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EDITED BY P. C. MAHALANOBIS

PROCEEDINGS AND ANNUAL REPORT OF
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FOR 1932-33

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Sankhyā is published with the help of the Indian Statistical Institute and in consultation with the following Journal Committee appointed by the Institute.

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Dr. H. Sinha, M.Sc., Ph.D., *Lecturer, Calcutta University (Secretary, Journal Committee)* and the Editor (*ex-officio*).

Each volume of Sankhyā will contain about 400 pages, with plates and tables, and will be issued in approximately four equal parts.

The Journal is supplied free to each member of the Indian Statistical Institute. The subscription price including packing and postage for non-members, payable in advance, is Rs. 20/- per volume; single issues Rs. 6/- including postage. Rates for foreign countries to be calculated on the basis of 32 shillings for each volume, and 9 shillings for each number. Subscriptions should be sent to the Art Press, 20, British Indian Street, Calcutta.

Papers for publication and books and reprints for review should be sent to the Editor, Prof. P. C. Mahalanobis, Presidency College, Calcutta.

It is a condition of publication in Sankhyā that the paper shall not already have been published elsewhere, and will not be reprinted without leave of the Editor. Manuscripts should be written on one side of the paper, and should be preferably typewritten. It is necessary that the raw data or measurements on which the paper is based, and detailed information of their sources, should be furnished in every case. It is desirable that the distributions or correlation charts from which statistical constants are calculated should accompany the paper. Tables should be numbered consecutively with Arabic figures without brackets (Table 1, Table 45, etc.), and should have short explanatory headings. Diagrams and drawings should also be numbered consecutively with Arabic figures, and should be sent in a finished state suitable for direct reproduction with all lettering in pencil. References to tables and diagrams should be given within brackets in the text. The list of literature cited should be arranged alphabetically according to authors' names. In the case of journals the volume number, year and page references, and in the case of printed books the name of the author and the publisher, the date of publication, and the number of the edition or impression should always be stated clearly. Abbreviations, local names, vernacular measures, etc., should be written very legibly (preferably in block letters) and should be explained where they first occur in the text. A detailed Note for Contributors has been prepared and may be obtained on application to the Editor.

Contributors receive 25 copies of their papers free. The cost of additional reprints will depend upon the number required; for 50 additional copies the rate is Rs. 6/- for each sheet of eight pages or Rs. 2/- per page for part of a sheet, with an extra charge for plates printed on special paper. Additional copies should be ordered at the time of returning the final proof.

INDIAN STATISTICAL INSTITUTE.

Annual Report and Accounts for 1932-33.

INTRODUCTION.

Early in 1931 the question of starting a Statistical Society was discussed by the workers in the Statistical Laboratory, Presidency College, Calcutta. Informal discussions were next held with Dr. Pranatha Nath Banerjee (Minto Professor of Economics, Calcutta University), Dr. D. B. Meek (Director-General of Commercial Intelligence and Statistics), and Dr. Nikhil Ranjan Sen (Professor of Applied Mathematics, Calcutta University)—all of whom approved of the proposal. At about this time Prof. K. B. Madhava of Mysore visited Calcutta, and warmly supported the idea. It was then decided to invite definite opinions from persons interested in statistics in different parts of India. A draft constitution for an all-India Statistical Institute was printed and circulated in June, 1931.

The proposal was received favourably in Calcutta, and among those who promised their support may be mentioned the names of:—

Messrs. Narayandas Bajoria (*Messrs. Sewdayal Jagannath*), S. N. Banerjee M.A. (*Lecturer in Economics, Calcutta University*), G. D. Birla (*Birla Bros.*), the Hon. Mr. P. H. Browne (*President, Bengal Chamber of Commerce*), D. M. Bose M.A., Ph.D. (Berlin) (*Professor of Physics, Calcutta University*), G. S. Bose M.D., D.Sc. (*Professor of Psychology, Calcutta University*), N. Chakrabarti B.Sc., M.A. (Cantab.) (*Asst. Inspector of Factories*), Sir Jehangir Coyajee M.A. (Cantab.), I.E.S., Mysore. S. M. Ganguli M.A., Ph.D. (*Lecturer in Mathematics, Calcutta University*), R. C. Ghosh M.A. (*Asst. Statistical Officer, E. B. R.*), D. P. Khaitan (*Birla Bros.*), K. C. Mahindra M.A. (Cantab.) (*Martin & Co.*), S. C. Majumdar M.A. (*Central Bank of India*), D. B. Meek M.A., D.Sc. (*Director, Bureau of Commercial Intelligence and Statistics*), G. L. Mehta B.A. (*Scindia Steam Navigation Co. Ltd.*), J. N. Mukherjee M. A., D.Sc. (*Professor of Chemistry, Calcutta University*), J. P. Neogy M.A., Ph.D. (Lond.) (*Lecturer in Economics, Calcutta University*), A. Paul M.A., A.I.A. (*National Indian Life Insurance Co. Ltd.*), N. L. Puri (*Agent, Central Bank of India*), C. S. Rangaswami M.A. (*Editor, The Indian Finance*) T. J. Y. Roxburgh, M.A. (Cantab.), I.C.S., Nalini Ranjan Sarkar (*President, Bengal National Chamber of Commerce*), B. M. Sen M.A. (Cantab.), I.E.S. (*Principal, Presidency College, Calcutta*), Haris Chandra Sinha M.Sc., Ph.D., A.L.B. (Lond.) (*Lecturer in Statistics, Calcutta University*).

On the 18th August, 1931, the Hon'ble Mr. (now Sir) P. H. Browne (President, Bengal Chamber of Commerce), Mr. L. V. Heathcote, M.L.A., Mr. D. G. Leckie (Chairman, Indian Jute Mills Association), and Mr. D. K. Cunison (Secretary of the Chamber) visited the Statistical Laboratory, Presidency College. Dr. D. B. Meek kindly attended by invitation. The general plan of work of the Institute was discussed in detail, and the proposal to start it at an early date was approved.

Encouraging replies were received during the next few months from other parts of India. Among those who promised to support the Institute may be mentioned:—

Messrs. A. C. Banerjee M.A. (Cantab.), I.E.S. (*Professor of Mathematics, Allahabad University*), S. N. Bose M.A. (*Professor of Physics, Dacca University*), N. Baksi M.A. (Cantab.), I.C.S. (*Jt. Magistrate, Muzfifur*), G. Pindley-Shirras M.A., I.E.S. (*Principal, Gujrat College, Ahmedabad*), G. S. Ghurur M.A., Ph.D. (Cantab.) (*Reader in Sociology, Bombay University*), J. C. Ghosh M.A., D.Sc. (*Professor of Chemistry, Dacca University*), D. R. Gadgil M.A., M.Litt. (Cantab.) (*Director, Gokhale Institute of Politics and Economics, Poona*), P. B. Junakar Sc.B., G.J.A. (*Reader in Commerce, Dacca University*), K. B. Madhava M.A., A.I.A. (Lond.) (*Professor of Mathematics and Statistics, Maharajah's College, Bangalore*), Chittul Mehta (Bombay), the Hon'ble Mr. Kandas Pantulu (Madras), Messrs. A. K. Roy B.Sc., M.A. (Oxon) (*Imperial Meteorologist, Quetta*), Meherund

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Saha D.Sc., F.R.S. (Professor of Physics, Allahabad University), Sir Lalubhai Samaldas (Bombay), Messrs. Sriram (Delhi), A. C. Sen Gupta M.A. (Rdini), I.E.S. (Professor of Economics, Nagpur University), J. C. Sinha M.A., Ph.D. (Head of the Department of Economics, Dacca University), B. T. Thakur (Rawgon), Sir Porshotamdas Thakordas (Bombay), Messrs. C. N. Vakil M.A. (Professor, School of Economics, Bombay), M. Vaidyanathan M.A. (Statistician, Imperial Council of Agricultural Research).

THE INAUGURAL MEETING.

The following letter was issued on the 14th December, 1931, over the signatures of Professors Pramatha Nath Banerjee, Nikhil Ranjan Sen and P. C. Mahalanobis.

"A meeting will be held to consider steps to be taken towards the establishment of an Indian Statistical Institute on Thursday, the 17th instant, at 2-30 p.m. in the Board Room of Messrs. Maslin & Co., 12, Mission Row, Calcutta. Sir R. N. Mookerjee, K.C.I.E., K.C.V.O., will preside."

At this inaugural meeting it was unanimously resolved that an Indian Statistical Institute be started, and that Sir R. N. Mookerjee be requested to accept the office of the President of the Institute. The Hon'ble Sir George Schuster, Finance Member of the Government of India, and Sir Brajendranath Seal were elected Honorary Members of the Institute. Other office-bearers were appointed and two committees were formed for drawing up the Constitution of the Institute and for preparing a scheme for a Statistical Journal. Prof. K. B. Madhava and Prof. C. N. Vakil were requested to organize local centres at Mysore and Bombay respectively. The full proceedings of this meeting will be found in Appendix 2.

Meetings of the Rules Committee were held in January and February, 1932, and draft rules were sent to Prof. K. B. Madhava (Mysore), Prof. C. N. Vakil (Bombay) and Prof. V. G. Kale (Poona, where also in the meantime a local centre had been proposed to be established) for eliciting local opinion. In Calcutta, Dr. P. N. Banerjee, Mr. D. P. Khaitan (Indian Chamber of Commerce) and Mr. R. A. Towler (Bengal Chamber of Commerce) along with Prof. P. C. Mahalanobis, the Hon. Secretary and Dr. H. C. Sinha, the Hon. Joint Secretary considered the suggestions received from other centres and incorporated many of them in the revised draft constitution.

The Journal Committee under the chairmanship of Mr. R. W. Brock (then Editor of *Capital*) with the able assistance of Mr. Gaganvihari Lal Mehta made careful enquiries and prepared a detailed scheme for the proposed Journal.

THE CONSTITUTION OF THE INSTITUTE.

The objects of the Institute as defined in the Memorandum of Association (Appendix 1) are comprehensive and include the promotion of the study of both pure and applied statistics as well as the encouragement of research and dissemination of knowledge of these subjects. It is expressly provided in the Constitution that the membership of the Institute and its constituent bodies shall be open to all persons irrespective of sex, nationality, race, creed, or class. It is also definitely laid down that the Institute shall not distribute any part of its income or profit as dividend, gift, or bonus, or in any other way among its members.

The Institute consists of Ordinary Members, Fellows, and Patrons and Honorary Members. The President, one or more Vice-Presidents, the Treasurers, and the Secretary are to be elected annually. The supreme control including the power of making rules is vested in the members in General Meeting assembled. The management of the affairs of the Institute is in the hands of a Council to be elected annually by the members of the

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Institute. One important feature is a standing Technical Committee consisting of members who are specially qualified by their knowledge of statistics to undertake the direction or review of special investigations and technical problems. Members of the Technical Committee are to be appointed by the Committee itself, and it is provided in the Rules that no opinion in technical questions shall be given on behalf of the Institute without the approval of the Technical Committee.

The Ordinary membership fee was fixed at Rs. 15/- per year.

The two reports of the Rules Committee and the Journal Committee were considered at a meeting of the Institute held in the Board Room of Messrs. Martin & Co., 12, Mission Row, Calcutta, on the 29th February, 1932 (Proceedings in Appendix 3). The Constitution and Rules of the Institute as drawn up by the Rules Committee were adopted, and the proposal for starting a Journal was generally approved, but in view of certain financial difficulties the Journal Committee was requested to go into the matter in greater detail. It was also decided to open an account with the Imperial Bank of India.

In accordance with a resolution passed at this meeting the Institute was registered under the Societies Registration Act No. XXI of 1860 on the 28th April, 1932 (Registration No. 57 of 1932-33.) Memorandum of Association and the Constitution of the Institute in Appendix 1).

LOCAL BRANCHES.

