INDIAN STATISTICAL INSTITUTE

ANNUAL REPORT

April 1958—March 1959

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CALCUTTA-35

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Committee of the Governing Body

FINANCE COMMITTEE

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Twentyseventh Annual Report: April 1958—March 1959

INTRODUCTION : CONSTITUTION AND ACTIVITIES

Genesis

Work on mathematical statistics started nearly forty years ago, in the early twenties, in the room of P. C. Mahalanobis in the Presidency College, Calcutta, where he was professor of physics at that time. During the next ten years a small group of young men came together in what was called the Statistical Laboratory which by 1930 was receiving an annual research grant of about Rs. 2,500 from the Imperial (now Indian) Council of Agricultural Research. This group took the initiative to start a statistical society in India.

The Indian Statistical Institute was brought into existence by a resolution passed at a public meeting held in 1931 under the chairmanship of the late Sir R. N. Mookerjee who was elected the first President of the Institute holding that office for 5 years (1931-36). The Institute was registered as a non-profit learned society under Act XXI of 1860 in April 1932. Against a single worker, a part-time computer and a total expenditure* of Rs. 238 in the first year, the Institute had, at the end of the 27th year (31 March, 1959), a staff of about 2000 paid workers, the total expenditure during the year being about Rs. 84 lakhs.

Constitution

Object : The basic object is the advancement of knowledge of statistics and allied subjects related to planning for national development and social welfare, and the collection of information for purposes of planning and the improvement of the efficiency of management and production.

Membership : The membership is open to all persons irrespective of sex, nationality, race, creed, or class. No part of the Institute funds can be distributed in any form among the members but workers of the Institute are not debarred from receiving remuneration because of their also being its members.

Control : The supreme control of the Institute is vested in the general body of members of the Institute, which includes ordinary, life and honorary members, and honorary fellows. It is this body which has the authority to make and amend the rules of the Institute. The Annual Report and Audited Accounts are presented at the Annual General Meeting; other General Meetings are held whenever necessary. The number of members entitled to vote was about 321 at the end of March 1959.

Management : The management of the Institute is vested in the President, Vice-Presidents and a Council consisting of the Chairman, Vice-Chairmen, Treasurer, Secretary and other office-bearers, and 20 members, elected by the members of the Institute, besides representatives of regional branches and co-opted members. Subject to general co-ordination by the Council, the management of the Research and Training School is vested in a Governing Body constituted with elected representatives of the Council of the Institute, of the Government of India, and of a number of public bodies. The International Statistical Education Centre is administered by a Board of Directors consisting of the representatives of the International Statistical Institute, the Government of India and the Indian Statistical

* Excluding the grant of Rs. 2,500 from the ICAR mentioned above.

Institute. There are two Finance Committees, one of the Governing Body and the other of the Council, an *ad hoc* committee for the allocation of expenditure, on which the Government of India is represented, a Journal Committee and an Examinations Committee; and several other committees, executive and technical, for day-to-day administration and co-ordination.

Audit : Chartered accountants qualified to audit accounts under the Indian Companies Act and appointed at the Annual General Meeting have been auditing the Institute accounts every year since the foundation of the Institute. In recent years the auditors are being selected with the approval of the Government of India.

Development of the Work of the Institute

Expansion—Three Stages : The expansion of the Institute's activities both in volume and range occurred since its foundation, broadly speaking, in three stages, bearing in mind that there has always been considerable overlapping in the process so that no date-line can be fixed for the passage from one stage to another. During the first few years of its existence, the Institute functioned as a scientific society and also served more or less as a laboratory for analytical studies including the use of design of experiments in agricultural experiments on a fairly large scale. Even during this early formative period, the Institute was commissioned by the Government as well as some private concerns to carry out several economic enquiries on a small scale.

Professional training had started in the very first year, on a small scale, and on an individual basis. With increasing demand the Institute was obliged gradually to offer organized courses at various levels, in theoretical and applied statistics and computational work. These activities later on developed into the Research and Training School with excellent facilities for advanced studies and research in many subjects. In 1938 the Institute started external examinations for the award of Statistician's Diploma and Computer's Certificate which are now held all over India. From this year the Institute also started receiving a research grant from the Government of India.

