

# INDIAN STATISTICAL INSTITUTE

## EIGHTH ANNUAL REPORT, 1939-40\*

The present report gives a brief review of the activities of the Institute in the eighth year of its existence. There was rapid expansion in many directions; and, although the future was made to some extent uncertain owing to the outbreak of War, the work of the Institute proceeded, on the whole, without any interruption.

As in previous years grants for the statistical work were received from various sources, but the actual work was done on the unitary plan without any division of the staff into water-tight compartments. On the scientific side, the present report, therefore, covers the work done under different schemes.

### THE THIRD SESSION OF THE INDIAN STATISTICAL CONFERENCE, MADRAS-MYSORE, 1940.

The opening ceremony of the third session of the Indian Statistical Conference was held at 11 A.M. on the 3rd January, 1940 in the Senate Hall of the University of Madras. After Mr. V. V. Giri, Chairman of the Reception Committee, had welcomed the members, the Conference was declared open by His Excellency Lord Brinkine, the Governor of Madras. Prof. Harold Hotelling then gave his Presidential Address; Prof. P. C. Mahalanobis presented the Annual Review; and Prof. P. J. Thomas, on behalf of the Madras Branch of the Indian Statistical Institute, moved a vote of thanks. In the evening of the same day there was a public discussion presided over by Mr. V. V. Giri, in which Mrs. S. Hotelling, Mr. A. C. Mukherji, Prof. P. J. Thomas, Prof. H. Hotelling, Prof. P. C. Mahalanobis and others participated.

The first scientific session presided over by Prof. Hotelling was held in the morning of Thursday the 4th January, 1940 when a number of papers were presented. On the same day at 11 A.M. there was a discussion on "Crop Forecasts and Crop Estimating Surveys" at a joint meeting with the Section of Agriculture of the Indian Science Congress which was presided over by Sir T. Vijayaraghavachari, and in which Prof. Hotelling, Prof. Mahalanobis and others participated. In the evening there was a public discussion on "Census and Population Statistics" presided over by Mr. M. W. M. Yeatts, C.I.E., I.C.S., Census Commissioner with the Government of India, in which Prof. P. J. Thomas, Mr. A. C. Mukherji, Prof. Hotelling, Prof. Mahalanobis, and others participated.

The second scientific session was held in the morning of the 5th January, which was followed by a joint meeting with the Section of Mathematics and Physics of the Indian Science Congress presided over by Sir C. V. Raman. Prof. P. C. Mahalanobis opened the discussion with a short introductory speech on the "Statistical Planning of Surveys"; and was followed by Mr. R. C. Bose who gave a general review of the "Mathematical Theory of the Design of Experiments". A large number of persons including Sir C. V. Raman, Prof. Hotelling, Dr. Vaidyanathaswamy, Mr. K. R. Nair and others participated in the discussion.

Besides the scientific meetings there were also a number of pleasant social functions such as a dinner arranged by the Reception Committee on the 3rd January, the Hon'ble Mr. M. C. M. Chidambaram Chettyyar's At Home on the 4th January, the Garden Party at the Government House on the 5th January, and a number of excursions to places of interest in Madras.

On the night of the 5th January the delegates left Madras and arrived at Mysore on the morning of the 6th January. The delegates, who were all treated as guests of the University of Mysore during their stay in Mysore, were received at the station by volunteers and members of the University. After breakfast in camp, the first academic session in the Maharaja's College was opened in the afternoon with a short speech of welcome by Rajakaryavrinna N. S. Subba Rao, Vice-Chancellor of the University; short speeches were given by Prof. Hotelling, Mr. Yeatts, Mrs. Hotelling, Dr. P. J. Thomas, Prof. Mahalanobis; and a number of interesting papers were presented. In the afternoon

\* Adopted at the Annual General Meeting of the Indian Statistical Institute held on the 22nd April, 1940.

there was an "At Home" at the University, after which the delegates left by cars for Krishnarajasagara where a most enjoyable evening was spent.

On the morning of the 7th January there was another full scientific session presided over by Prof. Hotelling at which a number of papers were read followed by brisk discussions in some cases. After tea in Camp, visits were arranged in the Palace, Seringapatam, Chamundi Hill and other places of local interest; and after dinner at night the delegates left Mysore by train. The programme in Mysore was carefully prepared, and all arrangements were perfect in every detail; and our best thanks are due to the Government and the University of Mysore for their most generous hospitality. Our thanks are also due to the Madras Branch and the Reception Committee for the excellent arrangements for the Conference at Madras.

#### PROFESSOR HAROLD HOTELLING'S VISIT TO INDIA.

Prof. R. A. Fisher's visit to India in 1937-38 at the invitation of the Indian Statistical Institute was so successful that it was decided to continue the practice of inviting distinguished foreign statisticians to visit India from time to time; and early in 1939 arrangements were made for Prof. Harold Hotelling of the Columbia University, U. S. A., to come to India as the Visiting Professor of the Institute for 1939-40. He arrived in Bombay on the 15th December, 1939 and sailed from there on the 18th March, 1940 after a stay of over three months in this country.

Prof. Hotelling gave one lecture at the University of Bombay on the 16th December and immediately left for Calcutta where he arrived on the 18th December. He had a consultation with the Indian Central Jute Committee on the 21st December; after a short visit to Darjeeling he came back to Calcutta on the 26th December. He left for Madras on the 30th December, and presided over the Madras and Mysore Sessions of the Indian Statistical Conference from the 3rd till the 7th January, 1940; gave two lectures at the Mysore University on the 8th and 9th January; three lectures at the Madras University between the 11th and 13th January; and four lectures at the Andhra University between the 16th and 18th January. He returned to Calcutta on the 19th January, and halted there for nearly five weeks. He gave a lecture at the All-India Institute of Hygiene on the 25th January, a lecture at the Presidency College on the 9th February, and a series of six lectures on mathematical economics at the Calcutta University, and about nine or ten lectures on various statistical topics in the Statistical Laboratory; he also conducted advanced seminars and discussions with the workers and visitors from outside the Laboratory. During his stay in Calcutta he met a large number of persons and had several consultations with the officials of the Government of Bengal and the Indian Central Jute Committee. He visited Santiniketan on the 20th February; and left Calcutta finally on the 24th February.

After short halts at Benares and Allahabad he visited the Imperial Institute of Sugar Technology at Cawnpore on the 26th February; halted two days at Lucknow where he gave a lecture at the University, and had a conference with the government officials at the Secretariat. He went to Agra on the 28th February, and Delhi on the 1st March where he gave a lecture at the University on the 2nd March and had consultations with the officials of the Imperial Council of Agricultural Research. He was in Lahore from the 4th to the 6th March; gave three lectures at the University of the Punjab, and also met the members of the Board of Economic Enquiry. He returned to Delhi on the 7th and halted there till the 9th March; and had interviews with a large number of high officials of the Government of India. He reached Bombay on the 11th March, gave a lecture at the Bombay Branch of the Institute, and left by air to pay a short visit to Hyderabad where he discussed statistical questions with the Director of Statistics. After visiting Aurangabad he returned to Bombay on the 14th March; gave two lectures at the University; had a consultation with Government officials at the Secretariat; and finally sailed from India on the 18th March, after a stay of more than three months.

Prof. Hotelling was accompanied throughout the tour by Mrs. Hotelling who was herself a lecturer in statistics in a College in New York. Mrs. Hotelling actively participated in the proceedings of the Madras and Mysore session of the Statistical Conference, gave lectures at the Mysore, Madras and Andhra Universities and also at Calcutta and Delhi; and helped generally in connexion with many of the consultations with Prof. Hotelling.

During his stay in India Prof. Hotelling met many high officials; he had the honour of interviews with H. E. the Viceroy of India, H. E. the Governor of Madras, H. E. the Governor of the United Provinces; and he saw many of the Hon'ble Members of the Executive Council of the Government of India, Hon'ble Ministers of different Provinces and Indian States, and a large number of government officials who consulted him in various statistical matters. He also had the oppor-

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tunity of meeting Mahatma Gandhi at Calcutta, Rabindranath Tagore at Santiniketan, Pandit Jawaharlal Nehru at Allahabad, and other representative public men of India.

Prof. Hotelling's visit was of great value to India in many ways. He gave expert help and advice in regard to a large number of specific schemes and projects of national importance; stimulated interest in mathematical economics and statistics by his lectures at the different Universities; and made valuable suggestions for further researches during discussions with advanced workers at Calcutta and other places. His visit established personal touch between workers in India and the United States which is bound to have a beneficial effect on the organization of research in India in future through the fruitful exchange of ideas.