The next work to be taken up was the organization of the local centres. A good deal of correspondence was carried on with Professors K. B. Madhava (Bangalore), C. N. Vaki (Bombay) and D. G. Karve (Poona) in this connexion, and Bye-laws relating to Local Branches were drawn up in consultation with them. These Bye-laws were adopted at a meeting of the Institute held on the 3rd August, 1932, in the Board Room of Messrs. Martin & Co., 12, Mission Row, Calcutta, under the Chairmanship of the President, Sir R. N. Mookerjee. Resolutions were also passed sanctioning the establishment of Local Branches at Bangalore, Poona and Bombay as soon as 10 members were enrolled at each centre. (Proceedings in Appendix 4).

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At the same meeting were also approved the recommendations of the Journal Committee which had, in the meantime, worked out further details regarding the publication of the Journal. Owing to the heavy cost of publication (not less than Rs. 4,500/- a year) it was decided that the Institute could not directly undertake its publication. It was, however, arranged that the Art Press of Calcutta would publish the Journal, the financial responsibility being taken by Prof. P. C. Mahalanobis in his personal capacity. A copy of the Journal will be supplied free to each member of the Institute ordinarily resident in India for which the Institute will contribute at the rate of Rs. 10/- per year for each member subject to a minimum payment of Rs. 500/- a year. Although the Institute will not be directly responsible for the Journal, it has been arranged that the management of the Journal will be conducted in full consultation with the Institute, and the proceedings, reports, and other communications of the Institute will be published in it. Owing to difficulties of typography the publication of the Journal has been unfortunately a little delayed. About 1500 new type-matrices were, however, brought out from abroad in February, 1933, and the first number of the Journal is being issued in May, 1933.

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WORK IN CALCUTTA.

A large number of discussion meetings were arranged during the period July, 1932—April, 1933. Our thanks are due to the Principal, Presidency College, Calcutta, for kindly granting us permission to hold the meetings of the Institute in the College. Brief reports of the topics discussed are given below; the name of the principal speaker is mentioned first in each case.

(1) *Friday, July 8, 1932.* Prof. P. C. Mahalanobis: *Elements of the Theory of Sampling.* Comparison of the concepts of 'universes of discourse' in logic and 'populations' in statistics. The distinction between 'population-values' and 'sample-values' of statistics. The distribution of 'sample-values.' The need of the concept of probability for interpretation of observed statistics. Difficulties in the use of inverse probabilities. The need of empirical verification. Messrs. Amulya Ratan Sinha, Kiran Chandra Basak and Subhendu Sekhar Bose took part in the subsequent discussion.

(2) *Friday, 20th July.* Prof. P. C. Mahalanobis: *Distribution Functions of Frequency.* A brief resume of the development of the Gauss-Laplacian (Normal) law of errors. Karl Pearson's work on skew distributions. The work of Edgeworth, Kaptzyn, and Charlier. The practical advantages of the Pearsonian family of curves. The need for a systematic comparison of different systems.

(3) *Friday, 5th August.* Prof. P. C. Mahalanobis: *Non-linear Correlation.* The fundamental importance of Karl Pearson's work on the 'correlation ratio' (η). Its connexion with R. A. Fisher's method of analysis of variance. The need of large samples in using curvilinear regressions.

In the subsequent discussion Mr. A. R. Sinha gave a short exposition of Ezekiel's graphical and approximative methods of correlational analysis. He was of opinion that these methods could be used with advantage in economic and crop studies where the size of the sample (the number of years for which data were available) was usually small. Mr. Subhendu Sekhar Bose pointed out the practical advantages of using the method of analysis of variance. Prof. Mahalanobis thought that Ezekiel's graphical method might furnish useful clues, but it should be used with great caution. No statistical control was available in this method as owing to uncertainties in the degrees of freedom absorbed in graphical processes, it was not possible to use the χ^2 -test or ascertain the magnitude of the probable errors involved. He admitted the advantages of the analysis of variance, especially for the interpretation of field experiments in agriculture and similar data, but thought that in many problems the use of the Pearsonian η^2 would furnish a straightforward comparison with r^2 , and also give a clear picture of the statistical situation.

(4) *Friday, 26th August.* Prof. P. C. Mahalanobis: *The Normal (Gauss-Laplacian) Law of Errors.* Its main characteristics. Its use in judging the significance of statistical results. The logical necessity of statistical results being wrong sometimes; for example, working with a level of significance of 1%, it was absolutely necessary that in one per cent. cases (on an average) the result should be found to be wrong. The departure from normality in the case of small samples. The importance of the work of "Student" and of R. A. Fisher in this connexion. The connexion between the distribution of Pearson's χ^2 and Fisher's z . The use of the t -table in designing new experiments.

(5) *Friday, 26th August.* Mr. Kiran Chandra Basak: *The Theory of Graduation by Polynomial Curves.** In dealing with time-series it is necessary to get an idea of the trend, and also the magnitude of random fluctuations after the trend had been eliminated. Cram, Jordan, Esscher, Fisher and others have developed certain methods by which the degree of the graduating polynomial could be increased by stages in such a way that the addition of a subsequent term would not affect the previous terms. Mr. Basak gave a brief resume of the properties of the polynomial functions used for this purpose which

*A full note will be published in the *Indian Journal of Statistics*.

were all uni-orthogonal. Prof. Mahalanobis stressed the great advantage of the orthogonal polynomial method by which the residual variation could be reduced stage by stage. This gave some kind of control in deciding to which stage it would be advantageous to push the analysis. Dr. Harish Chandra Sinha and Mr. Anulya Ratau Sinha pointed out that in any single time-series (in which repetitions of observations were impossible) no adequate control was theoretically available. Prof. Mahalanobis agreed that this deficiency was inherent in the nature of the material, but suggested that the randomness and normality of the residuals might furnish an indirect control, but this would require fairly large samples which were, unfortunately, not usually available in practice.

(6) *Friday, 22nd September.* Mr. Kiran Chandra Basak: *The Theory of Graduation by Polynomial Curves.* Mr. Basak gave numerical examples of polynomial graduation. He also considered the equations in the case of (a) power series, (b) orthogonal polynomials, (c) Jordan's factorial series, and pointed out that if certain coefficients were once calculated the work of polynomial graduation (at least up to the 4th degree) would become extremely simple. Such Tables are being at present constructed in the Statistical Laboratory, Presidency College, Calcutta.

(7) *Friday, 16th September.* Dr. Haris Chandra Sinha: *Correlation between Acreage and Price of Cotton.* Dr. Sinha discussed some of the results obtained by him in collaboration with Mr. A. R. Sinha of the Department of Commercial Intelligence and Statistics regarding the correlation between the acreage under cotton in India and the price ruling during the last harvest and at the sowing time. He referred to the work of Messrs. Jacobs and Unakar and pointed out that economic factors had so far been neglected in crop studies in India. He showed that even the meteorological data had not been properly utilised; for instance, Mr. Unakar had pooled the irrigated and non-irrigated areas together, although the effect of rainfall on the former must be less than that on the latter. The method of deriving the trend for several years also admitted of improvements. Dr. Sinha avoided the difficulty of trends by considering link-relatives, or rather percentage deviations of each year's figure compared to that of the previous year in both the price series and the acreage series. A correlation of 0.57 was obtained for a series extending over 30 years. The result was above the 5% level of significance.

Prof. P. C. Mahalanobis thought that correlational analysis with link-relatives was likely to yield interesting results and might prove useful in economic studies. He had, however, serious misgivings regarding the practical value of the coefficient of correlation for actual forecasting work. Values of r less than 0.9 were practically useless for individual forecasts, as the residual fluctuation in estimated values would still be greater than 40 per cent. Instead of attempting precise quantitative forecasts it would probably be desirable to express the results in broad categories say (1) large excess, (2) moderate excess, (3) about normal, (4) moderate defect, and (5) large defect.

(8) *Friday, 16th December.* Prof. P. C. Mahalanobis: *The Use of Pearson and Neyman's L-tests.* Samples may differ in their mean values or in their variabilities or in both. The L-statistics are designed to distinguish between these different cases. The application of the L-statistics was illustrated by numerical examples. The calculation of 5% and 1% points for L_n and L_1 was also briefly discussed. §

(9) *Friday, 17th December, 1932.* P. C. Mahalanobis: *Measures of Statistical Divergence.* The distinction between tests of divergence between samples and measures or estimates of the magnitude of the divergence. Pearson's χ^2 -tests for comparing two frequency distributions. Pearson's Coefficient of Racial Likeness (C^2 -test). A brief description of the Coefficient of Divergence (D^2 -test) recently developed by the author. †

Dr. B. B. Mundkur, Asst. Mycologist, Imperial Institute of Agricultural Research, Pusa, discussed the possibilities of its use for the study of biological variation.

§ A full report with relevant formulae will be found in the introduction to the Table of L-statistics published in the *Indian Journal of Statistics*, Vol. 1, June, 1933.

† P. C. Mahalanobis: *On Tests and Measures of Statistical Divergence*, Part I. *Jour. Biol. Soc., Bengal*, Vol. XXVI, 1930, pp. 641-688.

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(10) *Friday, 24th February, 1933.* Prof. P. C. Mahalanobis: *Recent Studies in the Theory of Sampling.* The use of sampling polynomials. Thiele's semi-invariants. The approximate normality of large samples.

(11) *Friday, 10th March.* Prof. P. C. Mahalanobis opened a general discussion regarding the possibilities of an empirical study of skew correlations in small samples by the method of experimental sampling. It was decided to construct suitable bivariate skew populations for this purpose.

(12) *Friday, 17th March.* Mr. Subhendu Sekhar Bose: *Analysis of Variance.* R. A. Fisher's method of Analysis of Variance is based on the fundamental Law of Addition of Variances, namely that the total variance of a set of observations subject to a number of independent factors of variation is the sum of the individual variances due to these independent factors. The variances of the independent factors must be correctly estimated with due reference to the restrictions put upon the sample (*i.e.* degrees of freedom of the sample), and these may be utilised in testing the homogeneity of the given sample so far as the mean and the standard deviation are concerned. When the sample is found to be heterogeneous, the analysis of variance makes it possible to separate and to obtain unbiased estimate of the variances due to the disturbing factor as well as the various factors belonging to the homogeneous portion of the sample.

In the discussion which followed Prof. P. C. Mahalanobis raised the question of appropriate degrees of freedom. He pointed out that the number of degrees of freedom would depend on the conditions of sampling. In a four-fold table, for example, when the size of the sample only is kept constant, the interpretation should be based on three degrees of freedom. But when one of the ratios of marginal totals is also kept constant the degrees of freedom would be reduced to two. If in addition the proportions within one category is also kept constant, the degrees of freedom would be reduced to only one. He suggested a careful consideration of similar situations in dealing with the analysis of variance of the results of field experiments.

(13) *Friday, 24th March.* Mr. Subhendu Sekhar Bose: *Further Notes on the Analysis of Variance.* Mr. Bose gave numerical examples of the Law of Addition. He then discussed the question of the degrees of freedom, and illustrated his remarks by giving a summary of Yule's sampling experiments on the four-fold table with 100 beans thrown on a rotating sector. Yule showed that the correct distribution of χ^2 was obtained with $n=3$ when the values of χ^2 were calculated from *a priori* expectations of uniformly distributed frequencies. On the other hand when χ^2 was calculated from independence values the correct distribution was obtained with $n=1$. In testing significance it is essential to assign correctly the appropriate number of degrees of freedom, but provided this was done the problem was free from ambiguity.

(14) *Friday, 31st March.* Mr. Amulya Ratna Sinha: *Correlation between Prices and Production of Wheat in the United Provinces.* Mr. Sinha explained that he had chosen the method of link relatives or rather one of its variants, the method of percentage difference, in preference to other methods for a number of reasons. The method of tentatives involved many assumptions, and was highly susceptible to mistakes in even one or two figures. He thought that in the present method the error would not be cumulative. He obtained a significant correlation of -0.59 between the percentage changes in price and production of wheat for data extending over 30 years (1901—1930). A much better result (a multiple correlation of 0.87) was obtained when a composite index of the wholesale prices of other staple crops was included as a second factor.