The Institute passed on to the second stage with an increase in the number and scope of economic enquiries, the most important among them being crop estimation surveys conducted on behalf of the Government of Bengal and later the Government of Bihar which led to the development of specialized techniques necessary for large-scale sample surveys. During this period, at the instance of the Government of India, the Institute prepared most of the tables for 1941 census of population on the basis of two per cent Y-sample.

A small workshop was started during the war through an associated non-profit organization for the repair and maintenance of calculating machines and other equipment. This made it possible for the Institute to design and construct the first electronic computer in India in 1953, which led to the creation of an Electronic Computer Division.

The third and present stage followed as a logical consequence to the second when the Institute was called upon by the Government of India in 1950 to take a leading part in organizing the National Sample Survey. The next big step was the inauguration by Prime Minister Nehru in 1954 of studies relating to planning for national development. This led to the formulation of the "Draft Plan-Frame" of 1955 which was accepted as the basis for the preparation of the Second Five Year Plan. Since then the Institute has been actively engaged in work on planning in both Calcutta and New Delhi in close collaboration with the Planning Commission and the Central Statistical Organization.

TWENTYSEVENTH ANNUAL REPORT : 1958-59

Present Activities

During the year under review the activities of the Institute covered a very wide field of which some indication is given below.

(1) *Learned society :* The Institute still functions as a learned society; and has an internationally known journal, *Sankhyā :* The Indian Journal of Statistics, as its official organ. It has society branches at Aligarh, Bangalore, Bombay, Madras and Poona.

(2) *The Research and Training School* has sections for mathematics, theoretical and applied statistics, biometry, psychometric research and service, demography, sociological studies, regional (geographical) surveys, geological studies, and flood research.

Two-year and other courses of professional training are given for candidates who have taken their Master's Degree; in-service training for statisticians in collaboration with the Central Statistical Organization in New Delhi; and technical training for computers, field investigators and operators of machine tabulation.

(3) *The International Statistical Education Centre* is maintained jointly by the International Statistical Institute and the Indian Statistical Institute with the support of the Government of India and the UNESCO.

(4) *Statistical Examinations :* The Institute is conducting examinations on a country-wide basis for the award of the Statistician's Diploma and Certificates for Computers and Field Investigators.

(5) *The Planning Division* has units in Delhi and Calcutta. The Delhi Unit is working on the outline of the Third Five Year Plan and scientific and technical manpower in collaboration with the Perspective Planning Division of the Planning Commission and the Central Statistical Organization. The Calcutta Unit is working on problems of economic development.

(6) *The National Sample Survey :* The Institute is in charge of the design of surveys, the technical work, and the tabulation and processing of the primary data collected by the Field Branch of the NSS which works under the direct control of the Cabinet Secretariat. The tabulation work is done at three centres, Calcutta, Giridih, and Delhi.

(7) *Electronic Computer Division :* An analogue computer was designed and constructed in the Institute in 1953; a digital computer of British make was purchased in 1956; and a Russian digital computer was installed in 1959. Computation service is being offered to many scientific institutions; and developmental research is also proceeding to construct electronic adjuncts and equipment.

(8) *The Development Workshop* services the machines and equipment in the Institute and is also engaged in developmental research. One high speed electronic "sorter" was designed and constructed and has gone into batch production; and proto-types have also been constructed of desk calculating machines.

(9) *Statistical Quality Control :* The Institute maintains six SQC units at Bangalore, Bombay, Baroda, Calcutta, Coimbatore and Delhi which work under the guidance of a SQC Policy Advisory Committee appointed by the Government of India.

(10) *Publications :* In addition to *Sankhyā :* The Indian Journal of Statistics, the Institute is publishing important scientific and statistical books in collaboration with the associated non-profit Statistical Publishing Society which maintains the well-equipped Eka Press in Calcutta.

INDIAN STATISTICAL INSTITUTE

Research and Training School

The Research and Training School (RTS) may be described as the hard core of the Institute. Before the Institute came into existence, statistics, in its scientific sense, was practically unknown in the country, the widely prevalent notion being that statistics meant just the compilation of figures. From the very beginning, therefore, the Institute had to train up its workers in the method of statistical analysis. As early as in 1932, the Central and State Governments began to depute officers for training in the Institute. Such training in the earlier years was largely on an individual basis. In 1939 the Institute started organized courses of instruction which gradually developed into the present Research and Training School.

