OBITUARY

PROFESSOR M. T. NARANIENGAR, M.A.

THE numerous old students and the wide circle of mathematical colleagues of Professor M. T. Naraniengar must have received the sad news of his demise with profound sorrow. After a brief illness he passed away on October 9, 1940. India has lost a mathematician of rare ability and a gentleman distinguished for his piety and gentleness. He sought neither greatness nor public recognition, but both found him while unostentatiously discharging his duties. A brilliant graduate of the Madras University, he was early summoned to occupy the Professorial chair of Mathematics in the Central College, of which he was an *alumnus*. He held this post till he retired in 1925. He was one of the professors of the earlier generation who annexed to their teaching duties research work also, and in collaboration with the late Mr. V. Ramaswamy Iyer, he accepted the responsibility of founding the Indian Mathematical Society of whose official organ, he was the Editor from 1909 to 1927. As professor of Mathematics Mr. Naraniengar enjoyed unrivalled popularity and esteem, and as Editor of the *Journal of the Indian Mathematical Society,* he achieved a great reputation for the journal and distinction for himself. Its present international position and its recognised standard are largely the creation of his unstinted devotion to the service of the Society. What the Editor's duties implied may be gathered from his words: "Our main complaint was about the slovenly manner in which manuscripts were prepared and sent up. I had invariably to make press copies of questions and solutions, and to prepare diagrams drawn to scale for making blocks. The work of editing all the solutions to a single question would often involve several hours of close scrutiny and fair copying". These words show the scrupulous neatness and exactness on which the Editor insisted and how he exercised his vigilance over the form of presentation of mathematical problems is illustrated by the fact that he had had to return three times Ramanujan's article on "Some Properties of Bernoulli's Numbers", before it assumed an acceptable shape. In recognition of his distinguished services to the Society, an Address was presented to him on the occasion of the Silver Jubilee Celebrations at Bombay in 1932. He was President of the Trivandrum Session of the Indian Mathematical Conference. He shares with Dr. R. P. Paranjpye the distinction of being the first author of one of the first original papers, in mathematics published in India and the stimulus which they have given has resulted in the establishment of flourishing schools of research practically in all the Indian Universities from which there is a steady flow of important research contributions. Mr. Naraniengar's greatness lay in infecting his young colleagues and pupils with a love as great as his own for original investigations in the different departments of mathematical enquiry. He was a man of few words, shy by nature, firm in principles, orthodox in habits and of a blameless record of work and character.

LETTERS TO THE EDITOR

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A General Test for Finding whether Two Random Samples are Consubstantial*

The usual method of testing whether two random samples are consubstantial is to test whether the two samples differ significantly in their means; see *e.g.*, R. A. Fisher's "Statistical Methods for Research Workers". This test is accurate only in the case of samples drawn from a normally distributed population. A more general test was given by the writer some time ago.[2] This test too is not entirely free from a defect. However, the following test is quite as general and appears to be flawless. We will consider the simpler case of two equal samples.

Suppose the two samples, containing n individuals each, had been drawn from the same population. In this case each of the $2n$ individuals could have been drawn either in the first sample or in the second. Assuming for the time being that no two out of these $2n$ individuals are alike, it is clear that the pair of samples obtained by us is only one out of ${}_{2n}C_n/2$ different pairs of samples in which these very individuals could have been drawn. We will now classify these different possible samples in the following manner:

Let the individuals arranged in the order of increasing magnitude be a_1, a_2, a_{n-1}, a_{2n} and let a_{H} be the median value of this sample.[1] We shall call an individual less than a_{H} an "inferior individual". In general, in each pair of samples one will have more inferior individuals than the other. We shall term this sample the "inferior sample". (If the two samples have the same number of inferior individuals it is immaterial which of them is classed as an inferior sample).

We now divide the different pairs of samples into groups, such that the inferior samples in each group have the same number of inferior individuals. If we give a number to a group equal to the number of inferior individuals in one of its inferior samples, it is clear that the greater the number of a group the smaller is the frequency of pairs of samples in that group.

Assuming the total frequency of the pairs of samples in all these groups to be unity, the frequency of the pairs of samples in groups numbered m, $m+1$, $m+2$, and n is

$$f = 2\sum_{r=m}^{n} ({}_nC_r)^2/({}_{2n}C_n) \quad \ldots \quad \ldots \quad \ldots \quad \text{I}$$

By rejecting these groups as not belonging to our population the chance of our going wrong is f.

We thus deduce the following test:

Using some limit P for random chance we solve equation I for m after putting $f = \text{P}$. Let m_1 be the value.

If the number of inferior individuals in the inferior of our two samples is m_1 or more

* This word was used by Karl Pearson to mean "from the same population".