Dr. Haris Chandra Sinha complimented Mr. Sinha on the high value of the multiple correlation found by him. Dr. Sinha desired to stress the economic aspects of the results. It was clear that the production of wheat in the United Provinces had less effect on its price than the price of other crops. This was but natural, in view of the fact that wheat was a world crop which was grown in different climates during different seasons. Secondly there was a remarkably high correlation (0.84) of the price of wheat with the price of other crops, and therefore, with the agricultural price level. Thus, in the

absence of detailed information, the price of wheat might be taken to represent the general level of agricultural prices. Dr. Sinha next discussed the supposed advantages of the present method. It was true that one or two wrong figures would affect the entire trend. But the question was, by how much. In the same way it might be argued that one or two wrong figures would affect the value of the correlation in the present method. The real difference in the two methods appeared to lie in this. The trend-ratio method emphasized changes in the level of prices, while the link-relative method concentrated attention to changes in the direction of price movements. The elasticity of demand derived from the former has been called 'consumer's elasticity' and that from the latter 'speculator's'. The results obtained by the two methods were open to different interpretations. There were other methods of analysis also, such as the 'triad' method suggested by Prof. Pigou. It would be interesting to compare the results obtained by the different methods.

Prof. P. C. Mahalanobis suggested that the problem might be theoretically approached from the point of view of index-correlation, and referred to Karl Pearson's work in this connexion. He thought that there was no harm in using the so-called 'spurious' (or index) correlations provided they furnished a significant ordering of facts.

Mr. A. R. Sinha raised the question of the proper correction for the number of variables in the case of multiple correlation, and desired to know whether it was possible to lump together all crops other than wheat and consider the combined price index as a single variable. Prof. Mahalanobis thought that it was quite correct to do so, in view of the fact that it was only the mean price (of all crops) which entered in this equation. The fluctuations in the mean price, which clearly represented only one degree of freedom, must not be confused with the fluctuations in the prices of the different crops from the mean level.

(15) Friday, 21st April. Mr. Rajchandra Bose: *The Application of Hyperbolic Geometry in the Theory of Multiple Correlation*. If there are n associated characters and a sample of N individuals is taken, then x_i may represent the i th character for the j th individual. We may now take an N -dimensional space and in it take n -points N_i with co-ordinates (x_{i1}, x_{i2}, \dots) where $i=1, 2, 3, \dots$. Then the system of n -points so obtained completely represents the given data. It is found that the various constants in the theory of multiple correlation have all concrete geometrical interpretations. Most of the theorems, including inequalities between various correlation coefficients, are capable of simple geometrical proofs.

PUBLIC MEETING.

Besides the above discussion meetings, a public meeting of the Indian Statistical Institute was held on Friday the 3rd March, 1933 in the Statistical Laboratory, Presidency College, Calcutta. Dr. D. B. Meek, D.Sc., O.B.E., Director-General of Commercial Intelligence and Statistics and Vice-President of the Institute took the Chair. Dr. Harish Chandra Sinha presented a paper on "Indian Prices during the Depression" prepared by Mr. Sailendra Nath Sen and himself.*

Dr. Sinha began by pointing out that it was difficult to compile and interpret a composite index for the world price systems, as the methods of construction of the various indices and the social and economic conditions in different countries were so different. They have, therefore, compared the wholesale price indices for Calcutta and Bombay with those for the United States, the United Kingdom and Canada separately. In order to make these five series comparable the price level in January, 1929 was taken as 100 in all cases and the percentage changes were tabulated quarter by quarter, since that date. The relative disparity coefficients were also worked out. The charts clearly brought out that the depression began first in India about the beginning of 1929 and last in Canada about the beginning of 1930. They also showed that the decline in the Calcutta price level was sometimes by as much as 15% below the levels of the U.S.A., Canada and the U. K. and by 20% below the level of Bombay.

*This paper is published in full in *Sankhya, The Indian Journal of Statistics*, Vol. 1, Part 1, May, 1933.

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This was followed by a description of the various criteria of economic maladjustment such as the disparity between gold prices and rupee prices, between the prices of exports and imports, of raw materials and manufactures, and of different primary products, in India and other countries. They all tended to confirm the conclusion already reached that the depression had set in in India earlier than elsewhere and was somewhat deeper, but during the past few months things were not getting worse.

Dr. H. C. Sinha supplemented the facts dealt with in the paper itself by charts and figures showing the change in the dispersion in the prices of different commodities in India. He thought that the dispersion had increased as the depression deepened, and was of opinion, that the magnitude of the dispersion was a kind of index of the intensity of economic maladjustments.

Dr. D. B. Meek opened the discussion by complimenting the authors on the great labour taken in preparing the paper, and the clear manner in which such a large mass of statistics had been presented. He agreed with the authors in thinking that it was practically impossible to reach a "world-level" for prices. A great deal depended upon local conditions, and valid comparisons were not possible between different countries, or between different parts of the same country like India. The authors had been wise in studying the price-levels separately.

As regards the question of disparity Dr. Meek was of opinion that prices were bound to get more and more apart, that is, the disparity was bound to increase with the passage of time. The relative demand for different commodities would change owing to changes in technology and the development of new industries. He pointed out that July, 1914, had been used as the base for both the Calcutta and the Bombay series of index numbers. He was of opinion that the disparity was increasing through the action of normal economic causes, and had very little connexion with the course of the depression. In order to study the depression itself it would have been more instructive to have adopted a nearer base for comparison.

Prof. P. C. Mahalanobis desired to discuss certain purely statistical aspects of the dispersion in prices. He was unable to agree that the dispersion must necessarily increase with the passage of time under all circumstances. In the absence of selective causes, prices should be dispersed about the mean in a random manner. He thought that a detailed study of the disparity in prices for different commodities would prove interesting. Such a study would reveal, for example, whether the prices fluctuated independently or there were definite groups of associated movements. He was, however, not clear whether any intensification of the depression would necessarily increase the dispersion in prices.

Mr. J. V. Joshi referred to the great rise in prices during and after the War, and agreed with Dr. Meek in thinking that the increase in the dispersion pointed out by Dr. Sinha was largely brought about by the economic disturbances of the post-War period independently of the present depression. He thought that an increase in the dispersion was not likely to have any diagnostic value so far as the depression was concerned.

Dr. L. Nemenyi mentioned some of the world causes which had operated in bringing about the depression, and thought that the absence of any appreciable lag in the fall of prices in India showed that the depression in India was only a part of the world depression. Dr. N. Sanjyal was of opinion that the depression was more severe in India than in other countries, and thought that this was due to mistakes in the economic policy followed in India.

Dr. Jogis Chandra Sinha referred to the wide disparity in prices between raw materials and manufactured goods. This indicated undue rigidity in the present economic structure which was the root cause of the present depression. He emphasized the acute hardship caused to Indian agriculturists who had to sell their produce cheap but had to buy their requirements dear. In India the dispersion in prices was probably aggravated by the recent imposition of heavy tariffs.

Dr. Haris Chandra Sinha pointed out that all prices in the present paper had been expressed as percentages of prices ruling in January, 1929. This month was chosen as

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the Calcutta index number was then practically the same as the average index number for 1928. He thought that the effect of the time factor had been largely eliminated by this device. In any case he was referring not to the dispersion as such but the increase in the dispersion observed during the four years 1929-1932. He thought that this was connected with the course of the depression, but agreed that further detailed studies were required before this result could be established. He agreed with Dr. J. C. Sinha in thinking that tariffs had intensified the disparity, but the purpose of the present paper was to describe and analyse the facts as they were, and not to discuss causes and remedies. He was very grateful for the kind reception of the paper, and wanted to point out that the charts were prepared by a number of research workers in the Statistical Laboratory of the Presidency College to whom praise was due.

WORK IN POONA.

The Poona Branch has shown great activity under the able guidance of its Chairman, Prof. V. G. Kale, and its energetic Secretary, Prof. D. C. Karve. No less than eight Life Members and four ordinary members were enrolled from this centre alone during the year under review. We are publishing below a short report of the work done at Poona.

At a preliminary meeting held at the residence of Prof. Kale on the 31st March, 1932, it was decided to start a Local Branch of the Institute in Poona. This proposal received the support of many of the members of the staff of the four Arts Colleges, the Poona Agricultural College, the Gokhale Institute of Economics and Politics, and the Meteorological Office. The branch commenced its public activities from July, 1932 and the following discussion meetings were arranged during the year.

(1) *Monday, 24th July, 1932.* Prof. V. G. Gokhale, Principal, Agricultural College, read a valuable paper on "*A Study of a Dry Farming Unit near Poona*" which dealt with an important economic problem. Prof. Gokhale discussed in this paper a large mass of facts and data collected by him in the course of his official work. It is hoped that the permission of his Department will be obtained in due course for the publication of the paper in *extenso*.

(2) *Monday, 18th September, 1932.* Rao Bahadur Sahasrabudhe: *Some Aspects of the Growth of Population in India.* After a careful survey of relevant population, vital, and production statistics, the author enumerated the following conclusions to serve as a basis for discussion:—

- (i) There exists a parallelism between the increase of food stuffs and the growth of population.
- (ii) Past experience shows that there is a considerable scope for increasing the area under cultivation and the yield per acre of food stuffs.
- (iii) The irregularities in the growth of population in different census decades were due to famines and epidemics.
- (iv) Smaller communities appear to increase their numbers faster than larger communities.
- (v) The spread of education appeared to affect adversely the growth of population.

In the discussion which followed Prof. Gokhale expressed the opinion that an analysis of birth and death rates, and a study of the diet in different communities was necessary for valid inter-communal comparisons. He was unable to accept the adverse effect of literacy on the growth of population without further analysis, and felt doubtful regarding the accuracy of the increase in the yield per acre.

Mr. D. R. Gadgil, Director of the Gokhale Institute of Politics and Economics, thought that the increase in the food supply was probably an effect rather than the cause of the growth in population. He felt that conclusions based on 1911-1921 census figures would be unreliable as this was a peculiarly abnormal decade. He suggested a comparison of figures for natural geographical regions like East Bengal or Travancore, instead of artificial units like the existing administrative provinces. The general economic condition was more important than literacy, and the supposed effect of education could be probably traced to

the influence of urban life. He also doubted the value of any normal rate of increase of population in India which did not take into consideration the effect of famines and epidemics which formed normal features of life in India.

(3) & (4) The third and fourth discussion meetings were devoted to a discussion of a statistical study of *Fruit Marketing in and around Poona* prepared by the Gokhale Institute of Politics and Economics under the direction of Mr. D. R. Gadgil. (The paper will be shortly published in book form).

Mr. Gadgil found considerable difficulties in securing reliable and adequate statistics. The *dalals* (representative of Revenue Department in each village) is the usual source of official statistics, but it is known that this source is not very reliable. The railway figures for import and export of fruit from railway station on the G. I. P. Railway are, of course, reliable. It was most unfortunate, however, that Mr. Gadgil was refused access to this material. The Institute was therefore obliged to collect its own material by independent enquiries.

In the Poona District fruit is grown mostly in small holdings. For example, out of 71 growers of fruit in one village on the Nira Left Bank Canal only one grower had an acreage above ten. Five holdings were between 10 and 5 acres; ten between 5 and 2½ acres; nineteen between 2½ and 1½ acres; twenty-four between 1½ and 1 acre, while twelve holdings were below 1 acre. This result definitely contradicts the finding of the Royal Commission on Agriculture that commercial fruit-growing is not possible in small holdings and that it cannot be combined profitably with other forms of cultivation.