It is gratifying to note that in arranging Prof. Hotelling's visit we received the active support of the Governments of India, Bengal, Bombay, the United Provinces, Hyderabad, Mysore, and Travancore, and also of the Indian Central Jute Committee and practically all the important Universities of India. Our best thanks are due to the private hospitality provided for Professor and Mrs. Hotelling by the Governments of Hyderabad and Mysore, Pandit Jawaharlal Nehru at Allahabad, the Hon'ble Mr. S. N. Roy, I.C.S., at New Delhi, Mr. R. C. Srivastava at Cawnpore, Mr. V. Sahay, I.C.S., at Lucknow, Prof. L. C. Jain at Lahore, and Prof. J. Maclean at Bombay. Prof. and Mrs. Hotelling stayed at the guests of Prof. and Mrs. P. C. Mahalanobis in Calcutta.

We are glad to note that the greater part of the expenses incurred in connexion with Prof. Hotelling's visit would be met from contributions already received for this purpose and from the contribution of Rs. 3,000 sanctioned by the Government of India which would be received during 1940-41. At the time of writing this report certain small contributions were still outstanding from one or two places; it was clear, however, that the net deficit which would have to be met from the General Fund of the Institute would in any case be considerably less than Rs. 1,000; from the financial point of view the present scheme was thus quite successful. In fact had it not been for the outbreak of War the financial position would have been much better and no deficit would have been incurred at all. Owing to the fall in the exchange there was a loss of about one thousand rupees in making payment of passage expenses in dollars. As Prof. Hotelling came to India by the Pacific route it had been originally arranged that he would come direct from Singapore to Calcutta; owing however to the suspension of connected sailings, he was obliged to come by sea from Singapore to Bombay, and from there by train to Calcutta; this made certain changes in the plan necessary which increased appreciably travelling expenses in India.

### RESEARCH AND SPECIAL REQUIREMENTS.

On the theoretical side emphasis has been given as in previous years, to fundamental advances rather than to the elaboration of complicated formulae or detailed discussion of hypothetical special cases; and on the applied side, to the application of statistical methods in solving problems of national welfare.

*D<sup>2</sup>Statistic.* A good deal of progress has been made in the theory of the  $D^2$ -statistic or "Mahalanobis's generalized distance" as Prof. R. A. Fisher calls it. In earlier work it had been assumed that the two populations from which the samples are drawn have the same dispersion (that is, the same set of variances and covariances) but differ only in the means for the different characters. The question of unequal dispersions for different values of population variances and covariances has been investigated; and in the  $p$ -variate problems it has been shown by S. N. Roy that an appropriate measure of the divergence is given by  $p$  different statistics.

*Theory of the Design of Experiments.* Important advances have been made in the theory of designs of experiments in various directions mainly by R. C. Bose who gave the general theory of the construction of balanced incomplete block designs by which he not only worked out all the known solutions previously given by Fisher and Yates but also obtained a number of new solutions. He has discussed a more general class of designs known as partially balanced incomplete block designs which include the balanced incomplete block and quasi-factorial designs as special cases; and it is expected that this generalization will yield a number of new designs of practical importance. Important advances have been made by him in the theory of non-Galois type of hyper-Graeco-Latin squares in respect of interchangeability of rows or columns and the detection of any system of finite algebras which may be associated with such squares. More detailed work on special problems in the design of experiments was done by K. R. Nair and K. Kishen.

*Sample Census of Jute.* Considerable progress has been made in developing an efficient technique for the sample census of the area under jute in Bengal which was started in 1937-38. Extensive

exploratory surveys on the field were carried out in 1939 on the basis of which the variance and cgt functions were studied in detail in the Statistical Laboratory. It was found that on the whole sampling units of size from 2-acre to 9-acre were likely to be more efficient than units of larger size in the sense of giving a higher accuracy in the final results at the level of expenditure proposed to be incurred in the work; the question of density or number of sampling units in the different districts was also settled approximately. A detailed report "On the Sample Census of Jute in 1939" was prepared on the basis of which the Jute Census Committee sanctioned a scheme for a large scale sample census in 1940 in eight important jute districts (Mymensingh, Dacca, Tipperah, Rajshahi, Raopur, Nadia, Bogra and Jessore) covering about 23,000 sq. miles at a cost of about one lakh and thirty thousand rupees out of which a block grant would be given to the Institute for the statistical portion of the work. The field work was conducted in 1939 under the general supervision of the Director of Land Records, Bengal; as the continuance of this procedure was not practicable owing to administrative reasons it was decided that the field work this year would be carried on under the technical direction and supervision of the Honorary Secretary of the Indian Statistical Institute.

At the request of the Jute Census Committee the scheme for the sample census of jute was examined by Professor Harold Hotelling who presented a written report on the subject in which he generally approved of the statistical methods used in the work; and stated at one place:—

"In the United States there have been many efforts by the Bureau of Agricultural Economics and others to estimate crop acreage by various methods. The view which has now come to prevail in that Bureau, and which is being made the basis at present for investigation of possible techniques, is that random sampling is the most economical and efficient procedure. However no technique of random sampling has, so far as I can find, been developed in the United States or elsewhere which can compare in accuracy or in economy with that described by Professor Mahalanobis."

*Crop Estimating Surveys.* For a crop forecast it is, however, not sufficient to have accurate estimates of area alone; it is also necessary to know the yield per acre regarding which unfortunately very little reliable information is available in this country. The point to be emphasized in the present connexion is the fact that crop-estimating surveys must be organised on an extensive scale covering whole provinces comprising areas of the order of sixty or seventy thousand square miles or more; and also that the work has to be repeated from year to year. There is urgent need, therefore, of developing a suitable technique for doing this at a reasonable cost; and the sampling method offers the only possible line of advance.

It is gratifying to note that this subject is receiving a great deal of attention throughout India. The Honorary Secretary had the opportunity of discussing this question at the meeting of the Sugar Committee and other committees of the Imperial Council of Agricultural Research held in Simla in May 1939. He prepared a scheme for work on sugarcane in the United Provinces for which a grant of Rs. 50,000 spread over three years has been sanctioned by the I. C. A. R.; a similar scheme was prepared for work on wheat which also has recently received the sanction of the U. P. Government. The work on both sugarcane and wheat will be started in 1940 and will be carried on under technical guidance of the Honorary Secretary; and the whole of the statistical portion of the work will be done in the Statistical Laboratory.

The Honorary Secretary attended the meeting of the Indian Central Cotton Committee held in Bombay in July 1939, and prepared a scheme for a crop-estimating survey on cotton to be conducted in six or seven provinces on a co-ordinated all-India basis. This scheme, which was circulated in 1939 among different provinces and Indian States interested in the matter, will be considered at the next meeting of the Indian Central Cotton Committee in July 1940.

At the request of Government of Bengal work was started during the year under review on the statistical analysis of extensive crop-cutting experiments on paddy conducted in 1938-39 in the Burdwan-Hooghly-Howrah Flushing and Irrigation Area covering roughly one thousand square miles. A detailed scheme with an appropriate field design was prepared for studying the variance and cost function in the same area during the 1939-40 season; but changes in the field design were made without reference to us which have to a great extent reduced the value of the material for the purposes which we had originally in view. A scheme was also prepared for intensive crop-cutting experiments on paddy in an area of about one thousand square miles in Mymensingh for revenue purposes; and work has been started on the analysis of the material. Block grants were sanctioned by the Government of Bengal for all this work; and first instalments of the grants were received during the year under review.

*Regional Sample Survey of Sugarcane Pests.* A scheme was prepared for a sample survey of sugarcane pests on an all-India basis by the Imperial Institute of Agricultural Research for which

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# grant of nearly two lakhs of rupees was sanctioned by the Imperial Council of Agricultural Research. Work on this scheme has been already started; and it has been arranged that the whole of the statistical work will be done in the Statistical Laboratory for which a block grant to the Institute has been sanctioned. This is the first survey of its kind in India, and is an essential step in developing adequate methods of control against sugarcane pests which, it is estimated, damage the sugarcane crop in India to the extent of eight or ten crores of rupees every year.

*Diet Survey in Calcutta.* In 1939 a special diet survey was organized in Calcutta and information was collected for over twelve hundred middle-class families with the help of a special grant from the Indian Tea Market Expansion Board. A report on the prevalence of drinking of tea among middle-class Indian families in Calcutta was prepared by the Honorary Secretary which appears to have been highly appreciated by the Indian Tea Market Expansion Board. A good deal of valuable material for family budgets as well as for other economic and social questions have been collected in the course of this enquiry; and it is hoped that it would be possible to undertake a detailed analysis of the material at an early date.