Training Courses : The Institute offers at present nine or ten courses at different levels including a two-year post-M.Sc. training course in professional statistics and several courses in theoretical and applied statistics in Calcutta and in Delhi in cooperation with the Central Statistical Organization and the Institute of Agricultural Research Statistics. The School also organizes the training of statistical computers at different levels. Up to 1958-59 organized training was given to over 2,500 persons including 280 foreign trainees in theoretical and applied statistics and, in addition, apprenticeship training was given to about 2,500 persons through participation in project work.

Research : A brief account is given below of the current research programme covering a variety of subjects.

1. *Theoretical Statistics :* Extensive researches have been done by the workers of the Institute on Mahalanobis's D^2 or the Distance Function and multivariate analysis particularly for purposes of classification; design of experiments with the application of the theory of Galois fields; the theory of estimation including the Rao-Blackwell theorem; large sample theory including frequency chi-square tests; and advanced probability including the use of the theory of topology. Much important work has also been done on the theory of design of sample surveys, the use of interpenetrating samples and fractile graphical analysis.

2. *Biometric Unit :* The Biometric Unit, which was greatly strengthened when Professor J. B. S. Haldane and Mrs. Haldane (Dr. Helen Spurway) joined it in 1957, is at present engaged in research of both scientific and economic interest. Among some of its interesting studies are those on regeneration in rice, growth and survival rate of fish (Indian carp), paddy-cum-fish culture, synthetic plant hormones and human blood groups.

3. *Psychometric Research and Service :* This unit was set up in 1954 to work on psychological measurements with particular emphasis on the development, application and analysis of psychological tests for educational and vocational selection.

4. *Demographic Research and Training :* Apart from the continuing demographic surveys conducted by the NSS, important studies have been carried out in the Institute since 1957, with the assistance of the Ministry of Health, in which special emphasis is laid on studying factors associated with fertility and mortality.

5. *Sociological Studies Unit :* This Unit is carrying on sociological studies with special reference to the village as a local unit and on various aspects of the changes in social conditions. Some field studies are being carried out at Giridih.

6. *Regional Survey Unit:* Dr. A. T. A. Learmonth of the Department of Geography, Liverpool (UK), who came to the Institute in August 1956, initiated in Mysore State a pilot project in regional survey for planning the development of new techniques for economic surveys by a combination of geographical with statistical methods. The Unit also provides specialised training to advanced students of the RTS.

7. *Geological Studies Unit:* Dr. (Miss) Pamela L. Robinson of University College, London, organized the Unit in 1957-58, and led two expeditions to different parts of the country during which important fossil material was collected. The work of this Unit would be generally directed to the application of statistical methods in geological studies.

8. *Flood Research Unit:* Important statistical work had been carried out by the Institute in its early days about floods in North Bengal and in Orissa. In May 1958, a small new Unit was organized to study the basic factors responsible for the frequent occurrences of floods in North-East India. The Flood Wing of the Central Water and Power Commission, New Delhi and the Indian Meteorological Department have taken the help of this Unit in carrying out some preliminary studies.

International Statistical Education Centre

This Centre was opened in 1950 under the joint auspices of the UNESCO and the International Statistical Institute in collaboration with the Indian Statistical Institute. It is being maintained with the support of the Government of India. The main purpose of the Centre is to provide courses in theoretical and applied statistics at various levels to selected participants from the countries of South and South-East Asia, the Far East and the Middle East. The teaching at the Centre is undertaken by members of the staff of the Indian Statistical Institute and visiting teachers provided by the International Statistical Institute and the United Nations. The Centre has completed the twelfth term of training, which was spread over 9 months. Since its inception altogether 324 persons from 18 Asian countries, including 229 from outside India, have received training at the Centre. The thirteenth term of the Centre started in July 1959.

Statistical Examinations

The Institute has been holding all-India examinations at a number of centres in India for the award of the Statistician's Diploma and Computer's Certificate since 1938 and Certificates of Proficiency in Field-surveys since 1950. The certificates and diplomas awarded as a result of these examinations are recognized for employment purposes by the Government as well as non-Government institutions and commercial organizations. Since 1938 about 11,771 candidates have registered, 9,622 have appeared and 2,981 have passed in one part or another of these examinations.

Since its inception the Institute has been instrumental in making available about 4,000 trained personnel consisting of about 2,500 (including about 300 trainees from outside India) who received organized courses of instruction, 2,500 who received apprenticeship training, and nearly 3,000 who became qualified through external examinations conducted by the Institute.

