LATE DWARKA NATH NANDA

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LATE DWARKA NATH NANDA, M.A., Ph.D.

Those of us who met Dwarka Nath Nanda at the International Statistical Conference at New Delhi during December 1951 felt that he was fighting perhaps a losing battle against his life-long implacable enemy, asthma, which had lately taken a more serious turn. We never thought, however, that his end would come so soon. His ill-health was for some time interfering with his technical duties as a Senior Scientific Officer (Statistics) with the Technical Development Establishment Laboratories of the Ministry of Defence at Kanpur and he had undergone a major brain operation in January this year. He had almost recovered when his health suddenly took a turn for the worst and Nanda died in New Delhi on March 10, 1952. This is indeed a tragic end of a selfmade and brilliant young scientist full of great promise at an early age of 35.

Nanda took his Master's degree in Mathematics in the first division from the Agra University in 1938 and topped the list of candidates. He started his statistical career at the Punjab Agricultural Research Institute, Lyallpur, where he worked as a statistical assistant under the Cotton Research Botanist. He was deputed by the Punjab Government for post-graduate training in agricultural statistics at the Institute of

Plant Industry, Indore, and the Indian Council of Agricultural Research.

Nanda left Lyallpur to join the staff of the Statistical Branch of the I.C.A.R. in 1944. But for a short absence in Mayurbhanj State, where he was appointed as the Director of Statistics, Nanda worked in close association with Dr. P. V. Sukhatme in the initiation of sample surveys for estimation of crop yields in India until August 1946 when he left for the U.S.A. for higher studies.

Nanda entered the University of North Carolina at Chapel Hill during the fall of 1946. He worked under the guidance of Professors Harold Hotelling, P. L. Hsu and M. S. Bartlett and obtained the degree of Doctor of Philosophy in Mathematical Statistics in the Summer of 1948, the subject of his dissertation being 'Some Contributions to the Theory of Multivariate Analysis'. During the last few months of his stay at Chapel Hill Nanda was indeed having a hard time with his asthma and this hastened his departure from the States.

Nanda's troubles did not end with his return to India. In spite of his excellent qualifications and practical experience it was some time before he could secure a suitable post. He was later appointed as an Assistant Professor in the Training Section of the I.C.A.R. and continued teaching there until he left to accept his last statistical position at Kanpur. Although military application of statistics was for him a new venture, he made very rapid strides in the introduction and propagation of modern methods of sampling inspection and quality control in their application to military stores and equipments.

Among Nanda's contributions to statistics, two papers[1,2] on the statistical nature of flowering curves and jassid infestation of Punjab cottons were the earliest.

Nanda has made important contributions[3,4,5] on the distribution of the roots of a determinantal equation based on covariance matrices of two p-variate samples on the null hypothesis of the equality of the two population covariance matrices. If A and B are suitably defined to provide independent estimates of the same population dispersion matrix he considers the determinantal equation $|A - \theta(A + B)| = 0$. The distribution of the individual roots of such a determinantal equation was first derived by Roy.[6] Nanda's technique[3] for obtaining the distribution of the individual roots is ingenious. He also utilizes the fact that the probability distribution of any one of the roots when arranged in the monotonic order can be obtained from that of the largest root. In [4] he obtains the limiting distribution of individual roots. In general it is not possible to obtain the distribution of the

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sum of the two roots of a determinantal equation. Nanda obtained such a distribution[5] under a restriction, which, under the hypothesis of the population canonical correlations being equal to zero, reduces to the condition that the number of the canonical variates in the two sets differ by unity.

It is well known that the joint distribution of the roots of the above determinantal equation is the same for three different types of null hypotheses. This raises the question of what function of the roots will provide the best test for different hypotheses. In the absence of the power functions of the various test functions based on functions of the roots, it is not possible to answer this quesiton in the present state of our knowledge. In certain situations the largest root of the above determinantal equation is recommended to provide the best test of significance purely from intuitive considerations. Nanda gives[7] certain percentage points of the distribution of the largest root of a determinantal equation having two roots only.

Nanda was interested through his contacts with Dr. V. G. Panse in the problem of the discriminant functions in plant breeding work for a long time. His association with Professor M. S. Bartlett at Chapel Hill enabled him to derive the formulæ for the standard errors of the discriminant coefficients and also of the genetic advance made by selecting plants on the basis of the discriminatory analysis.[8,9]

Nanda leaves behind him his wife, three children and numerous associates and friends to mourn his loss. He perhaps strained his physical capacity too much in trying to serve the cause of statistics and the world of statistics is left poorer by his premature death.

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