*Labour Statistics.* A scheme for the tabulation and analysis of the data collected during a recent labour enquiry at Cawnpore was prepared at the request of the Bureau of Economic Intelligence of the United Provinces. A scheme was also prepared for a proposed enquiry into the family budgets of textile labourers at Indore at the request of the Department of Statistics of H. H. the Maharaja Holkar's Government.

A Note was prepared on the need of standardization of Labour Statistics which was circulated by the Secretary to the Department of Labour of the Government of India and was considered at the Conference on Labour Problems convened by the Government of India in New Delhi in January 1940.

The Honorary Secretary was appointed a member of the Bengal Board of Economic Enquiry and also of its Labour Enquiry Sub-committee which was requested to prepare a scheme for an extensive labour enquiry in Bengal. At the suggestion of the Honorary Secretary an exploratory survey was organized from the Statistical Laboratory at Howrah and Kankarpara on the basis of which a scheme was prepared for a comprehensive enquiry into budgets and other questions relating to working class families in Bengal. This scheme was unanimously approved at a meeting of the Labour Enquiry Sub-committee held in February 1940.\*

*Other investigations.* Among other work in economic and business statistics may be mentioned the following papers which were presented before the Madras session of the Conference: "Index of business activity in India" by P. R. Ray and H. C. Sinha; "Scales of equivalence in family budget enquiries" by V. G. Pendharkar; and "Some problems in field operations in labour enquiries" by A. N. Bose.

A good deal of work has been done on various other topics. K. R. Nair has considered the use of the median in statistical tests and certain topics in the analysis of statistical data and fitting of parabolic curves. An interesting application of the method of non-linear regression was made by P. C. Mahalanobis and K. R. Nair for a critical analysis of extensive material on differential linen collected by Dr. G. Pal of the University College of Science. J. Roy was engaged on studies in the frequency distribution of words in Bengali text-books as a part-time worker. Mahesul Ganguli prepared a detailed report on crop-cutting experiments on wheat in U. P.; and Mrs. Chumeli Bose was engaged on an extensive and comprehensive correlational analysis of anthropometric measurements of Bengali castes and tribes. S. Sen Gupta worked on a number of applied problems including the analysis of agricultural field experiments. Sasidhanu Datta was engaged in making a critical study of errors of observations in physical measurements for which a great deal of experimental material had been collected in collaboration with other workers.

### STATISTICAL ENQUIRIES.

As in the previous years, a large number of enquiries from all parts of India were attended to during the year under review. The distribution by subjects and by provinces is given below:—

*By Subjects.*—Agriculture 78; Anthropology 2; Economics and Business Statistics 13; Education 4; Forest Research 6; Industry 7; Mathematical Statistics 9; Medical 13; Meteorology and Irrigation 7; Miscellaneous 8; Total 148.

*By Provinces.*—Assam 10; Bengal 52; Bihar 4; Bombay 5; C. P. 1; Central 24; Madras 5; Orissa 2; Punjab 12; Sind 6; U. P. 25; Others 2; Total 148.

\* The scheme was approved by the Bengal Board of Economic Enquiry on the 26th April 1940 and is now awaiting sanction by the Government of Bengal.

## TRAINING SECTION.

During the last seven years more than one hundred and fifty officers on deputation and advanced workers from the Government of India, various Provinces and Indian States and also from Universities and educational and scientific institutions came to the Laboratory for short courses of training extending from one month to one year. During the year under review sixteen officers from Assam, Bengal, Bombay, Burma, Hyderabad (Deccan), Government of India, Indore, Punjab, Travancore and the United Provinces worked in the Laboratory under this scheme. Dr. U. S. Nair, Ph.D. (London) in statistics came on special deputation from the University of Travancore to attend the advanced seminars conducted by Prof. Hotelling. A complete list of officers on deputation is given in an Appendix.

The demand for advanced training in statistics from other qualified persons became so great that in spite of our limited resources we were obliged to start a training class from July 1939; and systematic lectures numbering about seven per week besides supervised practical work were started from September 1939. A list of the advanced workers admitted to the training class is given in an Appendix. It will be noticed that all the candidates were either M.A.'s or M.Sc.'s or had passed the B.A. or B.Sc. examinations with Honours; three of them were receiving post-graduate research scholarships from their respective provinces which were made tenable for work in the Statistical Institute.

The Prospectus of Courses of Training in Statistics was carefully revised and after approval by the Council in July 1939 was issued in a printed form.

There is urgent need of organizing advanced instruction in statistics in India; and we are trying to do what we can in this matter, but in the light of the experience gained in the training section during the year under review it has become clear that it would be difficult with our present resources to cope with more than half a dozen regular students in the training class.

## VISITORS.

As in previous years a large number of visitors came to see the work of the Institute among whom the names of the following persons may be specially mentioned:

Dr. S. K. Banerjee, *Off. Director General of Observatories, India*; Mr. R. W. Bastin, I.C.S., *Settlement Officer, Mysore*; Mr. S. Basu, I.C.S., *Secretary, Imperial Council of Agricultural Research*; Mr. J. M. Bottomley, C.I.E., I.B.S., *Director of Public Instruction, Bengal*; Mr. P. H. Carpenter, *Director, Tocklai Tea Experimental Station of the Indian Tea Association, Assam*; Mr. E. T. Cordwell, *Messrs. Hind & Co., Calcutta*; Mr. C. D. Deshmukh, I.C.S., *Secretary, Reserve Bank of India*; Mr. Alfred E. Flubson, *Ethnologist, White Plains, N.Y., U.S.A.*; Dr. J. B. Grant, *Director, All-India Institute of Hygiene & Public Health, Calcutta*; Mr. C. J. Harrison, *Tocklai Tea Experimental Station, Assam*; Mr. P. M. Kharegat, I.C.S., *Vice-Chairman, Imperial Council of Agricultural Research*; Mr. H. Lewis, *Vice-Consul, U.S.A., Calcutta*; Mr. W. A. Lewis, I.C.S., *Labour Commissioner, Bengal*; Mr. D. L. Mazumdar, I.C.S., *Special Officer, Finance Department, Bengal*; Mr. G. L. Mehta, *Manager, Sindhia Steam Navigation Co., Calcutta*; Prof. Radhakamal Mukerjee, *University of Lucknow*; Mr. C. R. Nodder, *Secretary, Indian Central Jute Committee*; Mr. and Mrs. Kodanda Rao, *Servants of India Society*; Mr. John Sargent, *Educational Commissioner with the Government of India*; Rai N. C. Sen Bahadur, *Director of Land Records & Surveys, Bengal*; Mr. S. C. Sen, *Quinologist, Manipal*; Hon'ble Sir James B. Taylor, Kt., C.I.E., *Governor, Reserve Bank of India*; Mr. G. W. Tyson, *Editor, 'Capital'*.

## THE STATISTICAL STAFF.

Rajchandra Bose, the Senior Statistician of the Laboratory, resigned his post in January 1940 in order to accept a permanent post in the department of pure mathematics in the Calcutta University. He did distinguished work on the theory of generalized distance; and recently he opened an altogether new field for research in the theory of design of experiments by a brilliant application of finite hyperspace geometry and the theory of Galois fields and finite algebra. His researches have attracted a great deal of attention outside India; and he has already won for himself an international reputation in theoretical statistics; fortunately his connexion with the Institute as a scientific worker will continue as before. Samarendranath Roy, who was confirmed on the recommendations of the Federal Public

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Service Commission in October 1939 as Statistician under the I. C. A. R. scheme in the vacancy caused by the death of Subhendu Sekhar Bose, continued his theoretical researches on the D-statistic; and made significant advances which anticipated in a remarkable manner important investigations on the subject by Prof. R. A. Fisher himself and which has attracted appreciative notice outside India. K. Raghuvaran Nair, who had been officiating as Assistant Statistician in the I. C. A. R. scheme and who was appointed Statistician in the vacancy caused by the resignation of R. C. Bose, was engaged in both theoretical and applied researches on a number of topics. K. Kishen and A. N. Bose, both of whom joined the Statistical Laboratory in 1938, continued their work respectively on agricultural field experiments and labour and socio-economic enquiries.

A number of younger statisticians started work during 1939. V. G. Pendharkar joined the Laboratory as an honorary worker in 1936 with a degree from the London School of Economics; and became a whole time research worker from July 1939. S. Sen Gupta, who had worked in the Statistical Laboratory for two years before going to England and who took his degree in Statistics from London in 1938, joined the staff in July 1939; he was appointed an honorary lecturer in statistics in the Department of Post-graduate Teaching of the Calcutta University from August 1939; and Assistant Statistician in the I. C. A. R. scheme from January 1940 in the place of K. R. Nar. Mahabul Ganguli, who took his degree in Statistics from London in 1939, started work in August 1939. Mrs. Chameli Bose, who also took her degree in Statistics from London in 1939, joined the Laboratory in September 1939; she is the first woman in India who has taken up statistics seriously as a vocation and we hope she will be able to do useful work in this field. All the four new workers are helping generally in attending to enquiries, special investigations, training classes and administration; and all of them are proceeding with original researches on selected subjects.