The price structure especially the division between the grower and the distributor was studied carefully. Retail prices are incapable of exact measurement, particularly in such a market as Bombay. Retailing charges also are known to be heavy but exact statistical data on that point are not available. We have to go by the recorded wholesale prices. Any general statement such as that 80% of the price paid by the consumer goes to the distributors would be rash. There is indeed no uniformity in the matter, and much depends on local conditions. Transport charges which are dependent on nearness to market would make a considerable difference in several cases.

The *pattis* (account slips) of *dalals* (selling agents) and *hundekaris* (forwarding agents) at several centres for 1930 were analysed and the following distributions were found to be typical:—Wholesale price received in the Bombay Market for guavas is split up as 34% *hundekari*, 21% *dalal*, and 45% grower. For Mozambi (citrus) the figures are 11.67% *hundekari*, 13.49% *dalal* and 75% grower. The *dalals* in Bombay comes to about 20% whereas that in Poona is about 10% on average. Out of the share of the grower a further deduction has to be made for packing and transporting charges, and for octroi duty. This last comes to about 4% on dearer and 8% on cheaper fruits. In places where the retailing charges are heavy it would certainly be true to say that a considerable percentage of the retail price is shared by the distributors. But it would be unjustifiable to deduce any general conclusions from this fact without reference to the conditions of each case. These results were generally corroborated by a number of fruit marketing accounts collected by Prof. V. G. Kale.

The discussion following upon Mr. Gadgil's statement centred mainly round the proposals to improve the grower's share in the yield of the transaction. The limitations in the way of Co-operative Societies were well-known. The *dalals* make free and extensive advances to the growers. It will not be possible for a Co-operative Society to do this beyond a certain limit. The opposition of the *dalals* would also be considerable. There was a general consensus of opinion that efforts should be concentrated upon individual and collective efforts at reducing the risks of the trade, which are mainly responsible for the high middlemen's charges. An Act for compulsory grading was advocated. The provision of special fruit vans with refrigerator arrangement would reduce the losses of the wholesale purchaser. Co-operation has some useful part to play in improving the packing and grading and in reducing if not altogether eliminating the forwarding charges. Marketing news from the different selling and producing areas must be much better organized than at present. There must also be some legislative regulation of the *dalal's* system of rendering accounts to the grower. With such improvements in the organization of fruit marketing the risks involved would be reduced very considerably. It would then be possible for Co-operative Societies to function on sound lines.

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Prof. Karve hopes to be able to arrange meetings for the study of both theoretical and applied statistics during the coming session.

ACCOUNTS FOR 1932-33.

We give below an Account of the Receipts and Expenditure for 1932-33. The income from subscription dues amounted to Rs. 1,969/-. The total expenditure was Rs. 546-9-0, which can be divided under three broad heads:—

- (a) Non-recurring charges amounting to Rs. 78-9-0 for registration and affiliation dues.
- (b) The subsidy for the Indian Journal of Statistics (at the rate of Rs. 10/- per member), under which head Rs. 500/- was paid on account to the Art Press, and the contribution to Local Branches (at the rate of Rs. 2/8/- per local member) which amounted to Rs. 30/-.
- (c) Recurring expenses for general administration amounted to Rs. 238/-, which included Postage Rs. 41-12-0, Banking Commission Rs. 9/-, part-time allowance for assistant (Rs. 10/-) and peon (Rs. 5/-) for 1 year Rs. 180/-, and stationery Rs. 9/-. An earmarked donation of Rs. 189/- was received from Prof. P. C. Mahalanobis for establishment charges.

RECEIPTS AND EXPENDITURE FOR 1932-33.

RECEIPTS.		EXPENDITURE.	
	RS. A. P.		RS. A. P.
1. Subscription realised	... 1,969 0 0	1. Registration fee paid to the Joint Stock Co. ...	50 0 0
2. Special donation	... 189 0 0	2. Affiliation fee paid to the Royal Statistical Society of London ...	28 9 0
		3. Amount paid to Poona Centre as their share of subscription ...	30 0 0
		4. Postage ...	41 12 0
		5. Bank Commission ...	7 4 0
		6. Establishment part-time ...	180 0 0
		7. Stationery ...	9 0 0
		8. Amount paid to Art Press on account of the Statistical Journal as per resolution No. 4, dated 3rd August, 1932) ...	500 0 0
			846 9 0
		9. Bank balance ...	1,248 12 0
		10. Cash on hand ...	79 11 0
			1,327 3 0
Total	... 2,175 0 0	Total	... 2,175 0 0

Our best thanks are due to Mr. J. S. Henderson, Chartered Accountant, for having kindly agreed to serve as the Hon. Auditor. His report is reproduced below.

This is to certify that I have examined the accounts of the Indian Statistical Institute and verified the bank balance Rs. 1,248-12-0 and the cash on hand Rs. 79-11-0.

27th April, 1933.

(Sd.) J. S. HENDERSON, C.A.

MISCELLANEOUS.

Affiliation with the Royal Statistical Society, London. In accordance with resolution No. 11 of the 3rd August, 1932, the Institute was enrolled as a Corporate Member of the Royal Statistical Society, London, and Prof. P. C. Mahalanobis was nominated the representative of the Institute.

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Research Stipend. Prof. P. C. Mahalanobis offered a donation of Rs. 50/- per month for 6 months for the present for the award of a research stipend. The offer was accepted by the Council, and the stipend was awarded to Mr. Raj Chandra Bose, M.A., for work on the application of hyper-space geometry to statistical problems.

Journal Committee. Prof. P. N. Banerjee, Dr. D. B. Meek, Prof. P. C. Mahalanobis (Editor), Prof. N. R. Sen, Mr. T. J. V. Roxburgh with Dr. H. C. Sinha as Secretary were appointed members of the Journal Committee.

CONCLUSION.

The membership of the Institute at present consists of Honorary Members 2, Life Members 13, and Ordinary Members 84. The subscription dues from members were not fully realized this year, owing to the lack of systematic efforts on our part. In future it is proposed to collect membership dues by sending the Journal by V. P. Post.

It is exactly one year since the Institute was started. Useful work has been done in establishing contacts between statistical workers in different parts of India and in starting Local Branches in Poona, Bangalore, and Bombay. On the scientific side there was considerable activity in Calcutta where 16 meetings were held during the year, and also in Poona where 4 meetings were organised. The Indian Journal of Statistics is being published from this month with the help of a subsidy from the Institute, and by the efforts of its members.

We have no reason to be dissatisfied with the work done by the Institute in the first year of its existence, but we are confident that greater progress will be made in the coming year. The first thing necessary for this purpose is an increase in the membership, and we earnestly appeal to the existing members for their co-operation in this connexion.*

*The Annual Report and Audited Accounts for 1929-30 were adopted at the First Annual General Meeting held in Calcutta on the 28th April, 1930.

APPENDIX 1.

INDIAN STATISTICAL INSTITUTE

MEMORANDUM OF ASSOCIATION *

I. The name of the Society shall be the Indian Statistical Institute.

II. The objects of the Society shall be :—

- (1) To promote the study of Statistics both pure and applied and allied subjects.
- (2) To provide for research and instruction for the advancement of the study and dissemination of knowledge of Statistics and allied subjects.

III. For and in connection with the furtherance of its objects or any of them the Institute shall have power :—

- (1) To hold meetings, arrange for lectures or courses of instruction, and to grant certificates of proficiency in Statistics.
- (2) To undertake investigations including field-work, and prepare reports in particular subjects on its own behalf or on behalf of or in co-operation with other institutions, organizations or persons.
- (3) To publish reports, bulletins, books or periodicals at its own cost or contribute to the cost of publication of the same, sell such publications or distribute them gratuitously or at reduced prices.
- (4) To co-operate with Universities and other institutions and organizations, and to establish local centres in different parts of India.
- (5) To frame Rules and Bye-laws and alter, modify, or rescind the same.
- (6) To accept gifts and donations, to invest the funds of the Institute, to borrow or otherwise raise money ; to purchase, take on lease or otherwise acquire and to sell, give on lease, or otherwise dispose of movable and immovable properties, to incur expenditure and make all necessary financial arrangements for carrying on the work of the Institute.
- (7) To take all such action as may be incidental or conducive to the attainment of the objects of the Institute, or any of them.

IV. The membership of the Institute and its constituent bodies shall be open to all persons irrespective of sex, nationality, race, creed or class.

V. The Institute shall not distribute any part of its income or profit as dividend, gift, or bonus or in any other way among its members, provided nevertheless that office-bearers, workers, and other employees shall not be debarred from receiving remuneration or participating in grants because of their also being members of the Institute.

VI. The Registered Office of the Institute shall be in Calcutta.

*The constitution was adopted at a meeting of the Indian Statistical Institute held in the Board Room of Messrs. Martin & Co., 12, Mission Row, Calcutta, on the 29th February, 1932. The Institute was registered under the Societies Registration Act (Act No. XXI of 1909) on the 28th April, 1932. (Registration No. 87 of 1932-33, Calcutta).

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RULES

1. The Institute shall consist of the following classes of members:—

(a) *Ordinary Members.* They shall be elected by the Council and shall pay such fees and subscriptions as may be laid down in the Bye-laws from time to time. Any Ordinary Member, on payment of such a consolidated sum as may be prescribed in the Bye-laws, shall be entitled to be termed a Life Member.

(b) *Fellows.* Among the Life and Ordinary Members a certain number may be elected Fellows, and a certain number of non-members may be elected Honorary Fellows by the Institute for distinguished work in Statistics or allied subjects on the recommendation of the Technical Committee and in manner prescribed in the Bye-laws. Fellows shall exercise all the privileges and obligations of membership. Honorary Fellows shall enjoy all the privileges of membership, but shall not be required to pay any fees or subscription.

(c) *Patrons and Honorary Members.* Persons who make substantial contributions to the funds of the Institute, or render distinguished service to the Institute, and other eminent persons by virtue of their knowledge of, or contributions to, science, art, or literature, may be elected as Patrons or Honorary Members. Such election shall be made by the Institute on the recommendation of the Council for such period as the Council may determine. Patrons and Honorary Members shall enjoy all the privileges of membership, but shall not be required to pay any fees or subscriptions.

2. A General Meeting of the Institute, duly and properly convened, shall be the supreme controlling authority, and in particular shall have the power to sanction with or without modifications or reject changes in Bye-laws, and by a two-thirds majority of members voting, to add to, alter or rescind any of the Rules subject to confirmation by majority of votes at a subsequent General Meeting to be held not earlier than a fortnight of the date of the original meeting.

(a) An Annual General Meeting shall be held not later than the last day of April in each year to consider the Annual Report and Accounts, to elect office-bearers and members of the Council, to appoint Auditors, and to consider any other business which may be brought forward in the manner prescribed in the Bye-laws.

(b) On the written requisition of not less than fifteen members of the Institute, the Council shall convene a Requisition General Meeting for the transaction of the business stated in the requisition. If within three months of the date of requisition the Council fails to convene a Special General Meeting so requisitioned, the requisitionists themselves may convene a Requisition General Meeting to be held in Calcutta for the transaction of the requisitioned business, provided that no business other than the requisitioned business shall be transacted at Requisition General Meetings.

3. Members who are in arrears as to dues and subscriptions shall not be entitled to exercise any of the rights and privileges of membership while in arrears, and the membership of a member who is in arrears for more than 2 years may be terminated by the Council after due notice.

4. Any person interested in the study of Statistics may be enrolled by the Council as an Associate, and shall pay such fees and subscriptions and enjoy such privileges as may be prescribed in the Bye-laws. Associates shall not, however, have the right of voting at General Meetings or otherwise participate in the administration of the Institute.

CONSTITUTION OF THE INDIAN STATISTICAL INSTITUTE

5. The Office-bearers of the Institute shall be a President, a Treasurer and a Secretary. One or more Vice-Presidents and Joint or Assistant Secretaries may also be elected. They shall be elected at an Annual General Meeting, and shall hold office for one year, but shall be eligible for re-election.

(a) The President shall preside at all meetings of the Institute, the Council and other Committees at which he may be present.

