INDIAN STATISTICAL INSTITUTE

ADDRESS

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by

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I am pleased and honoured to deliver this address at the occasion of the Second Convocation held at the Indian Statistical Institute.

The address at the First Convocation was given by Sir Ronald Fisher, and this fact alone would be sufficient to explain why I feel honoured to speak to you today.

But it is also a pleasure for me to be here at the Indian Statistical Institute where I have met so many eminent statisticians. It was my good fortune to meet Professor and Mrs. Mahalanobis in 1947 at a meeting of the International Statistical Institute in Washington, D.C. Since then I have come into more or less close contact with many scholars who were or are still associated with the Indian Statistical Institute : R. C. Bose, S. N. Roy, K. R. Nair, C. R. Rao, D. B. Lahiri, J. M. Sengupta, N. C. Ghosh, to name only a few.

At the First Convocation Sir Ronald Fisher and Professor Mahalanobis have outlined their ideas about Statistics as a new technology. May I first of all say a few words about the connection between observation and experiment in Science and Statistics. I think we would all agree that Statistics is an essential tool for a scientist taking observations and carrying out experiments. The tools which one should use when taking observations are the techniques of sample surveys, while, when making experiments, he should design them according to the principles first spelled out by Sir Ronald Fisher. We have learnt, in particular, how important it is to deliberately introduce an element of chance in carrying out sample surveys as well as in the design of an experiment.

As a statistician, I have been especially interested in applications in different fields. May I give you a simple illustration of the application of some methods which have been developed in the Indian Statistical Institute, and particularly by Professor Mahalanobis. I refer to the method of *fractile graphical analysis* into which the concept of *interpenetrating sub-samples* has also entered.

For some years I have found that the existing methods to *test* the normality of a given distribution are far from satisfactory. One method at our disposal is Fisher's test using cumulants of the third and fourth order. This method is, however, not very sensitive; it will usually only detect deviations from normality with rather big samples. A second method is to use normal probability paper which will show a straight line for the cumulative normal distribution. The drawback of this method is that it is purely graphical and that, therefore, a subjective element in judging deviations from normality will have to be introduced.

Fractile graphical analysis can be used to test normality in the following way. Suppose as an example that we have measured the length of 100 fibres taken at random from a specified sample of cotton-wool. It is well known that the quality of cotton-wool depends essentially on the distribution of the lengths of these fibres.

We have found that the distribution of the lengths of fibres in cotton-wool is log-normal. In order to test this, we split the 100 measurements in two sub-samples of 50 in a suitable way. We then rank the measurements in each of the two sub-samples. We then take the means of the logarithms of the measurements of fibre-length for five consecutive values. In that way we get 10 means of each sub-sample, one for the five lowest, the next five, and so on up to the five highest values. These mean values are plotted in a graph as ordinates, the abscissae being the mean values of the corresponding scores of a normal variate with mean zero and standard-deviation unity.
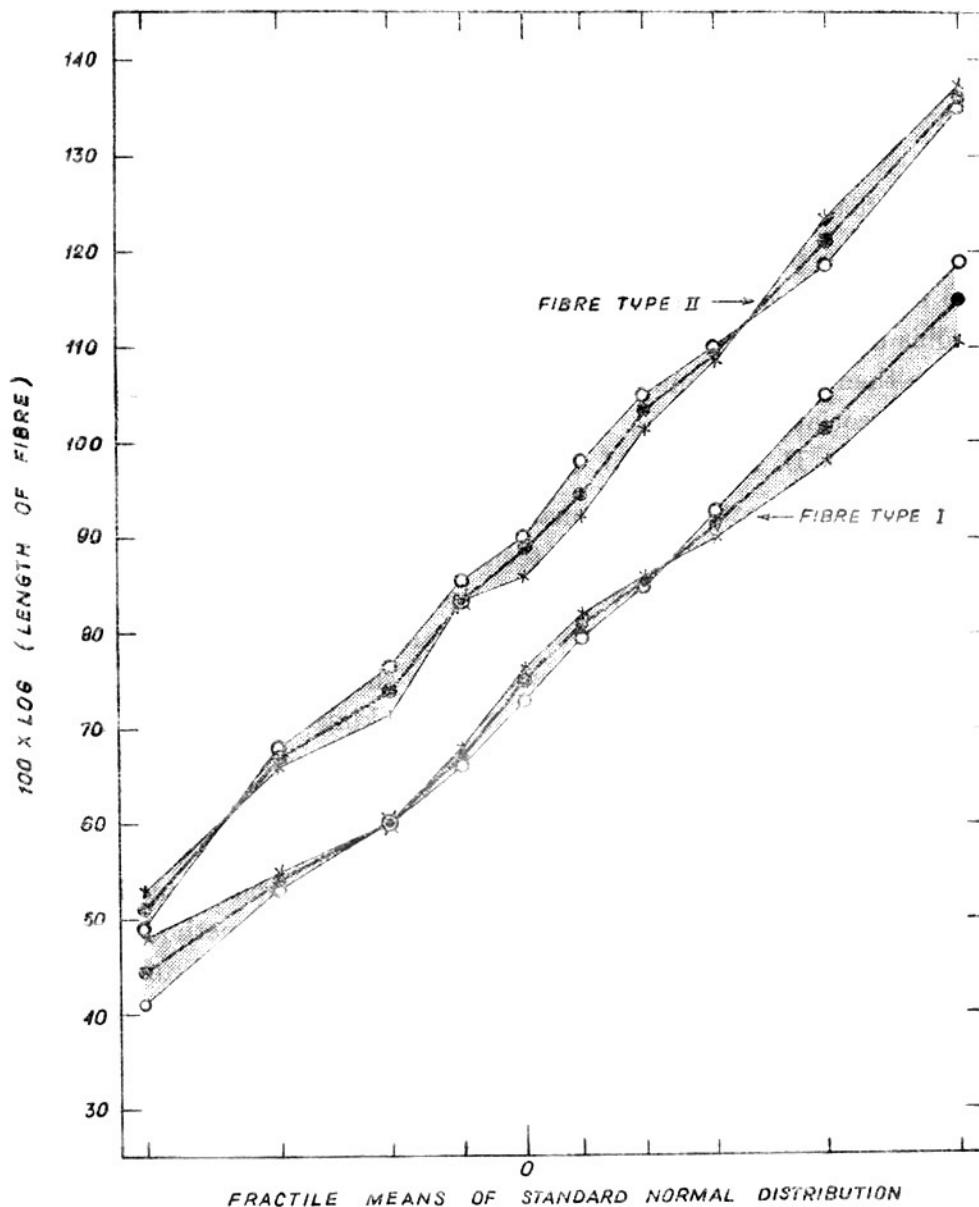
The above diagram gives the graph for two types of cotton-wool. It shows clearly that both types have log normal distributions of fibre-lengths, but with different means and standard-deviations. These could be determined from the graph with sufficient precision.

I feel confident that all those who are receiving today their new degrees, will maintain the high standards which have been the tradition of the work done in statistics in your Institute.