### RESEARCH GRANT FROM THE GOVERNMENT OF INDIA.

An additional recurring grant of Rs. 10,000 per year had been sanctioned by the Government of India from April 1938 but was kept in abeyance during 1938-39 owing to the sudden deterioration in the financial position; as a result of representations made in this matter the grant was restored with effect from April 1939. In accordance with the condition of the grant the Standing Research Committee was reconstituted as follows:—

(1) Dr. Nazir Ahmad, Director, Cotton Technological Institute, Matunga, Bombay; (2) Prof. G. S. Bose, Head of the Department of Psychology, Calcutta University; (3) Prof. S. N. Bose, Professor of Physics, Dacca University; (4) Mr. P. H. Carpenter, Chief Scientific Officer, Teoklai Tea Experimental Station, Assam; (5) Dr. T. E. Gregory, Economic Adviser to the Government of India (Nominated by the Government of India); (6) Prof. K. B. Madhava, Professor of Mathematical Economics and Statistics, Mysore University; (7) Dr. John Mathai, Director General of Commercial Intelligence and Statistics, India; (8) Dr. C. W. B. Normand, Director General of Observatories, India; (9) Mr. John Sargent, Educational Commissioner with the Government of India (Nominated by the Government of India); (10) Prof. N. R. Sen, Head of the Department of Applied Mathematics, Calcutta University; with (11) Prof. P. C. Mahalanobis as member and Secretary of the Committee.

A Note on the Research Programme and Staff was circulated by the Secretary in September; and a meeting of the Standing Committee was held on the 13th October 1939, which was presided over by Mr. P. H. Carpenter and was attended by Prof. G. S. Bose, Prof. S. N. Bose, Mr. John Sargent and Prof. N. R. Sen. Written notes had also been sent in by Dr. T. E. Gregory and Prof. K. B. Madhava. It was unanimously agreed that the training class should be continued, but the general opinion was that there should not be too rapid an expansion in the number of students; and that every effort should be made to maintain a high standard. After a careful consideration of the whole question it was unanimously agreed that the research programme should include advanced studies and researches in mathematical and theoretical statistics with applications to economic, medical and public health, biometric and educational problems. The proposal to place members of the research staff on deputation from time to time for work on special schemes was approved, and the Secretary was authorized to make such temporary and part-time arrangements as may be necessary.

The Committee also approved of the proposal for the appointment of five Research Fellows. The posts were advertised in Calcutta, Madras, Bombay, Allahabad, Lahore, and Lucknow. A large number of applications were received which were carefully scrutinized; and Atindra Nath Bose, M.A. (Premchand Roychand Research Student, Calcutta University), Mrs. Chameli Bose, B.Sc. in statistics (London), Mohanlal Ganguli, B.Sc. in statistics (London), Kunwar Kishen, M.A. (Punjab), and V. G. Pendharkar, B.Sc. in economics with statistics (London), who all had experience of actual statistical work in the Institute, were awarded Research Fellowships of Rs. 100 per month from

1st April 1940 for one year in the first instance. Two candidates, N. T. Malhotra, B.A. Hona. (Delhi), and Ram Deva Narain, M.A. (Agra), were awarded scholarships of Rs. 50 each per month for one year.

At the suggestion of Mr. Sargent it was agreed that a scheme should be prepared for the stabilisation of the Institute and circulated among members of the Standing Committee. The Honorary Secretary had the opportunity of discussing this question with the Hon'ble Sir Girja Shankar Bajpai; and it is believed that a scheme prepared by Dr. T. B. Gregory at the instance of the Government of India in 1938 was being examined by the Department of Education, Health and Lands.

#### STATISTICAL LIBRARY.

Jitendra Salia was appointed as whole-time Librarian and the Library was re-organized during the year under review. The number of books purchased during the year was 118; the number of books received for review in *Sankhyā* was 43; and 250 periodicals were received mostly in exchange of the journal. The Library remained open for 249 days and the number of books issued was 4830. The author catalogue has been completed; and a subject catalogue is being prepared. A special card-index for current periodicals and annual reports on a geographical basis with cards of different colours for different types of periodicals has proved very useful. A bulletin is circulated in the first week of every month giving a list of recent additions to the Library with miscellaneous notes; a weekly note is also circulated giving names of important articles contained in periodicals received during the previous week. The Library Rules were revised and brought into operation during the latter part of the year.

#### EXTENSION WORK.

During the year under review the Honorary Secretary visited many places outside Calcutta in connexion with his work in statistics. He took leave from the Government of Bengal in April 1939 and went to New Delhi at his own expense to see Sir James Grigg (then Finance Member of the Government of India) and other government officials in connexion with the grant to the Institute. In his way back, he visited the Imperial Institute of Sugar Technology at Lucknow; and also went to Lucknow where he had discussions with government officials regarding a number of schemes in the United Provinces. At the end of May 1939 he attended the meeting of the Sugar Committee and of the Advisory Board of the I. C. A. R. held in Simla; and in June he went to Mysore where he had discussions with the Director of Agriculture, U. P.; on his way back, he had discussions with officers of the Imperial Institute of Forest Research, Dehradun, regarding the application of statistics in forest research.

He again took leave for one month to attend meetings of the Indian Central Cotton Committee in Bombay in July 1939, and to visit Poona, Mysore, Bangalore and Madras in connexion with the work of the Institute; he gave one lecture on "Statistics" at the Mysore Branch of the Institute; and one lecture on "Statistics in Relation to Pure Mathematics" at Bangalore at the inaugural meeting of the Mathematical Society of the University which was presided over by Sir C. V. Raman. He also saw many University and State officials including the Hon'ble Sir Mirza Ismail, the Dewan of Mysore, in connexion with arrangements for the Mysore session of the Statistical Conference. At Madras he had interviews with many of the Hon'ble Ministers, including Messrs. C. Rajagopalachariar (Prime Minister), V. V. Giri, S. Ramanathan, Dr. P. Subbarayan, and saw a large number of other persons in connexion with the work of the Conference. He gave a lecture on the "Administrative Use of Statistics" at a meeting of the Madras Branch which was presided over by Mr. S. Ramanathan (Minister for Public Information). At Poona he had interviews with many of the Hon'ble Ministers, Parliamentary Secretaries and permanent officials including Mr. B. G. Kher (then Prime Minister of Bombay), Dr. M. D. Gilder, Dr. Sorley, Mrs. Hansa Mehta, Mr. Jyengar etc. As a result of these interviews it was possible to secure the active support of the Government of Bombay in the work of the Institute in various ways. He gave one lecture at a symposium held in the Meteorological Office, Poona; and a lecture at the Poona Branch of the Institute held in the Servants of India Society. He had a long discussion at Poona with Mr. Galgil regarding economic surveys; and met Principal D. G. Karve, the Secretary of the Poona Branch of the Institute, at Miraj. He then returned to Bombay and halted there for nearly a week during which he saw the Secretary and other officials of the National Planning Committee; and looked into the work of the Bombay Labour Office where he had several discussions with the Assistant Commissioner of Labour. He also actively helped in the re-organization of the Bombay Branch; gave a lecture at Wilson College, and another lecture on



## ANNUAL REPORT FOR 1939-40

statistics before the Society of Mathematical Teachers at the Institute of Science; and also a lecture on "Statistics in Relation to National Planning" at a meeting of the Bombay Branch of the Institute.

Early in October 1939 he went to Delhi as a co-opted member of the Federal Public Service Commission for interviewing candidates for a statistical post. At the end of November he again went to Delhi to attend meetings of the Advisory Board of the I. C. A. R. and had interviews with a large number of Government officials in connexion with the work of the Institute.

At the end of December 1939 the Honorary Secretary visited Madras to attend the Indian Science Congress and to make arrangements for the Madras session of the Statistical Conference; and went to Mysore at the time of the Conference. On his way back from Madras, he halted for a short time at Waltair and met the members of the staff of the Mathematics Department and had informal talks regarding University courses in statistics. At the invitation of the Government of Orissa he halted three days at Cuttack to discuss questions relating to river floods in Orissa with the Chief Engineer and Special Officer in charge of floods.