(b) In the absence of the President, one of the Vice-Presidents who may be present shall take the chair.

(c) The Treasurer shall receive and hold for the use of the Institute all moneys paid to the Institute, and shall make payments in accordance with the directions of the Council.

(d) The Secretary shall be responsible for the proper administration of the affairs of the Institute subject to the control of the Council. He shall represent the Institute in all business and legal transactions and shall sign all necessary documents on behalf of the Institute in accordance with the Bye-laws and the directions of the Council, if any. All suits instituted by, or on behalf of, the Institute, shall be instituted in the name of the Secretary, and in all suits brought against the Institute the Secretary shall represent the Institute.

(e) Joint or Assistant Secretaries, when appointed, shall assist the Secretary in all matters, and shall have authority to exercise all or any of the powers of the Secretary which may be delegated to them.

6. There shall be a Council of the Institute consisting of:—

(a) The Office-bearers, who shall be *ex-officio* members.

(b) Twenty or such number of Members as may be determined by the Bye-laws, to be elected by the Institute at the Annual General Meeting.

(c) Not more than five Co-opted Members who may be elected by the Council by a two-thirds majority of members voting and who shall hold office for the year or part of the year as the case may be.

7. The Council shall be responsible for the management of the affairs of the Institute and shall have full powers to do all things that may be necessary or desirable to give effect to the objects of the Institute, and generally to exercise all the powers of the Institute except in regard to such powers and functions as are required by the Rules to be otherwise exercised. In particular, the Council shall have power:—

(a) To make, alter, or rescind Bye-laws subject to confirmation at a General Meeting of the Institute;

(b) To grant leave to Office-bearers and make officiating appointments;

(c) To fill up vacancies among the Office-bearers and Members of the Council occurring during the year;

(d) To delegate any of its powers to persons, committees, boards, or other bodies composed of its own members or other members of the Institute by specific resolution, and in particular to appoint a Working Committee from among the members of the Council to carry on the administrative work of the Institute, provided always that the Working Committee and all other bodies created by the Council shall be subordinate to the Council in all matters.

8. (a) Not less than fifteen days' notice shall be given for all General Meetings of the Institute. Ten members present in person shall form a quorum at all General Meetings, except in the case of a Requisition General Meeting when twenty-five members shall form the quorum.

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(b) Not less than seven days' notice shall be required for all meetings of the Council. Five members shall form a quorum.

9. In the absence of the President and the Vice-Presidents, a Chairman shall be elected at a meeting of the Institute, the Council or a Committee.

All questions except such for which other provisions exist in the Rules and the Bye-laws shall be decided by a majority of votes.

10. It shall be the duty of the Council to prepare an Annual Report for consideration by the Annual General Meeting of the Institute.

11. All Banking Accounts, Documents, Securities, etc., shall stand in the name of the Institute.

The General Banking Account shall be operated on by the Treasurer or in his absence by a member of the Council authorized to do so by the Treasurer or the Council.

12. There shall be a Technical Committee of the Institute consisting of twenty-five members (or such number as the Technical Committee may decide from time to time) who are specially qualified by their knowledge of Statistics to undertake the direction or review of special investigations and technical problems. Members of the Technical Committee shall hold office for such period as the Technical Committee may decide.

(a) Vacancies in the Technical Committee shall be filled and new members shall be elected by a two-thirds majority of such members of the Technical Committee who may participate in the voting.

(b) No publications or opinion involving technical questions shall be issued on behalf of the Institute except with the approval of the Technical Committee, but the Technical Committee shall not exercise any authority regarding the administration of the Institute, except in the matter of the election of Fellows and Honorary Fellows.

(c) The Technical Committee shall have power to elect its own Secretary, and to frame bye-laws for the conduct of its own business.

13. If upon the dissolution of the Institute there remains after the satisfaction of all its debts and liabilities any property whatsoever the same shall not be paid to or distributed among its members or any of them, but shall be made over or distributed among such other institutions or associations having objects wholly or partly similar to those of the Institute as may be determined by a two-thirds majority of members voting at a Special Meeting of the members to be convened for this purpose.

14. Proposed changes in Bye-laws shall be notified to all members of the Council not less than one month before the date of the meeting of the Council at which they will be considered and shall be adopted upon being passed by a two-thirds majority of members voting, and all such changes shall be placed before a subsequent Council and a subsequent General Meeting of the Institute for confirmation. In case all or any of the proposed changes are not confirmed by the General Meeting of the Institute such proposed changes shall be referred back to the Council for reconsideration.

15. Proposed changes in Rules shall be notified to all members of the Institute not less than three months before the date of the General Meeting at which they will be considered and shall be adopted upon being passed by a two-thirds majority of members voting and upon being confirmed by a majority of members voting at a subsequent General Meeting held not earlier than a fortnight after the first mentioned General Meeting.

APPENDIX 2.

PROCEEDINGS OF THE MEETING DATED THE 27th DECEMBER, 1901.

A meeting was convened over the signature of Prof. Prarnathanath Banerjia, M.A., D.Sc., (*Mislo Professor of Economics, Calcutta University*), Prof. P. C. Mahalanobis, M.A., I.E.S. (*Professor, Presidency College*), and Prof. N. R. Sen, M.A., D.Sc. (*Ghosh Professor of Mathematics, Calcutta University*) to consider steps to be taken towards the establishment of an Indian Statistical Institute.

The meeting was held in the Board Room of Messrs. Martin & Co., 12, Mission Row, Calcutta, on Thursday, the 17th December, 1901, at 2-30 p.m.

Sir R. N. Mookerjee, K.C.I.E., K.C.V.O., presided.

The following gentlemen were present:—

Prof. Prarnathanath Banerjia, M.A., D.Sc., *Mislo Professor of Economics, and President, Council of Post-Graduate Teaching in Arts, Calcutta University.*

Rai Bahadur A. C. Banerjee (Messrs. A. C. Banerjee & Co., Member, Committee of the Bengal National Chamber of Commerce).

Mr. S. N. Banerjee, M.A., *Lecturer in Statistics, Calcutta University.*

Prof. D. M. Bose, M.A., Ph.D., *Ghosh Professor of Physics, Calcutta University.*

Mr. S. S. Bose, M.Sc., *Late Statistician to the Government Agricultural Farm, Dacca.*

The Hon'ble Mr. P. H. Browne, C.B.R., (Messrs. Mackinnon, Mackenzie & Co., President, Bengal Chamber of Commerce).

Dr. Kodernath Das, M.D., C.I.B., *Principal, Carmichael Medical College.*

Mr. M. P. Gandhi, M.A., (*Secretary, Indian Chamber of Commerce, Calcutta.*)

Mr. H. D. Ghosh, M.A., *Lecturer, Calcutta University.*

Mr. P. N. Joseph, M.A., *Deputy Director (Statistics) Commercial Intelligence Department.*

Mr. J. Reid Kay (Messrs. James Finlay & Co., Member, Committee of the Bengal Chamber of Commerce).

Mr. D. P. Khaitan (Messrs. Birla Bros., Member, Committee of the Indian Chamber of Commerce).

Mr. Mohanlal Lalubhai (Messrs. Chintamani Vadliel & Co., Member, Committee of the Indian Chamber of Commerce).

Prof. P. C. Mahalanobis, B.Sc., M.A., I.E.S., *Professor, Presidency College, Calcutta.*

Mr. A. L. Ojha (Messrs. Amrita Lal Ojha & Co., Ltd., Vice-President, Indian Chamber of Commerce).

Sir Hari Sankar Paul, Kt. (Messrs. Billo Kristo Paul & Co., Member, Committee of the Bengal National Chamber of Commerce).

Mr. K. J. Purohit, F.S.A.A. (London), (Member, Committee of the Indian Chamber of Commerce).

Prof. Nihhiranjan Sen, M.A., D.Sc., *Ghosh Professor of Mathematics, Calcutta University.*

Dr. H. Sinha, Ph.D., *Lecturer, Calcutta University.*

Mr. R. A. Towler (Messrs. McLeod & Co., Member, Committee of the Bengal Chamber of Commerce).

Sir R. N. Mookerjee stated that the Hon'ble Sir George Schuster, K.C.M.G., C.B.E., Finance Member to the Government of India, had accepted the invitation to attend the

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meeting and expressed keen interest in the work of the Institute. But he was unable to attend the meeting at the last moment owing to unforeseen business.

The following resolutions were adopted:—

1. Resolved that Sir R. N. Mookerjee, K.C.I.E., K.C.V.O., do take the Chair.

Proposed by—Prof. Pranamath Banerjee.

Seconded by—Mr. P. M. Joseph.

2. Resolved that an Indian Statistical Institute be started, and the following sub-committee with powers to co-opt be appointed to draw up the rules and submit the same for consideration at the next meeting.

Prof. P. N. Banerjee, M.A., D.Sc., *Minto Professor of Economics, Calcutta University.*

Mr. D. P. Khaitan, *Messrs. Birla Bros., Member, Committee of the Indian Chamber of Commerce.*

Prof. K. B. Malhotra, M.A., A.I.A. (London), *Professor, Mysore University.*

Prof. P. C. Mahalanobis, M.A. (Cantab), I.E.S., *Professor, Presidency College, (Coimbatore).*

Dr. H. Sinha, Ph.D., *Lecturer, Calcutta University.*

Prof. C. N. Vakil, M.A., M.Sc., *Professor, Bombay University.*

Seconded by—Dr. Kedarnath Das.

Proposed by—The Hon'ble Mr. P. H. Browne. } Carried unanimously.

3. Resolved that Sir R. N. Mookerjee, K.C.I.E., K.C.V.O., be requested to serve as the first President of the Institute.

Seconded by—Mr. A. I. Ojha.

Proposed by—Mr. R. A. Towler. } Carried with acclamation.

4. Resolved that the following gentlemen be requested to serve as the first Vice-Presidents of the Institute:

Prof. P. N. Banerjee, M.A., D.Sc.

Mr. G. D. Birla.

The Hon'ble Mr. P. H. Browne, C.B.E.

Dr. D. B. Meek, M.A., D.Sc., O.B.E.

Mr. Manohar Lal, M.A.

Sir C. V. Raman, D.Sc., F.R.S., N.L.

Sir P. Thakurdas, Kt.

Sir M. Visveswaraya, Kt., D.Sc., K.C.I.E., M.I.C.E.

Proposed by—Mr. Reid Kay.

Seconded by—Prof. D. M. Bose, M.A., Ph.D. } Carried unanimously.

5. Resolved that Sir Hari Sankar Paul, Kt., be requested to serve as the first Honorary Treasurer, Prof. P. C. Mahalanobis as the first Honorary Secretary, and Dr. H. Sinha as the first Honorary Joint-Secretary of the Institute.

Proposed by—Prof. Nikhilenra Sen.

Seconded by—Mr. S. N. Banerjee. } Carried unanimously.

MEETING DATED THE 27TH DECEMBER, 1931

6. Resolved that the following gentlemen be requested to serve as the first members of the Council:—

(In alphabetical order.)

