

KESHAVAN RAGHAVAN NAIR

(13 May 1910 - 20 November 1993)

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Signature



KESHAVAN RAGHAVAN NAIR

(1910 – 1993)

Elected Fellow 1957

FAMILY BACKGROUND, EARLY EDUCATION AND PERSONAL LIFE

KESHAVAN RAGHAVAN NAIR was born of Madhavan Kunchu Pillai and Narayani Amma on 13 May, 1910 in the village Parur, then under the princely state of Travancore (now in Kerala). After completing his schooling in the English High School in the same village, he moved 200 miles to Thiruvananthapuram for his undergraduate studies at the Maharaja's College of Science. KR Nair received a B. A. (Hons.) degree from this college, affiliated at that time to the University of Madras, in 1932. Nair had an optional paper in Statistics in his Honours course, which was being taught by Professor R. Srinivasan. Nair learnt the rudiments of statistical science from Professor Srinivasan, which in later years became the corner stone of his professional career. For his meritorious performance in the university examinations, Nair received the Ross's medal and the Natesan's medal. His graduation coincided with the worldwide depression of 1932 and young KR Nair spent two years hunting for a suitable job. Eventually, in 1934, he received a stipendary scholarship of the University of Madras.

KR Nair got married to Parvati, eldest daughter of Sardar KM Pannikar, in February 1941. The Nairs were blessed with three sons.

RESEARCH AND PROFESSIONAL CAREER

KR Nair began his research work under N Sundaramma Sastry at the University of Madras. During the tenure of the research scholarship, largely through his own efforts, KR Nair was able to write five research papers, one of which was published in *Biometrika* and the other in the newly started Indian Journal of Statistics, *Sankhya*. Based on these papers, KR Nair was awarded the M. Sc. degree (by thesis) of the University of Madras. His first paper entitled *Maternity Statistics from Madras*, which appeared in 1936 in *Sankhya*, was influenced by two earlier papers by Madhava *et al.* and Mahalanobis *et al.*, also published in *Sankhya*. His other two early papers, published in *Biometrika* and the Journal of the Royal Statistical Society were based on the early works of Karl Pearson and GU Yule. When the Madras University research scholarship was terminated in 1936, KR Nair decided to go to Calcutta to look for a possible position at the Indian Statistical Institute, founded by Professor PC Mahalanobis.

KR Nair was appointed as a research worker at the Indian Statistical Institute by Mahalanobis in 1936. The main task assigned to him was to assist SS Bose (Chief Assistant of Mahalanobis) in the statistical training of research workers deputed from agricultural research stations and other



organizations, like the Forest Research Institute, Dehradun. Besides the training work, KR Nair collaborated during this period with RC Bose and CR Rao and wrote several research papers. Among the research work that KR Nair carried out while at the Indian Statistical Institute, two deserve special mention, as these had significant impact on future work. The first of these (jointly with RC Bose) was on the introduction of a new class of designs called "Partially Balanced Incomplete Block Designs". The balanced incomplete block designs, introduced by Frank Yates to the statistical literature in 1936, has the property that every treatment difference is estimated with the same variance. Unfortunately, balanced incomplete block designs do not exist for all possible parametric values. Also, even if a balanced incomplete block design existed, it some times required too many experimental units to be attractive to an experimenter. These problems associated with balanced designs motivated Bose and Nair to dispense with the property of balance and look for alternative designs. The partially balanced designs do not have the property of 'balance' in the sense that all treatment differences are not estimated with the same variance under these. However, these designs have very nice combinatorial properties and are often available with small number of experimental units. Partially balanced incomplete block designs have been a subject matter of intense research in the subsequent years, particularly by RC Bose and his students. KR Nair himself continued to work in this area and produced several interesting papers. The connection between partially balanced incomplete block designs and the underlying association schemes with geometric configurations and graph theory continues to be studied even now.

The second important work of KR Nair during his days at the Indian Statistical Institute was on finding confounded designs for asymmetrical factorial experiments. In a factorial experiment, there is an output variable which is dependent on several controllable or input variables, called factors. Each factor has two or more possible settings, these settings being called levels. Any combination of the levels of all the factors is called a treatment combination. Factorial experiments aim at exploring the effects of individual factors as also their inter-relationships. A factorial experiment is called symmetric if all the factors have the same number of levels. Unfortunately, in many experimental situations, it is not possible for each factor to have the same number of levels and one has to experiment with asymmetric factorials. In a series of papers, KR Nair (jointly with CR Rao) developed a theory for confounded asymmetrical factorial designs. The papers of Nair and Rao on the subject are still considered as a very significant contribution towards developing a theory of confounded designs for asymmetric factorials. During 1936-1944, KR Nair worked at the Indian Statistical Institute and was actively engaged in research, publishing over 29 research papers. In 1941, on the recommendation of Professor Mahalanobis, KR Nair was appointed as a part-time Lecturer in the newly created Department of Statistics in Calcutta University.

AWARDS AND HONOURS

Dr KR Nair was an elected Member of the International Statistical Institute, a Fellow of the American Statistical Association, a Fellow of the Royal Statistical Society (London) and was elected Fellow of the Indian National Science Academy in 1957, and was Member INSA Council (1966-68). He was the President of the Statistics Section of the Indian Science Congress in 1954.



SCIENTIFIC CONTRIBUTIONS

Around 1943, the newly created Department of Food, Government of India, was proposing to create a Directorate of Statistics. Dr. KR Nair was offered a post of Assistant Director of Statistics in that department and he left the Indian Statistical Institute for Delhi in February, 1944 to join the post of Assistant Director of Statistics in the Department of Food. KR Nair, however, did not continue in this department for long, mainly because he found that being in this department was not helping him to carry out research. In 1945, he left for the University College, London to pursue higher studies, having obtained an Overseas Scholarship. During his stay in London, Dr. KR Nair worked on topics other than design of experiments under the supervision of Professors ES Pearson and HO Hartley. Based on his thesis, KR Nair was awarded a Ph. D. degree of the University of London in 1947. His thesis formed the basis of three important papers, which were published in *Biometrika* and the *Journal of the Indian Society of Agricultural Statistics*. While working for his Ph. D. thesis, Dr. KR Nair applied for a position of Statistician in the Forest Research Institute and Colleges at Dehradun. He was selected for this post and was able to join his duties in October, 1947. At the Forest Research Institute, he was involved in training of officers, selected on the basis of a competitive examination. During this period, he continued his research work, not only on theoretical statistics, including design of experiments, but also on applied problems arising in Forestry and Silviculture.

In 1953, Dr. KR Nair submitted a selected number of his publications for the award of the degree of Doctor of Science of the University of London. He was awarded the D. Sc. degree in 1954. In 1959, KR Nair joined the Central Statistical Organisation (C.S.O.) as a Joint Director. He became the Director of C. S. O. in 1962 and retired on superannuation, from this position in 1968. After retiring from government service, KR Nair held several important positions in international organizations. He was the Regional Adviser, ECAFE, Bangkok during 1968-69 and a Deputy Director (1969-1971) and Project Manager/Director (1971-1975) of the Asian Statistical Institute, Tokyo. He was also associated with several non-governmental organizations in India. He breathed his last on 20th November 1993.

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