At the end of January 1940 he went to Delhi to attend the Conference on Labour Questions and the Conference on Price Control as adviser to the Hon'ble Minister, Commerce and Labour, Bengal. At the suggestion of the Government of India he again went to Delhi in March at the time when Prof. Hotelling was there; and had a large number of interviews including a long discussion with the members of the Railway Board in regard to statistical matters. From Delhi he went to the Imperial Forest Research Institute at Dehradun and halted there for about a week, and discussed a large number of statistical questions in connexion with the work of the Forest Research Institute.

The Honorary Secretary's visits to places outside Calcutta proved useful not only in establishing personal contacts but also in eliciting the sympathy of both officials and non-officials in other provinces in the work of the Institute; and it will be desirable to continue such visits and interviews as far as practicable.

### LOCAL BRANCHES OF THE INSTITUTE.

**Bombay Branch.** It is extremely gratifying to note that the work of the Bombay Branch has been carried on with vigour since its reorganization in August 1939. Mr. B. G. Kher (then Prime Minister of Bombay) gave us great encouragement by agreeing to accept the office of the President of the Bombay Branch; Dr. Nazir Ahmad and Lt. Col. S. L. Bhatia were elected Vice-Presidents; Prof. John Maclean and Dr. S. R. Savar, Joint Secretaries; and Mr. S. S. Rajagopalan, Treasurer of the Bombay Branch. At a business meeting held in October the revised constitution was adopted, and six general meetings of the Bombay Branch have been held since then. A series of interesting lectures and discussions on statistics were also arranged, a list of which is given below:—

6th October 1939.	Prof. John Maclean:	Review of Nursing Statistics in India.
17th October 1939.	Sir Humi Mehta:	Statistics in Industry.
3rd November 1939.	Mr. A. N. Galati:	Application of Statistical Methods to Entomology.
8th December 1939.	Prof. C. N. Yakil:	Statistics and Economic Research in Bombay.
2nd February 1940.	Mr. R. S. Koshil:	The Efficient Estimation of Statistical Parameters.
11th March 1940.	Dr. S. R. Savar:	A General Co-efficient of Statistical Relationship.
11th March 1940.	Prof. Hotelling:	Statistical Methods in Economics.

The question of appointing a paid worker has been actively taken up for consideration by the Bombay Branch and possibilities of securing the co-operation of the University of Bombay in this matter is being explored.

**Mysore Branch.** The work of the Mysore Branch is proceeding on normal lines in co-operation with the Departments of Mathematical Economics and Statistics, and of Psychology of the Mysore University. The Mysore Branch was responsible for the excellent arrangements made for the Mysore session of the Statistical Conference on the 7th and 8th January, 1940. The programme was arranged with great forethought; and included, besides scientific and academic meetings, a number of excursions to places of interest in Mysore and its neighbourhood. The arrangements for the reception of delegates and the hospitality provided were lavish and perfect in every detail; and our best thanks are due to the Government of Mysore, the University and also to Prof. K. B. Madhava, the Secretary in charge of the local Branch, for a most successful session in their beautiful city.

*Madras Branch.* Prof. P. J. Thomas was the President and Mr. Sundararama Sastry, the Secretary of the Madras Branch during the year under review. Most of the work of the Branch is being done in active co-operation with the Department of Economics of the University. Occasional public meetings were held during the year. The Madras Branch was in effective charge of arrangements for the Madras Session of the Statistical Conference in January 1940, and our best thanks are due to members of the Branch and the members of the Reception Committee for their efforts to make the session successful in every way.

*Poona Branch.* Mr. V. G. Kale was the President, and Prof. D. G. Karve the Secretary of the Branch during the year under review. A number of meetings were held at one of which the Honorary Secretary gave a lecture on the work of the Institute on the applied side.

*Lahore Branch.* The Hon'ble Mr. Manoharlal was the President, and Dr. N. K. Bose the Secretary. The Branch made all arrangements for Prof. Hotelling's visit to Lahore in March and held occasional public meetings.

*Lucknow Branch.* A new branch was opened in Lucknow with Dr. N. K. Katju (then Minister in charge of Agriculture and Industries) as President and Mr. D. P. Mukherji as Secretary; but the organization of the Branch was hampered by the unsettled conditions following the outbreak of War in September. The Branch however helped in making arrangements for Prof. Hotelling's visit to Lucknow in February 1940.

## SANKHYĀ: THE INDIAN JOURNAL, OF STATISTICS.

Two issues of Sankhyā, the Indian Journal of Statistics, were brought out during the year under review; and two other issues were practically ready at the end of March 1940. We have in hand a large number of papers; but owing to the outbreak of War we have been faced with great difficulties both in regard to typographical arrangements and the supply of paper. Arrangements were made for importing certain special types just before the outbreak of War; but these types have not yet been received, and it is not known whether they are likely to be received in the near future. Strenuous efforts are being made for securing suitable typographical and printing facilities; and until these arrangements are completed delay in publication is inevitable. It is hoped that, in case unforeseen difficulties do not arise, it would be possible to make satisfactory arrangements for regular publication of the journal in the course of the next seven or eight months.

## Sankhyā: Receipts and Payments Account for the year ending 31st March, 1940.

RECEIPTS.		PAYMENTS.	
	RS. A. P.		RS. A. P.
To Opening Balance—	470 3 1	By Press Bills ...	2,261 8 6
Bank ...		.. Establishment ...	450 5 3
.. Barmarkel Grant ...		.. Contingent Expenses ...	279 9 6
.. from Government of India ...	2,000 0 0	.. Bank Charges ...	26 4 2
.. Other Grants ...	1,000 0 0	.. Advance to Press Account ...	797 15 11
	3,000 0 0	Closing Balance—	
.. Subscriptions ...	231 0 0	Cash at Bank ...	86 13 0
.. Contributions ...	194 8 0	Cash in hand ...	70 8 3
.. Donation from Prof. P. C. Mahalanobis ...	207 3 6		157 5 3
	4,102 14 7		4,102 14 7

6, HASTINGS STREET, CALCUTTA.  
The 22nd April, 1940.

Examined and Found Correct.  
P. C. NANDI & Co., Auditors.  
Chartered Accountants,  
Registered Accountants.



**MEMBERSHIP AND AUDITED ACCOUNTS.**

*Membership.* The number of Life Members is at present 25; and of Ordinary Members 173.

*Audited Accounts.* The audited accounts for the Institute are attached. In the case of the grant from the Indian Central Jute Committee and certain other grants it is necessary to submit an auditor's certificate, and for these grants separate accounts were maintained; but in the case of other grants for which separate statements are not necessary, the accounts were kept in a consolidated form in the Barmarked and Special Requiries Fund.

**Jute Census Scheme: Receipts and Payments Account for the year ending 31st March, 1940.**

RECEIPTS.		EXPENDITURE.			
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	
To grant from the Indian Central Jute Committee Opening Balance ...	2,800 9 0		By Establishment Jute Census work (1938-39) ...	20,530 2 3	
Grants in 1938-39	25,965 0 0		" House Rent, Electricity, Hire of Fans, Furniture and Machines ...	3,183 12 6	
Grants in 1939-40		26,066 9 0	" Contingent Expenses ...	5,953 6 9	
.. Advance from Institute ...		10,584 9 6	" Contribution to Institute ...	2,000 0 0	31,867 5 6
		8,684 3 0	" Establishment of Jute Census Work (1939-40) ...	9,183 5 6	
			" House Rent, Electricity, Hire of Fans, Furniture and Machines ...	1,383 8 0	
			" Contingent Expenses ...	2,646 9 0	
			" Purchase of Maps ...	584 9 6	13,788 0 0
			" Advance (Map-Mounting for Jute Census Work) ...		2,500 0 0
					47,965 5 6
		47,965 5 6			

8, HASTINGS STREET, CALCUTTA.  
The 22nd April, 1940.

Examined and Found Correct.  
P. C. NARAYAN & Co., Auditors,  
Chartered Accountants,  
Registered Accountants.

**MISCELLANEOUS.**

*Examinations in Statistics.* Unfortunately owing to difficulties created by the War it was not possible to hold the examinations for Statistician's Diploma and Computer's Certificate during the year under review. It is hoped however that it would be possible to hold these examinations in December 1940.

*Scheme for Statistical Studies in the Calcutta University.* A scheme for the introduction of statistics in the B.A., B.Sc., M.A., and M.Sc. examinations of the Calcutta University, which was prepared in May 1936, by a committee consisting of Professors S. C. Ghosh, S. N. Bose, N. R. Sen and the Honorary Secretary, was unanimously approved at a joint meeting of the two Executive Committees of the Councils of Post-Graduate Teaching in Arts and Science in March.\* In case this scheme is approved by the Calcutta University an important advance would be made in the organization, on modern lines, of statistical studies in India.