- T Mr. N. K. Adyanthya, M.A., *Madras University.*
- T Prof. P. N. Banerjee, M.A., D.Sc., *Minto Professor of Economics, Calcutta University.*
Dr. P. Basu, M.A., Ph.D., *Indore.*
Prof. H. R. Batheja, I.E.S., *Patina University.*
Dr. G. S. Bose, M.B., D.Sc., *Calcutta University.*
- T Dr. Nalini Bose, M.A., D.Sc., *Irrigation Department, Lahore.*
- T Prof. S. N. Bose, M.A., *Dacca University.*
Mr. R. W. Brock, *Editor, Capital, Calcutta.*
Mr. Duncan Campbell, *Chartered Bank, Calcutta.*
- T Sir J. C. Coyajee, M.A., I.F.S., (Retd.), *Calcutta University.*
Dr. Kedarnath Das, M.D., C.I.E., *Principal, Carmichael Medical College, Calcutta.*
Mr. K. L. Dutta, M.A., *Calcutta.*
Mr. D. Ghose, M.A., *Bombay University.*
- T Mr. R. N. Gilechrist, M.A., I.E.S., *Labour Intelligence Officer, Bengal.*
Rai Bahadur B. D. Goenka, *Calcutta.*
- T Prof. Satis Chandra Ghosh, M.A., *Calcutta University.*
Mr. L. V. Heathcote, *Burma Shell Oil, Calcutta.*
Dr. Jafar Hosain, Ph.D., *Hyderabad.*
Dr. L. K. Hyder, Ph.D., *Public Service Commission.*
- T Mr. J. V. Joshi, M.A., *Deputy Director, Commercial Intelligence.*
Prof. V. G. Kale, M.A., *Fergusson College, Poona.*
Mr. Reid Kay, *Messrs. James Finlay & Co., Calcutta.*
Mr. D. P. Khaitan, *Mesro, Birla Bros., Calcutta.*
Prof. J. Maclean, M.A., *Wilson College, Bombay.*
- T Prof. K. B. Madhava, M.A., A.I.A., *Maharaja's College, Mysore.*
- T Mr. K. C. Mahindra, M.A., *Messrs. Martin & Co., Calcutta.*
- T Dr. John Matthai, D.Sc., *Tariff Board, Simla.*
- T Dr. D. D. Meek, D.Sc., O.B.E., *Director General of Commercial Intelligence & Statistics, Calcutta.*
- T Prof. Ratha Kama Mukherjee, *University of Lucknow.*
Mr. N. Mukherjee, A.I.A., *Government Actuary, Simla.*
The Hon'ble Mr. Ram Das Pantulu, *Madras.*
- T Mr. T. J. V. Roxburgh, I.C.S., *Presidency Magistrate, Calcutta.*
Dr. B. C. Roy, M.D., F.R.C.S., *Mayor, Calcutta Corporation.*
- T Prof. M. N. Saha, D.Sc., F.R.S., *Allahabad University.*
Mr. N. R. Sarker, *Vice-President, Bengal National Chamber, Calcutta.*

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T Mr. B. M. Sen, M.A., I.E.S., *Principal, Presidency College, Calcutta.*

T Prof. N. R. Sen, M.A., D.Sc., *Ghosh Professor of Mathematics, Calcutta University.*

Prof. A. C. Sen-Gupta, M.A., I.E.S., *Nagpur University.*

Prof. Gurnumukh N. Singh, M.A., M.Sc., *Banaras University.*

T Dr. J. C. Sinha, M.A., Ph.D., *Dacca University.*

T Mr. G. F. Shiras, M.A., *Gujrat College, Ahmedabad.*

Mr. Manu Subedar, M.A., *Bombay.*

T Prof. C. D. Thomson, *Allahabad.*

Mr. R. A. Twinkl, *Access. Mead & Co., Calcutta.*

T Mr. M. Vaidyanathan, M.A., *Imperial Council of Agricultural Research, Simla.*

T Prof. C. N. Vakil, M.A., M.Sc., *Bombay University.*

(Members with T marked against their names will constitute the Technical Committee.)

Proposed by—Mr. K. J. Purshit.

Seconded by—Mr. Mohanlal Lalohai.

} *Carried unanimously.*

7. Resolved that Prof. C. N. Vakil and Prof. K. B. Madhava be requested to take the necessary steps for organising local centres at Bombay and Mysore respectively.

Proposed by—Prof. P. C. Mahalanobis.

Seconded by—Dr. H. Sinha.

} *Carried unanimously.*

8. Resolved that a Journal Committee, consisting of the following gentlemen with powers to co-opt be appointed to report on the possibilities of starting a Statistical Journal.

Mr. R. W. Brock.

Prof. K. B. Madhava.

„ P. C. Mahalanobis.

Mr. G. L. Mehta.

Dr. H. Sinha (*Couvenier*).

Proposed by—Mr. A. L. Ojha.

Seconded by—Mr. M. P. Gaudhi.

} *Carried unanimously.*

9. Resolved that Sir Brajendranath Seal and the Hon'ble Sir George Schuster be requested to accept the Honorary Membership of the Institute.

Proposed from the Chair.

Carried unanimously.

10. Resolved that thanks be accorded to Sir R. N. Mookerjee, for conducting the deliberations of this preliminary meeting.

Proposed by—Mr. D. P. Khaitan.

Seconded by—Rai A. C. Banerjee Bahadur.

} *Carried with acclamation.*

The Hon'ble Mr. P. H. Bronse stressed the necessity of going slowly in order to lay a sure foundation for the work of the Institute, and hoped that the Institute would gradually become really useful to the business community of India.

R. N. MOOKERJEE,

President.

P. C. MAHALANOBIS,

Hon'y. Secretary.

APPENDIX 3.

PROCEEDINGS OF THE MEETING DATED THE 29TH FEBRUARY, 1932.

The Second Meeting of the Indian Statistical Institute was held in the Board Room of Messrs. Martin & Co., 12, Mission Row, Calcutta, on Monday, the 29th February, 1932, at 3 p.m.

Sir R. N. Mookerjee, K.C.I.E., K.C.V.O., President of the Institute, sent word to the effect that owing to an attack of fever he was unable to attend the Meeting.

Prof. P. N. Banerjee, M.A., D.Sc. (*Minto Professor of Economics, Calcutta University*), Vice-President, presided:—

The following gentlemen were present:—

- Mr. S. Bose, M.Sc., *Late Statistician to the Government Agricultural Farm, Dacca.*
Mr. R. W. Brock, *Editor, "Capital," Calcutta.*
Mr. Duncan Campbell, *Manager, Chartered Bank of India, Calcutta.*
Sir J. C. Coyajee, Kt., M.A., I.R.S. (Retd.), *Late Principal, Presidency College, Calcutta.*
Mr. H. D. Ghosh, M.A., *Lecturer, Calcutta University.*
Mr. S. C. Ghosh, M.A., *Secretary, Council of Post-Graduate Teaching in Arts, Calcutta University.*
Mr. J. Gaha-Thakurta, M.A., *Statistical Laboratory, Presidency College, Calcutta.*
Mr. J. Reid Kay, (Messrs. James Finlay & Co., *Member, Committee of the Bengal Chamber of Commerce*).
Prof. P. C. Mahalanobis, B.Sc., M.A. (Cantab), I.R.S., *Professor, Presidency College, Calcutta.*
Mr. S. C. Majumdar, B.Com. (*Agent, Central Bank of India, New Market Branch; Member, Committee of the Bengal National Chamber*).
Mr. K. K. Mitter (*Member, Committee of the Bengal National Chamber of Commerce*).
Sir Hari Sankar Paul, Kt. (Messrs. Batta Kristo Paul & Co., *Vice-President, Bengal National Chamber of Commerce*).
Mr. P. Ray, M.Sc., *Statistical Laboratory, Presidency College, Calcutta.*
Mr. R. Sen, B.Sc., *Statistical Laboratory, Presidency College, Calcutta.*
Dr. H. Sinha, Ph.D., *Lecturer, Calcutta University.*
Mr. R. A. Towler (Messrs. Meleod & Co., *Member, Committee of the Bengal Chamber of Commerce*).

1. Proceedings of the First Meeting of the Indian Statistical Institute (already circulated) were confirmed.

2. The following Report of the Rules Committee (previously circulated) was placed before the meeting.

The Honorary Secretary explained that in accordance with the decision of the Rules Committee the financial clause (Section III, clause 6) was referred to Messrs. H. N. Datta & Co., Solicitors, Calcutta, for opinion. The solicitors have approved of the following clause, which should be incorporated in the body of the Rules as recommended by the Rules Committee.

"To accept gifts and donations, to invest the funds of the Institute, to borrow or otherwise raise money; to purchase, take on lease or otherwise acquire and to sell, give on lease, or otherwise dispose of movable and immovable properties, to incur expenditure and make all necessary financial arrangements for carrying on the work of the Institute.

He also stated that Mr. D. P. Khaitan (Messrs. Birla Bros.), a member of the Rules Committee, had suggested that the Institute should be registered, under Section 26 (Association not for profit) of the Indian Companies Act instead of under the Societies Registration Act, as recommended by the other members of the Rules Committee. The Chairman invited the opinion of the members present on this point. After a short discussion it was decided to accept the recommendation of the Rules Committee.

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Report of the Rules Committee.

1. At the first meeting of the Indian Statistical Institute, held on the 17th December, 1931, the following resolution was adopted:—

Resolved that an Indian Statistical Institute be started, and the following sub-committee with powers to co-opt be appointed to draw up the rules and submit the same for consideration at the next meeting:

Prof. P. N. Banerjea, Mr. D. P. Khaitan, Prof. K. B. Mahava, Prof. P. C. Mahalanobis (Convener), Dr. H. Sinha, and Prof. C. N. Vakil.

2. Three members of the Sub-Committee, Prof. P. N. Banerjea, Prof. P. C. Mahalanobis and Dr. H. Sinha met informally in early January to draw up the draft Rules for discussion.

The first meeting of the Rules Committee was held on the 18th January, 1931, with Prof. P. N. Banerjea, one of the Vice-Presidents, in the chair. Mr. R. A. Towler (Bengal Chamber of Commerce) and Prof. V. G. Kale (Poona) were co-opted members of the Rules Committee. Mr. D. P. Khaitan (Indian Chamber of Commerce) who was present at the meeting made many valuable suggestions.

3. The draft Rules as revised at this meeting were circulated among the members of the Rules Committee with the request that all suggestions should be sent to the Honorary Secretary by the 1st February, 1932. Prof. Mahava (Mysore) sent a note, which was considered in detail, and many of the suggestions were accepted after discussion among Prof. P. N. Banerjea, Mr. R. A. Towler, Prof. P. C. Mahalanobis, and Dr. H. Sinha. No suggestions were received from Prof. C. N. Vakil (Bombay) and Prof. V. G. Kale (Poona). The final draft was again circulated on the 20th February, 1932, and the Report was adopted at the Second Meeting of the Rules Committee which was held on the 29th February, 1932.

4. We submit the following recommendations:—

(i) We recommend that the Rules as per Schedule (A) be adopted.

(ii) We recommend the following scale of subscription:—

Ordinary Members	...	Rs. 15 a year
Associates	...	" 5 "
Life members	...	" 100 during the first two years.

Note.—It would probably be desirable to raise the Life Membership fee to Rs. 200/- after two years, with a rebate, for all ordinary members, of Rs. 10/- for each completed year's subscription subject to a minimum composition fee of Rs. 100/-. We, however, do not wish to make a definite recommendation at this stage.

(iii) We recommend that the Indian Statistical Institute be registered under the Societies Registration Act (Act XXI of 1860).

The following resolutions were then moved and adopted in connexion with the Report of the Rules Committee.

2 (a) Resolved that the Report of the Rules Committee be adopted.

Proposed by:—Mr. R. A. Towler
Seconded by:—Sir J. C. Coyajee } (Carried unanimously).

2 (b) Resolved that the annexed Rules of the Indian Statistical Institute as drawn up by the Rules Committee (previously circulated) be adopted with such verbal alterations as the Rules Committee may find necessary.

Proposed by:—Sir J. C. Coyajee
Seconded by:—Mr. Duncan Campbell } (Carried unanimously).

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2 (c) Resolved further that the Rules Committee be requested and authorized to take necessary action for having the Indian Statistical Institute registered under the Societies Registration Act (Act No. XXI of 1960).

Proposed by:—Mr. Reid Kay
Seconded by:—Sir J. C. Coysje } (Carried unanimously).

3. The following Report of the Journal Committee (previously circulated) was placed before the meeting.

Report of the Journal Committee.

