to indicate further key areas to which your new Journal may make contributions useful to enhancing the role of statistical science, note that many regard induction as being central in scientific work that, as Jeffreys indicates, includes (1) measurement and description and (2) generalizations or models to explain past data and to predict as yet unobserved data. It is obvious that statistics and statisticians play an important role by providing statistical measurement procedures, experimental designs, descriptive statistical methods, etc., that are very useful and important in measurement and description. As regards implementing given models to explain variation in past data and predict as yet unobserved data, of course statistical estimation, testing, model comparison and averaging, prediction and other techniques play a key role in this aspect of scientific work.

Another central activity in science is reduction, defined in the

literature by C. Pierce, the famous physicist, as "... reduction suggests that something may be; that is, it involves studying facts and devising theories to explain them." (Zellner, 1996, p. 5 and 1997). The process of reduction is not fully understood. Some emphasize the role of unusual facts in stimulating minds to produce new combinations of ideas, or new theories, that can be tested with new data. See Zellner (1996, Ch. 1, and 1997) and references cited therein for further consideration of induction and reduction. Also, research that involves producing empirical descriptive models that work well in fitting the data and predicting new data clearly involves a challenge to researchers, statistical or others, to produce a subject matter theory to explain why the empirical models, say time series forecasting models work well. In this area, that is producing explanatory, subject matter theoretical models, statisticians will have difficulty making contributions unless they have some background in the subject matter field, e.g. physics, chemistry, economics, business, etc. To meet this need, perhaps the new Journal can provide references to and reviews of relevant, good books, review articles and courses that can serve to introduce more statisticians to subject matter fields and the philosophy of science.

From what I have written above, it appears to me that there are many opportunities for your new Journal to contribute substantially to promoting important work in statistical science and the contributions it makes to other sciences and society in general. I shall watch with interest how the editors develop their unique combination of policies to shape the content of the new Journal of the Iranian Statistical Society and, again, wish them great success in this important undertaking.

References

Berger, J.O. (2000), Bayesian analysis: A look at today and thoughts of tomorrow. Journal of the American Statistical Association, **95**, 1269-1276.

Cox, D. R. (2002), Invited deming lecture. Joint Statistical Meetings. New York.

Jaynes, E.T. (1983), Papers on probability, statistics and statistical physics. Eds, R. D. Rozenkrantz, Dordrecht: D. Reidel.

Jaynes, E.T. (1984), The intuitive inadequacy of classical statistics. Epistemologia, VII Special Issue on Probability, Statistics and Inductive Logic, 43-74.

Jeffreys, H. (1931), Scientific Inference. Cambridge: Cambridge Univ. Press, reprinted with addenda, 1937, 2nd ed., 1937, 3rd ed., 1973.

Jeffreys, H. (1939), Theory of Probability. Oxford: Oxford Univ. Press, 2nd ed., 1948, 3rd ed., 1961, 3rd rev. ed., 1967, reprinted 1998.

Soofi, E. (1994), Capturing the intangible concept of information. Journal of the American Statistical Association, **89**, 1243-1254.

Soofi, E. (1996), Information theory and bayesian statistics. Eds. D. Berry, K. Chaloner, and J. Geweke, Bayesian Analysis in Statistics and Econometrics: Essays in Honor of Arnold Zellner, New York: Wiley, 179-189.

Soofi, E. (2000), Principal information theoretic approaches. Journal of the American Statistical Association, **95**, 1349-1353.

Zellner, A. (ed.), (1980), Bayesian analysis in econometrics and statistics: essays in honor of Harold Jeffreys. Reprinted by R. F. Krieger Publ., Malabar, Flor- ida, 1989, containing papers by S. Geisser, I. J. Good, D. V. Lindley and others, Amsterdam: North-Holland.

Zellner, A. (1996), An introduction to bayesian inference in econometrics. Wiley Classics Library, reprint of 1971 edition, also reprinted in 1987 by R. F. Krieger Publ., Malabar, Florida, New York: Wiley.

Zellner, A. (1997), Bayesian Analysis in Econometrics and Statistics. Cheltenham, UK: Edward Elgar Publ. Ltd