P. C. MAHALANOBIS,  
Honorary Secretary.

\* The scheme was approved by the Senate of the Calcutta University in May 1940.

APPENDIX I. LIST OF PAPERS PUBLISHED AND  
REPORTS SUBMITTED IN 1939-40.

1. On Completely Orthogonalised Sets of Latin Squares. By R. C. Bose and K. R. Nair. *Science & Culture*, May 1939.
2. On Partially Balanced Youden's Squares. By R. C. Bose and K. Kishen. *Science & Culture*, August 1939.
3. Partially Balanced Incomplete Block Designs. By R. C. Bose and K. R. Nair. *Sankhyā*, Vol. 4 (3), 357-372.
4. On the Construction of Balanced Incomplete Block Designs. By R. C. Bose. *Annals of Entomology*, Vol. 9 (4), Dec. 1939, 353-369.
5. A Study of Forty-three Years of Rainfall in Calcutta, 1893-1935. By S. S. Bose. *Sankhyā*, Vol. 4 (4), 559-562.
6. Balanced Incomplete Block Designs with Blocks of Unequal Size. By K. Kishen. *Science & Culture*, August 1939.
7. On a Simplified Method of Expressing the Components of the Second Order Interaction in a  $3^2$  Factorial Design. By K. Kishen. *Sankhyā*, Vol. 4 (4), 577-580.
8. General Report on the Enquiry into the Prevalence of Drinking Tea among Middle Class Indian Families in Calcutta, 1939. By P. C. Mahalanobis. *Tea Market Expansion Board*.
9. Report on the Sample Census of Jute in 1939. By P. C. Mahalanobis. (Printed by the Indian Central Jute Committee).
10. Anthropological Observations on the Anglo-Indians of Calcutta. Part III-Statistical Analysis of Measurements of Seven Characters. By P. C. Mahalanobis. *Records of the Indian Museum*, Vol. XXIII.
11. Errors of Observation in Physical Measurements. By P. C. Mahalanobis. *Science & Culture*, January, 1940.
12. A Sample Survey of the Acreage under Jute in Bengal. By P. C. Mahalanobis. *Sankhyā*, Vol. 4 (4), 511-530.
13. Discussion on Planning of Experiments. By P. C. Mahalanobis. *Sankhyā* Vol. 4 (4), 530-531.
14. Application of Statistical Methods in Physical Anthropometry. By P. C. Mahalanobis. *Sankhyā*, Vol. 4 (4), 594-598.
15. A Note on Graduation by the Method of Least Squares. By K. R. Nair. *Science & Culture*, March 1939.
16. The Median in Tests by Randomisation. By K. R. Nair. *Sankhyā*, Vol. 4 (4), 543-550.
17. The Application of Covariance Technique to Field Experiments with Missing or Mixed-up Yields. By K. R. Nair. *Sankhyā*, Vol. 4 (4), 581-588.
18. Table of Confidence Interval for the Median in Samples from any Continuous Population. By K. R. Nair. *Sankhyā*, Vol. 4 (4), 551-558.
19. On the  $k$ -statistics. By S. N. Roy. *Science & Culture*, August 1939.
20. A further note on the use of the  $k$ -statistic for testing a certain class of hypotheses. By S. N. Roy. *Science & Culture*, September 1939.
21. A Note on the Distribution of the Studentized  $D^2$ -Statistic. By S. N. Roy. *Sankhyā*, Vol. 4 (3), 373-380.
22.  $p$ -Statistics or Some Generalisations in Analysis of Variance appropriate to Multivariate Problems. By S. N. Roy. *Sankhyā*, Vol. 4 (3), 381-396.
23. Distribution of  $p$ -statistics on the Non-null Hypothesis. By S. N. Roy. *Science & Culture*, March 1940.
24. On the distribution of certain symmetric functions of  $p$ -statistics on the null hypothesis. By S. N. Roy. *Science & Culture*, March 1940.
25. The Use and Distribution of the Studentized  $D^2$ -Statistic when the Variances and Covariances are based on  $K$  Samples. By S. N. Roy and R. C. Bose. *Sankhyā*, Vol. 4 (4), 535-542.

APPENDIX 2. LIST OF OFFICERS AND SENIOR WORKERS SENT ON  
DEPUTATION TO THE STATISTICAL LABORATORY, 1939-40.

1. A. K. Chakraborty, M.Sc., (*Asst. Rice Research Officer, Chinsurah, Bengal*). May—June, 1939.
2. Manik Rao Kamalkar, B.Sc., (*through Director of Agriculture, Hyderabad*). July—December, 1939.
3. Sarjoo Prasad Mian, (*Office of the Provincial Marketing Officer, United Provinces*). July, 1939.
4. I. D. Khanna, B.A., LL.B., (*through Imperial Council of Agricultural Research, New Delhi*). July—December, 1939.
5. J. C. Sen, B.Sc., (*Forest Research Institute, Dehra Dun*). August—October, 1939.
6. H. K. Nandy, M.Sc., Ph.D., (*Economic Botanist to the Government of Assam*). August—September, 1939.
7. J. K. Pandey, M.A., (*Bureau of Economic Intelligence, Lucknow; United Provinces*). September, 1939.
8. S. Mazid, B.Sc., (*Economic Botanist to the Government of Assam, Habiganj*). December, 1939.
9. Gur Bux Singh, M.A., (*Jail Department, Lahore*). January, 1940— .
10. Kanwar Singh, B.Sc. (Agriculture), (*Punjab Agricultural College, Lyallpur, Punjab*). January, 1940.
11. J. L. Sen, B. Ag., (*Department of Agriculture, Habiganj, Assam*). January—March, 1940.
12. U. S. Nair, M.A., Ph.D. (London), (*Department of Mathematics, Travancore University*). January—February, 1940.
13. P. M. Salvekar, B.Sc., (*Statistical Assistant, Institute of Plant Industry, Indore*). February, 1940— .
14. Muhammad Shaq, B.A., (*Office of the Director of Public Instruction, United Provinces*). February, 1940— .
15. P. G. Choudhury, B.Sc., M.B., D.P.H., (*Bacteriologist, Office of the Director of Public Health, Bengal*). February, 1940— .
16. L. N. Phukan, B.Sc. (*Chemical Assistant, Jorhat Farm, Assam*). February—March, 1940.

### APPENDIX 3. LIST OF STUDENTS IN THE TRAINING CLASS, 1939-40.

1. G. K. Sarkar, M.Sc. 1st Class in Pure Mathematics (*Calcutta*). November, 1938—still working.
2. Purna Balendu Shrestha, M.A. in Applied Mathematics (*Calcutta*); Research Scholar, Nepal State. December, 1938—still working.
3. M. P. Shrivastava, M.Sc. 1st Class in Pure Mathematics (*Nagpur*); Research Scholar, Nagpur University. January, 1939—still working.
4. S. P. Agarwala, M.A. in Mathematics and Economics (*Lucknow*); (through Director of Public Information, P. P.). April, 1939—April, 1940.
5. A. K. Dasgupta, M.Sc. in Applied Mathematics (*Calcutta*). March, 1939—December, 1939.
6. M. Abdul Wali, M.A. in Mathematics (*Dinnaula*); (through Director of Statistics, Hyderabad State). July, 1939—still working.
7. J. B. Hukku, M.Sc. in Mathematics (*Allahabad*); passed Part II of the Institute of Actuaries' Examination. July, 1939—January, 1940.
8. Aglar Hanveel, M.A. 1st Class in Mathematics (*Punjab*). July, 1939—December, 1939.
9. R. L. Tucker, M.A. (*Punjab*), M.Sc. in Mathematics (*Nagpur*). July 1939—December, 1939.
10. N. P. Nair, M.Sc. in Pure Mathematics (*Bombay*); Research Scholar, R. B. Karandikar's Charitable Trust Fund. August, 1939—still working.
11. Om Prakash, M.Sc. 1st Class in Mathematics (*Allahabad*). August, 1939—December, 1939.
12. B. N. Malhotra, B.A. with Honours in Physics (*Delhi*); C.A.I.B. January, 1940—
13. Bilhatesh Sircar, M.Sc. 2nd Class 1st in Pure Mathematics (*Calcutta*). January 1940—
14. S. C. Sengupta, M.Sc. 2nd Class 3rd in Pure Mathematics (*Calcutta*). January 1940—
15. S. S. Shrikhande, B.Sc. Honours 1st Class 1st (*Nagpur*); Research Scholar, K. E. M. Fund, Nagpur. January, 1940—
16. Phani Bhusan Bhattacharjee, M.Sc. 1st Class 2nd in Pure Mathematics (*Allahabad*). January, 1940—
17. Gauri Dnyal Mathur, M.A. in Economics (*Agra*); M.A. 1st Class in Mathematics (*Agra*); formerly lecturer in Economics, Meerut College. January, 1940—
18. S. N. Chaudhuri, M.Sc. in Mathematics (*Nagpur and Allahabad*). February, 1940—
19. S. P. Subramanian, B.Sc. with Honours in Mathematics (*Annamalali*). January, 1940—
20. Veil Prakash Sud, M.A. 1st Class in Mathematics (*Punjab*). February, 1940—

# THE INDIAN STATISTICAL INSTITUTE

## PROCEEDINGS OF THE ANNUAL GENERAL MEETING, 23rd APRIL, 1940

The Annual General Meeting of the Indian Statistical Institute was held at 3-30 P.M. on Tuesday the 23rd April, 1940 in the Statistical Laboratory, Presidency College, Calcutta.