1. At the first meeting of the Indian Statistical Institute held on 17th December, 1931, the following resolution was adopted:—

Resolved that a Journal Committee, consisting of the following gentlemen with powers to co-opt, be appointed to report on the possibilities of starting a Statistical Journal:

Mr. R. W. Brock, Prof. K. B. Madhava, Prof. P. C. Mahalanobis, Mr. C. L. Mehta and Dr. H. Sinha (Convener).

2. Professors Madhava and Mahalanobis exchanged a number of letters with persons interested in different branches of statistical researches, and Dr. Sinha attended the Indian Economic Conference at Bombay to elicit opinion regarding the Journal. The proposal to start a Monthly Economic Service (on the lines of the London and Cambridge or the Harvard Services) was carefully considered, but it was felt that it would be inopportune to undertake such an ambitious scheme at the present time.

3. The publication of occasional bulletins was also discussed. The Committee was unanimous in thinking that anything short of a Quarterly Journal would not serve the purpose of stimulating research and advanced studies in Statistics in India. The standard of production as regards both the contents and the form must be such as to win recognition in the scientific world.

4. After a careful enquiry into the cost of publishing such a Journal we are satisfied that the annual expenditure involved would not be less than Rs. 4,500/- a year.

During the first two or three years it is not likely that more than Rs. 1,500/- per year would be recovered from advertisement and subscriptions from abroad. This would leave a deficit of at least about Rs. 3,000/- a year.

With a membership of about 300, and a contribution of Rs. 10/- per member (each of whom will be supplied with a free copy of the Journal), it would be possible for the Institute to undertake the direct publication of the Journal.

5. We apprehend that the membership of the Institute is not likely to reach 300 during the first 2 or 3 years. We do not, therefore, consider it advisable for the Institute to undertake directly the publication of the Journal.

6. We are, however, of opinion that the publication of a Journal is essential for the proper functioning of the Institute.

7. We, therefore, recommend that steps be taken to try to induce some publisher to undertake the publication of an Indian Statistical Journal on the following lines:—

(i) The Publishing Firm to undertake the entire financial responsibility.

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- (ii) Each member of the Institute to be supplied with a copy of the Journal, the Institute contributing Rs. 10/- per member, with a minimum contribution of Rs. 500/- per year.
- (iii) The arrangement between the Institute and the Publishing Firm to be subject to termination on fifteen months' notice on either side.
- (iv) The whole arrangement to be subject to revision when the membership exceeds 300.

The following resolution was moved in this connexion.

Resolved that the Report of the Journal Committee be adopted, and the Journal Committee be requested to take necessary steps for carrying out their recommendations.

Proposed by:—Mr. R. W. Brock
Seconded by:—Mr. K. K. Mitter } (Carried unanimously).

4. Resolved that the following gentlemen be invited to serve on the Council of the Institute:—

- (1) Mr. N. S. Subba Rao, M.A. (Cantab.), Director of Public Instruction, Mysore.
- (2) Mr. S. N. Sen, M.Sc., Ph.D. (London), Meteorologist, Calcutta.
- (3) Mr. B. N. Mookerjee, M.A. (Cantab.), C/o Messrs. Martin & Co., Calcutta.
- (4) Mr. H. H. Durr, C/o Messrs. McLeod & Co., Calcutta.
- (5) Mr. A. R. Smith, C/o Chartered Bank of India, Calcutta.

Proposed by:—Mr. P. C. Mahalanobis
Seconded by:—Mr. Satis Chandra Ghosh } (Carried unanimously).

5. (a) Resolved that an account be opened with the Imperial Bank of India in the name of the Indian Statistical Institute.

Proposed by:—Sir Hari Sankar Paul, Kt.
Seconded by:—Mr. S. C. Majumdar } (Carried unanimously).

(b) Resolved that Sir Hari Sankar Paul, Kt., Hony. Treasurer, Indian Statistical Institute, be authorized to operate on the above account.

Proposed by:—Mr. R. A. Towler
Seconded by:—Mr. R. W. Brock } (Carried unanimously).

6. Resolved that the Hony. Treasurer and the Hony. Secretary be authorized to sanction expenditure up to a limit of Rs. 200/- for meeting preliminary expenses and the cost of registration pending the framing of a Budget by the Council of the Institute.

Proposed by:—Mr. Reid Kay
Seconded by:—Mr. Duncan Campbell } (Carried unanimously).

The Hony. Secretary stated that Sir George Schuster, K.C.M.G., C.B.F., and Sir Brajendra Nath Seal, Kt., M.A., Ph.D., had agreed to accept the Honorary Membership of the Institute, and that almost all the gentlemen invited to accept the Vice-Presidentship or membership of the Council had agreed to do so, and no refusal had so far been received.

PRAMATHA NATH BANERJEA,

Chairman.

P. C. MAHALANOBIS,

Hony. Secretary.

APPENDIX 4.

PROCEEDINGS OF THE MEETING DATED THE 3RD AUGUST, 1932.

The Third Meeting of the Indian Statistical Institute was held in the Board Room of Messrs. Martin & Co., 12, Mission Row, Calcutta, on Wednesday, the 3rd August, 1932, at 3 p.m.

Sir R. N. Mookerjee, K.C.I.E., K.C.V.O., President of the Institute, took the chair.

The following gentlemen were present:—

Prof. P. N. Banerjee, Minto Professor of Economics, Calcutta University.
Mr. E. C. Beathall, President, Bengal Chamber of Commerce
Mr. B. C. Chatterjee, Calcutta Port Trust.
Mr. S. K. Chitta Roy, Indian Audit & Accounts Service.
Mr. H. D. Ghosh, Lecturer, Calcutta University.
Mr. M. K. Ghosh, Principal, Government Commercial Institute.
Prof. P. C. Mahalanobis, Professor, Presidency College, Calcutta.
Mr. K. C. Mahindra, Messrs. Martin & Co., Calcutta.
Mr. G. L. Mehta, Member, Committee of the Indian Chamber of Commerce.
Sri Hari Sankar Paul, Messrs. Union Kristo Paul & Co.
Mr. R. N. Roy, Indo-Japanese Mercantile Association, Calcutta.
Prof. N. R. Sen, Ghosh Professor of Applied Mathematics, Calcutta University.
Dr. H. Sinha, Lecturer, Calcutta University.

1. Proceedings of the Second Meeting of the Indian Statistical Institute held on the 29th February, 1932 were confirmed.

2. Read a letter, dated the 23rd March, 1932 from Sir Phillip H. Browne resigning membership of the Council on account of his departure from India. Mr. Beathall stated that Sir P. H. Browne was due to return to India in January, 1932.

It was moved from the Chair that Sir P. H. Browne be requested to reconsider his resignation and the resolution was carried unanimously.

Resolved further that Mr. E. C. Beathall be elected a Vice-President of the Institute and a member of the Council.

Proposed by:—Sir H. S. Paul } *(Carried unanimously).*
Seconded by:—Mr. G. L. Mehta }

3. It was reported by the Honorary Secretary that an account had been provisionally opened with the Imperial Bank of India, Calcutta, but the Chief Accountant of the Bank had asked for specific resolutions in the form approved by them.

(i) Resolved that the Imperial Bank of India be and are hereby appointed Bankers to the Indian Statistical Institute.

Proposed by:—Prof. P. N. Banerjee } *(Carried unanimously).*
Seconded by:—Mr. E. C. Beathall }

(ii) Resolved that all cheques on the banking account be signed and all bills, notes and other negotiable instruments be drawn, accepted, and made on behalf of the Institute

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By the Honorary Treasurer, Sir Hari Sankar Paul or the Honorary Secretary, Prof. P. C. Mahalanobis.

Proposed by:—Mr. H. D. Ghosh
Seconded by:—Mr. B. C. Chatterjee. } (Carried unanimously).

(iii) Resolved that cheques, bills, notes, and other instruments payable to the Institute may be endorsed for the Institute by any one or more of the persons mentioned in the resolution No. 2 or by the Secretary of the Institute for the time being.

Proposed by:—Mr. G. L. Mehta
Seconded by:—Mr. M. K. Ghosh. } (Carried unanimously).

(iv) Resolved that a copy of these Resolutions, signed by the Chairman, be handed to the Bank, together with specimens of the necessary signatures.

Proposed by:—Mr. R. C. Benthall
Seconded by:—Prof. P. N. Banerjee } (Carried unanimously).

4. Considered the recommendations of the Journal Committee.

Resolved that the following arrangements made by the Journal Committee be confirmed:—

(i) The Journal will consist of about 400 Imperial or D/Demy 8vo. 400 pages (in 10 point and 8 point types with accented, mathematical, and numerical types as necessary) per year.

(ii) A copy of the Journal will be supplied free to each member of the Indian Statistical Institute ordinarily resident in India, for which the Institute will contribute at the rate of Rs. 10/- per year for each member subject to a minimum payment of Rs. 500/- per year. This arrangement will be subject to readjustment on the basis of the actual financial situation when the membership exceeds 300.

(iii) 40 pages per year will be reserved for the proceedings, and other communications of the Statistical Institute.

(iv) The price to non-members and advertisements rates etc., to be settled in agreement with the Institute by the Art Press.

(v) The Art Press will undertake the entire responsibility for printing and publishing, as well as for the business management of the Journal. The Editor will be responsible for all editorial work including preparation of the copy, correction of proof and correspondence with the contributors.

(vi) Prof. P. C. Mahalanobis has agreed to give a guarantee, in his personal capacity, to the Art Press to make good any losses sustained by the Art Press on account of the publication of the Journal.

(vii) The arrangement is to terminate on 15 months' notice on either side, or on the withdrawal of the financial guarantee by Prof. P. C. Mahalanobis.

(viii) In case of termination of the above arrangements the Art Press will be free to continue the Journal without, however, using the name of the Institute in any way.

(ix) At the request of the Journal Committee Prof. P. C. Mahalanobis has agreed to act as the Hony. Editor of the Journal.

Proposed by:—Mr. G. L. Mehta
Seconded by:—Mr. K. C. Mahindra } (Carried unanimously).

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5. The Honorary Secretary placed before the meeting certain draft Bye-laws relating to Local Branches and explained that these had been framed in consultation with Provisional Secretaries of the Local Branches. He further pointed out that in case Bye-law (iv) Clause (a) was passed, Rule 6 of the Institute would require consequential modification.

Resolved that the following Bye-laws regarding Local Branches be sanctioned.

BYE-LAWS FOR LOCAL BRANCHES.

(i) Each Local Branch will consist of not less than ten members of the Indian Statistical Institute resident in a particular area. Associates (who are not members of the Indian Statistical Institute) may also be elected on such condition as the Local Branches may think fit, but such Associates shall be debarred from participating in the Administration of the Local Branch in accordance with the Articles of Association of the Institute.

(ii) Each Local Branch will appoint a Local Secretary who will hold office for one year but will be eligible for re-election.

(iii) The Local Branch may appoint a Chairman and also other office-bearers and such Committees as it may consider necessary, and also frame such rules for its own guidance as it may think fit, provided such rules are not inconsistent with the Rules of the Indian Statistical Institute.

(iv) (a) Every Local Secretary and Local Chairman (when appointed) shall be *ex-officio* members of the Council of the Institute.

(b) If a member of the Local Branch who is an *ex-officio* member of the Council of the Institute is unable to attend a meeting of the Council, the Local Branch shall have the power to nominate a member of the Institute, as a substitute member of the Council to represent the Local Branch.

(v) An Annual Report will be prepared and forwarded to the General Secretary for incorporation in the Annual Report of the Institute. Quarterly Reports on the work of the Local Branch will also be forwarded to the General Secretary.

(vi) The Membership Fee of Rs. 15/- for members resident within the area covered by a Local Branch shall be allocated as follows:—

(a) Rs. 10/- for the Journal (a copy of which will be supplied free to each member of the Institute).

(b) Rs. 2/8/- for the Local Branch Fund.

(c) Rs. 2/8/- for the Institute Fund.

Each Local Branch will be free to raise such other funds as it may think desirable, but all such funds will be incorporated in its accounts. Special allocations to local Branch funds may be made from time to time out of the funds of the Institute at the discretion of the Institute.