In the absence of the President, Dr. P. N. Banerjee, M.A., D.Sc., M.L.A., Vice-President of the Institute was in the Chair.

The following members were present:—

- Mr. R. C. Bose (*Calcutta University*).
- Prof. K. N. Chakravarti (*Presidency College, Calcutta*).
- Mr. H. C. Ghosh (*Calcutta University*).
- Sir Balradas Goenka (*Indian Chamber of Commerce, Calcutta*).
- Mr. S. N. Roy (*Statistical Laboratory, Calcutta*).
- Prof. N. R. Sen (*Ghosh Professor of Mathematics, Calcutta University*).
- Mr. S. Sen Gupta (*Statistical Laboratory, Calcutta*).
- Dr. H. Sinha (*Calcutta University*).
- Prof. J. C. Sinha (*Presidency College, Calcutta*).
- Dr. P. V. Sukhatme (*All-India Institute of Hygiene and Public Health, Calcutta*).
- Prof. P. C. Mahalanobis (*Honorary Secretary*).

### ANNUAL REPORT AND AUDITED ACCOUNTS.

1. Prof. P. C. Mahalanobis, Honorary Secretary, placed before the meeting the Annual Report and Audited Accounts for 1939-40 as approved by the Council, and mentioned that the accounts had been audited by Messrs. P. C. Nandi & Co., Chartered Accountants.

Resolved that the Annual Report and Audited Accounts (annexed) for 1939-40 be adopted.

Proposed by Prof. J. C. Sinha

Seconded by Prof. K. N. Chakravarti (Carried unanimously).

### ELECTION OF OFFICE-BEARERS AND MEMBERS OF THE COUNCIL.

2. Prof. P. C. Mahalanobis, Honorary Secretary, reported that, in accordance with Bye-law 4 for the election of office-bearers and members of the Council, nominations for 1940-41 approved by the Council of the Institute had been circulated on the 1st March, 1940 and the final list was circulated together with the notice of the Annual General Meeting on the 6th April 1940. As the number of nominations was in no case in excess of the number of officers no voting was necessary and no voting paper was therefore issued.

The election of the following office-bearers and members of the Council as circulated was then announced from the Chair.

#### President

Sir Balradas Goenka, Kt., C.I.E., *Indian Chamber of Commerce, Calcutta.*

#### Vice-Presidents

Dr. P. N. Banerjee, M.A., D.Sc., M.L.A., *Calcutta.*  
Mr. H. H. Burn, C.A., *McLeod & Co., Calcutta.*  
Dr. T. R. Gregory, D.Sc., *Economic Adviser to the Government of India, Delhi.*  
Dr. John Matthai, D.Sc., C.I.E., I.R.S., *Special Officer, Commerce Department, Delhi.*  
Dr. S. P. Mookerjee, M.A., B.L., M.L.A., *President, Council of Post Graduate Teaching in Arts, Calcutta University.*  
D.Litt., *Barrister-at-Law.*  
Dr. C. W. B. Normand, C.I.E., M.A., D.Sc., *Director General of Observatories, Poona.*  
F.N.I., *Delhi Cloth and General Mills, Delhi.*  
Lala Shri Ram, B.A., *Indian Institute of Science, Bangalore.*  
Sir C. V. Raman, D.Sc., F.R.S., N.L., *Judge, Calcutta High Court.*  
The Hon'ble Mr. Justice T. J. V. Roxburgh, *B.A., Barrister-at-Law, C.I.E., I.C.S.,*  
Mr. Nalin Ranjan Sarkar, M.L.A., *Bengal National Chamber of Commerce.*



## INDIAN STATISTICAL INSTITUTE

### Treasurer

Dr. Satya Churn Law, M.A., B.L., Ph.D.,  
F.Z.S., M.B.O.U., Calcutta.

### Secretary

Prof. P. C. Mahalanobis, M.A., F.N.I., I.B.S. *Statistical Laboratory, Calcutta.*

### Joint Secretaries

Prof. Hariharan Ghosh, M.A., P.R.S., *University of Calcutta.*  
Mr. Salsar Sen Gupta, M.Sc., B.Sc. (Lond.), *Statistical Laboratory, Calcutta.*

### Members of the Council for 1940-41

Prof. R. P. Adarkar, M.A., *University of Allahabad.*  
Dr. Nazir Ahmad, O.B.E., M.Sc., Ph.D., *Director, Cotton Technological Laboratory,*  
F. Inst. I., *Bombay.*  
Dr. G. S. Bose, M.B., D.Sc., *University of Calcutta.*  
Mr. R. C. Bose, M.A., *Lecturer, Calcutta University.*  
Prof. S. N. Bose, M.Sc., *University of Inacca.*  
Mr. P. H. Carpenter, F.I.C., F.C.S., *Chief Scientific Officer, Indian Tea Association,*  
*Fackal, Assam.*  
Prof. K. N. Chakravarti, M.Sc., *Presidency College, Calcutta.*  
Mr. H. T. Corbelle, *Messrs. Bird & Co., Calcutta.*  
Prof. L. C. Jain, M.A., LL.B., D.Sc., *University of the Punjab, Lahore.*  
Mr. J. V. Joshi, M.A., *Director General of Commercial Intelligence*  
*& Statistics, Calcutta.*  
Prof. F. W. Levi, Dr. Phil. Nat., *University of Calcutta.*  
Mr. K. C. Mahindra, M.A., *Messrs. Martin & Co., Calcutta.*  
Mr. N. C. Mehta, B.A., I.C.S., Bar-at-Law, *Secretary to the Govt. of the United Provinces,*  
*Lucknow.*  
Mr. C. S. Nair, M.A., Ph.D., *Travancore University, Trivandrum.*  
Mr. K. C. K. E. Raja, I.R.C.P. & S., D.P.H., *Assistant Public Health Commissioner with the*  
D.T.M. & H., *Government of India, Delhi.*  
Mr. B. Range Reddy, *Deputy Commissioner, Secunderabad.*  
Mr. S. N. Roy, M.Sc., *Statistical Laboratory, Calcutta.*  
Dr. H. C. Sinha, M.Sc., Ph.D., *Calcutta University.*  
Prof. J. C. Sinha, M.A., Ph.D., *Presidency College, Calcutta.*  
Dr. P. V. Sankhane, Ph.D., D.Sc., *All-India Institute of Hygiene and Public*  
*Health, Calcutta.*

### RECOMMENDATIONS FROM THE COUNCIL.

3. Considered the recommendation of the Council regarding the creation of a Provident Fund  
Resolved that the principle of creating a Provident Fund be approved; and the Council be  
authorized to prepare a scheme for this purpose for consideration by the Institute at an early date.

Proposed by Prof. P. C. Mahalanobis

Seconded by Dr. H. C. Sinha *(Carried unanimously).*

### APPOINTMENT OF AUDITORS.

4. Prof. P. C. Mahalanobis, Honorary Secretary, stated that Messrs. P. C. Nandi & Co., Chartered Accountants, have kindly agreed to audit the accounts of the General Fund of the Indian Statistical Institute free of charge as in previous years; it is proposed however that an honorarium of Rs. 300 should be paid to him out of the Barmarket and Special Enquiries Fund for auditing the accounts relating to this Fund.

Resolved that Messrs. P. C. Nandi & Co., Chartered Accountants, be appointed auditors for the year 1940-41; and an honorarium of Rs. 300 be paid out of the grant for Barmarked and Special Enquiries Fund for a detailed audit of this Fund.

Proposed by Dr. P. V. Sankhane

Seconded by Mr. H. C. Ghosh *(Carried unanimously).*

APPOINTMENT OF COMMITTEES.

5. Resolved that as recommended by the Council the Journal Committee be constituted as follows :—

Prof. S. N. Bose, Prof. E. N. Chakravarti, Prof. K. B. Madhava, Mr. N. C. Mehta, Mr. T. J. Y. Roxburgh, Mr. S. N. Roy, Prof. N. R. Sen, Dr. H. Sinha, Dr. P. V. Sukhame, Prof. P. C. Mahalanobis (Editor, *ex-officio*) with Mr. R. C. Bose as Secretary.

*Proposed by Prof. J. C. Sinha*

*Seconded by Mr. H. C. Ghosh*

*(Carried unanimously).*

MISCELLANEOUS.

6. (i) Resolved that the Institute places on record its appreciation of the services rendered by the retiring office-bearers and members of the Council.

(ii) Resolved that the Annual General Meeting places on record its deep appreciation of the services rendered by Mr. Haria Chandra Sinha who served as Honorary Joint Secretary for more than eight years since the foundation of the Indian Statistical Institute and was retiring from the office at his own request. He was one of the founders of the Institute; and it was largely due to his selfless and devoted services that the work of the Institute was placed on a sound basis.

*Proposed from the Chair*

*Seconded by Prof. P. C. Mahalanobis*

*(Carried unanimously).*

P. N. BANERJEA,  
*Chairman.*

P. C. MAHALANOBIS,  
*Honorary Secretary.*

## INDIAN STATISTICAL INSTITUTE

### PROCEEDINGS OF THE COUNCIL dated 33rd APRIL, 1940

A meeting of the Council of the Indian Statistical Institute was held at 3.0 p.m. on Tuesday the 23rd April, 1940 in the Statistical Laboratory, Presidency College, Calcutta.

*Present:* In the absence of the President, Dr. P. N. Banerjee, Vice-President of the Institute, was voted to the Chair.

Professor K. N. Chakravarti, Mr. H. C. Ghosh, Mr. S. N. Roy, Prof. N. R. Sen, Mr. S. Sen Gupta, Mr. H. Sinha, Prof. J. C. Sinha, Dr. P. V. Sukhatme and Prof. P. C. Mahalanobis (*Honorary Secretary*).

1. Proceedings of the meeting of the Council dated 1st March, 1940 were read and confirmed.

#### ANNUAL REPORT AND ACCOUNTS, 1939-40.

2. Prof. P. C. Mahalanobis, *Honorary Secretary*, placed before the Council the Annual Report and Audited Accounts for 1939-40 (circulated).

Resolved that the Annual Report and Audited Accounts be passed and forwarded to the Annual General Meeting.

#### STATISTICAL CONFERENCE, 1941.

3. Prof. P. C. Mahalanobis, *Honorary Secretary*, reported that in accordance with resolution No. 2 of the Council dated the 3rd January, 1940 he had written to the Hon'ble Sir Girija Shankar Bajpai inviting him to preside over the 1941 session of the Indian Statistical Conference, and placed before the meeting the reply received from him in which he had kindly agreed to accept the invitation.

(i) Resolved that the Hon'ble Sir Girija Shankar Bajpai be elected the General President of the 1941 session of the Indian Statistical Conference.

(ii) Resolved that a Committee (with powers to co-opt) consisting of the President, the Treasurer, Prof. K. B. Madhava, Prof. N. R. Sen, and the *Honorary Secretary* be appointed to make necessary arrangements for the 1941 session of the Indian Statistical Conference.

#### RESEARCH FELLOWSHIPS.

4. The *Honorary Secretary* reported that, on the recommendation of the Standing Committee for Research, Atindra Nath Bose, M.A. (Fremchand Roychand Research Studentship, Calcutta University); Mrs. Chameli Bose, B.Sc. in statistics (London); Mohonalal Ganguli, B.Sc. in statistics (London); Kunwar Kishen, M.A. (Punjab); and V. G. Pentharkar, B.Sc. in economics with statistics (London) were awarded Research Fellowships of Rs. 100 per month for one year from 1st April, 1940 in the first instance, and N. T. Mathew, B.A. Hons. (Madras) and Ram Deva Narain, M.A. (Agra) were awarded scholarships of Rs. 50 per month for one year.

#### EARMARKED AND SPECIAL ENQUIRIES FUND.

5. The *Honorary Secretary* explained the need of a contribution to cover training, leave, and provident fund expenses in the case of workers placed on duty in special enquiries.

In continuation of resolution No. 4 of the Council dated the 1st March, 1940 resolved that a contribution on account of training, leave and provident fund reserve be fixed for the present at 25 per cent of the total pay and salary of each employee of the Institute who is placed on duty for work in special schemes financed out of the Earmarked and Special Enquiries Fund.

6. The *Honorary Secretary* reported that he was trying to secure a non-recurring grant from the Government of Bengal for making suitable typographical arrangement for Sanhva and placed before the meeting relevant correspondence resting with letter No. 2570-G/20-14C-40 dated the 19th April, 1940 from the office of the Director of Public Instruction, Bengal.

Resolved that the *Honorary Secretary* be authorized to give a suitable reply to the above letter.

7. The *Honorary Secretary* placed before the meeting the following resolution of the Earmarked and Special Enquiries Fund Committee dated 16th April, 1940.

Resolved that the Honorary Secretary be authorized to utilize the balance or any part of it in the Barmarked and Special Enquiries Fund up to 31st March, 1940 towards typographical arrangements for the Indian Journal of Statistics. (Recorded).

JOURNAL COMMITTEE.

8. Resolved that the Council recommends to the Institute the reconstitution of the Journal Committee as follows:—

Prof. S. N. Bose, Prof. K. N. Chakravarti, Prof. K. B. Madhava, Mr. N. C. Mehta, Mr. T. J. V. Roxburgh, Mr. S. N. Roy, Prof. N. R. Sen, Dr. H. Sinha, Dr. P. V. Sakthame, Prof. P. C. Mahalanobis, (Editor, *ex-officio*) with Mr. R. C. Bose as Secretary.

BUDGET FOR 1940-41.

9. The Honorary Secretary placed before the meeting the draft budget for 1940-41.

Resolved that the following budget estimate (General Fund) for 1940-41 be passed:—

RS. A P.		RS. A P.	
Opening Balance (estimated) ...	4,400 0 0	Research staff and honoraria ...	12,000 0 0
Grants from the Govt. of India ...	15,000 0 0	Books and journals ...	2,000 0 0
Grants from the Govt. of India (Barmarked for Sankhya) ...	2,000 0 0	Laboratory equipment ...	2,000 0 0
Membership fee ...	1,200 0 0	Contribution for Journal ...	1,000 0 0
Examination and other fees ...	1,400 0 0	Establishment and travelling ...	1,500 0 0
		Postage, stationery and Contingent ...	1,500 0 0
		Barmarked grant for Sankhya ...	2,000 0 0
			22,000 0 0
		Closing Balance ...	2,000 0 0
			24,000 0 0
	Rs. 24,000 0 0		Rs. 24,000 0 0

PROVIDENT FUND.

10. The Honorary Secretary suggested that it would be desirable to introduce a Provident Fund as early as possible.

(i) Resolved that the Council recommends to the Institute the creation of a Provident Fund for the workers of the Institute.

(ii) Also resolved that a Committee (with powers to co-opt) consisting of the Treasurer, Dr. H. C. Sinha, Mr. S. N. Roy, Mr. A. N. Bose and Prof. P. C. Mahalanobis as Secretary be appointed to prepare a scheme for a Provident Fund for consideration by the Council at an early date.

COMMITTEE FOR EXAMINATIONS IN STATISTICS.

11. The Honorary Secretary reported that although there was a great deal of demand for training in statistics a sufficient number of candidates were not forthcoming for the Institute examinations in statistics owing probably to the impression that it was difficult to pass the examination as a whole. He was of opinion that it might be advisable to split up the examinations in several parts on the lines of the actuarial examinations.

Resolved that a Committee (with powers to co-opt) consisting of Prof. S. N. Bose, Mr. R. C. Bose, Prof. K. B. Madhava, Prof. N. R. Sen, Mr. S. N. Roy and Prof. P. C. Mahalanobis as Secretary be appointed to consider the question and report to the Council at an early date.

ELECTION OF MEMBERS.

12. The following persons were elected members of the Indian Statistical Institute:—

1. Dr. R. B. Gupta, M.A., Ph.D., Labour Officer, Cawnpore.
2. Mr. Intesaruddin Haqqani,  
Asst. General Manager, The Nizam Sugar Factory, Bollhan, Hyderabad (Deccan).

P. N. BANERJEA,  
Chairman.

P. C. MAHALANOBIS,  
Honorary Secretary.