(vii) The decision of the Institute or its Council shall be binding upon each Local Branch in all matters not specifically left to the discretion of the Local Branch, but in case of a difference of opinion between the Council and a Local Branch no final decision shall be made till an opportunity has been given to the Local Branch concerned to represent its views to the Institute and the matter has been discussed and decided at a general meeting of the Institute; provided that no action be taken by a Local Branch against the directions (if any) of the Council pending final decision of the question by the Institute.

Proposed by:—Prof. P. C. Mahalanobis }
Seconded by:—Sir H. S. Paul } (Carried unanimously).

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6. Resolved that a Local Branch be established at Mysore with Professor K. B. Madhava as its first Honorary Secretary, as soon as 10 members are enrolled.

Proposed by:—Prof. P. C. Mahalanobis } (Carried unanimously).
Seconded by:—Sir H. B. Paul.

7. Resolved that a Local Branch be established at Poona with Professor D. G. Karve as its first Honorary Secretary, as soon as 10 members are enrolled.

Proposed by:—Prof. N. R. Sen } (Carried unanimously).
Seconded by:—Mr. H. D. Ghosh.

8. Resolved that a Local Branch be established at Bombay with Professor C. N. Vakil as its first Honorary Secretary, as soon as 10 members are enrolled.

Proposed by:—Prof. P. N. Banerjee } (Carried unanimously).
Seconded by:—Prof. P. C. Mahalanobis.

9. Resolved that the following gentlemen be elected to the Council:—

Mr. W. A. Burns, M.A., Barrister-at-Law, *Chairman, Calcutta Port Trust.*

Prof. D. G. Karve, M.A., *Honorary Secretary, Poona Branch.*

Proposed by:—Prof. P. C. Mahalanobis } (Carried unanimously).
Seconded by:—Dr. H. Sinha.

10. The Honorary Secretary stated that it would be convenient if a small Working Committee were appointed under Rule 7 (d) of the Institute.

Resolved that a Working Committee be formed consisting of the President, Honorary Treasurer, Honorary Secretary, Honorary Joint Secretary, Honorary Secretaries of Local Branches (all *ex-officio*), and Messrs. P. N. Banerjee, D. B. Meek, D. P. Khaitan, N. R. Sen, and G. L. Mehta with powers to coopt two more members.

Proposed by:—Mr. E. C. Beethall } (Carried unanimously).
Seconded by:—Mr. K. C. Mahindra.

11. The Honorary Secretary pointed out the desirability of having the Institute affiliated with similar Institutes in other countries.

Resolved that the Hon. Secretary do initiate steps to get the Indian Statistical Institute affiliated with the Royal Statistical Society (London) and the American Statistical Association (New York).

Proposed by:—Prof. P. N. Banerjee } (Carried unanimously).
Seconded by:—Dr. H. Sinha.

12. The meeting terminated with a vote of thanks to the Chair moved by Prof. P. N. Banerjee.

R. N. MOOKERJEE,
President.

P. C. MAHALANOBIS,
Hon. Secretary.

APPENDIX 5.

PROCEEDINGS OF THE ANNUAL GENERAL MEETING

DATED THE 28TH APRIL, 1933.

The First Annual General Meeting of the Indian Statistical Institute was held in the Board Room of Messrs. Martin & Co., 12, Mission Row, Calcutta, at 3-0 p.m., on Friday, the 28th April, 1933.

Sir R. N. Mookerjee, K.C.I.E., K.C.V.O., President of the Institute, in the Chair.

The following gentlemen were present:—

Prof. P. N. Banerjee, M.A., D.Sc. (*Minko Professor, Calcutta University*)
Mr. S. S. Bose, M.Sc. (*Statistical Laboratory, Presidency College*).
Mr. N. Chakravarti, M.A. (Cantab.) (*Asst. Inspector of Factories*).
Mr. B. M. Chatterjee, M.A. (*Port Commissioners, Calcutta*).
Mr. H. D. Ghose, M.A. (*Lecturer, Calcutta University*).
Mr. J. V. Joshi, M.A. (Cantab.) (*Deputy Director, Commercial Intelligence Department*).
Prof. P. C. Mahalanobis, B.Sc., M.A. (Cantab.), I.E.S. (*Professor, Presidency College*).
Mr. K. C. Mahindra, M.A. (Cantab.) (*Messrs. Martin & Co.*).
Sir H. S. Paul, Kt. (*Messrs. Bata Kristo Paul & Co.*).
Mr. M. K. Powala (*Messrs. Tata Iron & Steel Co.*).
Prof. N. R. Sen, M.A., D.Sc. (*Professor, Calcutta University*).
Prof. S. N. Sen, M.A. (*Professor, Burdwan College*).
Dr. H. Sinha, M.Sc., Ph.D. (*Lecturer, Calcutta University*).
Prof. J. C. Sinha, M.A., Ph.D. (*Professor, Presidency College*).
Mr. R. A. Towler (*Messrs. McLeod & Co.*).

1. Proceedings of the General Meeting, dated 3rd August, 1932 (previously circulated), were confirmed.

2. Prof. P. C. Mahalanobis, Secretary, placed before the meeting the Annual Report and Accounts for 1932-33 (previously circulated). He reported that Mr. J. S. Henderson, Chartered Accountant, had kindly audited the Accounts.

(b) Resolved that the Annual Report and Accounts for 1932-33 be adopted.

(ii) Resolved that this meeting places on record its appreciation of the services of Mr. J. S. Henderson, Chartered Accountant, who had kindly agreed to serve as Honorary Auditor.

Proposed by—Mr. R. A. Towler.
Seconded by—Dr. J. C. Sinha. } Carried unanimously.

3. Resolved that Sir R. N. Mookerjee, K.C.I.E., K.C.V.O., be re-elected President of the Indian Statistical Institute.

Proposed by—Prof. P. N. Banerjee.
Seconded by—Mr. J. V. Joshi. } Carried with acclamation.

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4. Resolved that Prof. P. N. Banerjee, M.A., D.Sc., Sir E. C. Benthall, Kt., M.L.A., Dr. D. B. Meek, M.A., D.Sc., O.B.E., Sir C. V. Raman, D.Sc., F.R.S., N.I., Prof. M. N. Saha, D.Sc., F.R.S., Prof. C. D. Thompson, M.A., Sir T. V. Jiyaraghavacharya, K.B.E. and Sir M. Visvesvaraya, K.C.I.R., LL.D., D.Sc., M.I.C.E.

Proposed by—Sir Hari Sankar Paul. } Carried unanimously.
Seconded by—Dr. J. C. Sinha.

5. Resolved that Sir Hari Sankar Paul, be elected Honorary Treasurer for 1933-34.

Proposed by—Prof. P. N. Banerjee. } Carried unanimously.
Seconded by—Mr. K. C. Mahindra.

6. Resolved that Prof. P. C. Mahalanobis be re-elected Honorary Secretary, and Dr. H. C. Sinha be re-elected Honorary Joint Secretary for 1933-34.

Proposed by—Mr. R. A. Towler. } Carried unanimously.
Seconded by—Prof. P. N. Banerjee.

7. Resolved that the following persons be elected members of the Council for 1933-34.

Proposed by—Prof. P. C. Mahalanobis. } Carried unanimously.
Seconded by—Mr. S. D. Ghosh.

Prof. H. R. Batheja, M.A., I.E.S. (Pune University), Dr. G. S. Bose, M.B., D.Sc. (Calcutta University), Prof. S. N. Bose, M.Sc. (Dacca University), Mr. H. H. Burns (McLeod & Co., Calcutta), Mr. W. A. Burns, M.A. (Cantab.), Bar-at-Law (Port Commissioners, Calcutta), Sir J. C. Coorjee, M.A., I.E.S. (Madras), (Indira University), Mr. R. D. Cosmotic (Mercantile Bank of India, Calcutta), Dr. K. J. Das, M.D., C.I.B. (Principal, Lunatic Asylum, Calcutta), Mr. G. F. D. Saha, M.A., I.E.S. (Principal, Gauhati College, Assam), Prof. Satish Chandra Ghosh (Calcutta University), Mr. L. V. Hazarika (Baruah Shell Oil Ltd., Calcutta), Mr. J. S. Henderson (President, Bengal Chamber of Commerce), Mr. J. V. Joshi, M.A. (Deputy Director, Commercial Intelligence Department), Prof. V. G. Kale, M.A. (Fergusson College, Poona), Prof. D. G. Karve, M.A. (Fergusson College, Poona), Mr. Raji K. (Jewett Flitay & Co., Calcutta), Mr. D. P. Khanan (Hindu Bank, Calcutta), Prof. K. B. Madhava, M.A., A.I.A. (Mysore University), Mr. K. C. Mahindra, M.A. (Cantab.) (Horn & Co., Calcutta), Dr. John Mathai, D.Sc. (President, Tariff Board, Simla), Mr. G. L. Mehta, M.A. (Scindia Steam Navigation Co., Ltd., Calcutta), Prof. Radhakamal Mukherjee, M.A., Ph.D. (Lucknow University), The Hon'ble Mr. Ramdas Pantala (Madras), Mr. J. Ponnala (Tata Iron and Steel Co., Ltd.), Mr. T. J. Y. Roxburgh, B.A. (Cantab.), I.C.S. (District Judge, Alipore), Mr. Nalin Ranjan Sarkar (President, Bengal National Chamber of Commerce), Prof. N. R. Sen, D.Sc. (Calcutta University), Mr. B. M. Sen, M.A. (Cantab.), I.E.S. (Principal, Presidency College, Calcutta), Dr. S. S. Sen, M.Sc., Ph.D. (London) (Meteorologist, Calcutta), Mr. N. S. Sinha Rao, M.A. (Director of Public Instruction, Mysore), Prof. J. C. Sinha, M.A., Ph.D. (London) (Presidency College, Calcutta), Mr. Nann Sulekar, M.A. (Bombay), Mr. R. A. Towler (McLeod & Co., Calcutta), Mr. G. D. Tyson (Halter, Capital, Calcutta), Mr. M. Vaidyanathan, M.A. (Imperial Council of Agricultural Research), Prof. C. N. Vakil, M.A., M.Sc. (Bombay University).

8. Resolved that Prof. P. N. Banerjee, Prof. K. B. Madhava, Prof. P. C. Mahalanobis (Editor), Dr. D. B. Meek, Prof. N. R. Sen, Mr. T. J. Y. Roxburgh with Dr. H. C. Sinha as Secretary be appointed members of the Journal Committee.

Proposed by—Mr. R. A. Towler. } Carried unanimously.
Seconded by—Mr. K. C. Mahindra.

ANNUAL GENERAL MEETING (1933)

9. Resolved that Mr. J. S. Henderson be requested to serve as *Honorary Auditor* for 1933-34.

Proposed by—Sir Hari Sankar Paul. } *Carried unanimously.*
Seconded by—Dr. J. C. Sinha. }

10. Prof. P. C. Mahalanobis, Secretary, reported that in accordance with resolution No. 11 of the 3rd August, 1932, he had applied for enrolment of the Indian Statistical Society as a Corporate Member of the Royal Statistical Society of London, and this proposal had been unanimously approved by the Executive Committee of the Royal Statistical Society. It was now necessary to appoint a representative of the Institute.

Resolved that Prof. P. C. Mahalanobis be nominated representative of the Institute.
Proposed by—Mr. K. C. Mahindra. } *Carried unanimously.*
Seconded by—Mr. M. K. Puvvala. }

11. Resolved that this meeting places on record its appreciation of the services rendered to the Institute by retiring office-bearers and members of the Council.

Proposed by—Prof. J. C. Sinha. } *Carried unanimously.*
Seconded by—Mr. N. Chakravarti. }

R. N. MOOKERJEE,
Chairman.

P. C. MAHALANOBIS,
Hon. Secretary.