Planning Division

The Institute has been engaged in studies relating to planning for national development since 1954 when such studies were inaugurated by the Prime Minister, Sri Jawaharlal Nehru. The first phase of the work contributed to the preparation of the "Draft Plan

Frame", which was submitted by Professor Mahalanobis to the Government in March 1955 and was accepted as the basis for the formulation of the Second Five Year Plan. Since then, one unit located in Delhi, in collaboration with the Perspective Planning Division of the Planning Commission, is actively cooperating in the preparation of an Outline of the Third Five Year Plan and a series of studies on scientific and technical manpower. It has also assisted in statistical and economic researches on problems of planning in India in collaboration with a number of foreign experts. The unit in Calcutta was engaged on studies in national income, economic growth, and some of the special problems of planning in a mixed economy. The Calcutta Unit is also looking after the teaching of economics in the Research and Training School. An experimental unit for the study of the economics of cottage industries, called *Kalyanasri*, was started in Calcutta in 1956 and is being maintained on a self-supporting basis.

The National Sample Survey (NSS)

The Institute has for many years been carrying out sample surveys, both small and large-scale, for the collection of information on agricultural crops and social and economic conditions of the people, on behalf of different Governments and other organizations, with the help of block grants sanctioned by the sponsoring authorities. It has also been functioning as a computational laboratory for the scientific processing and analysis of statistical data for various authorities.

Since 1950, the Institute has been handling, on a continuing basis, the vast project of the design and technical work and a part of the field work of the Indian National Sample Survey which is financed by the Government of India. The Field Branch with a large staff of investigators covering the whole country is under the direct control of the Cabinet Secretariat, Government of India.

A very large portion of the Institute's staff is at present engaged in this project which has for its objective the collection of comprehensive information relating to the social, economic and demographic conditions of the country. The survey is carried out in rounds, each round of field investigation extending over a period varying from 4 to 12 months. The method used is that of canvassing suitable questionnaires in sample households, by trained field investigators. Several thousands of households covered by the NSS every year are selected from both urban and rural areas all over the country. Information is also collected in respect of several organized industries. The results are being increasingly used for the planning of the country's economy and for policy decisions.

Thirteen rounds of survey had been completed by May 1958 and the field work for the fourteenth round was in progress when the year under review ended. Reports and technical papers are also published for the information of the public. Forty reports have been prepared, out of which eighteen have been printed and the remaining reports are in the press.

Machine Tabulation Section: The Machine Tabulation Section of the Institute, which is perhaps the largest in Asia, has 22 Accounting Machines, 1 Electronic Statistical Machine, 32 Sorters, 6 Calculating Punches (Multipliers), 6 Collators, and 27 Reproducer and Gang Summary Punches. On an average, over five million cards are punched and fed into the machines every year with about fifty million card-passages through the tabulators.

Electronic Computer Division

Analogue Computer : A small workshop had been started during the war through an associated non-profit organization (to which reference is made later) for the repair and maintenance of calculating machines and scientific equipment. In 1950 a small section was started to promote the use of modern electronic computers. In 1953 a small analogue electronic computer was designed and constructed in the Institute for the solution of a system of linear equation in 10 variables which is giving useful service.

Digital Computers : A digital computer, HEC-2M, of British make was installed in 1956 by Institute engineers and is being maintained since then by them. In 1958 a much bigger digital computer, URAL, was received from USSR through the United Nations, and was recently installed by Soviet engineers, and is being maintained by ISI engineers since February 1959. The URAL machine was working two shifts towards the end of 1959.

Computation Service : The electronic computers are being used not only for the Institute's own work but also to solve computational problems sent by other scientific institutions among whom may be mentioned the Indian Institute of Science, Bangalore; the Tata Institute of Fundamental Research, Bombay; the Indian Institute of Technology, Khargpur; and the Indian Association for the Cultivation of Science, Calcutta.

Development Workshop : The Institute has a well-equipped workshop which is responsible for repairs and the maintenance of different types of calculators and other equipment in the Institute. It is also rendering assistance to other organizations for repair work; for example, it has successfully redesigned and fabricated a vital part of the radar equipment at the Calcutta airport at the request of the Civil Aviation Directorate.

Apart from maintenance and repair work, the workshop carries out developmental research for the manufacture of precision scientific instruments such as desk calculators, punched card sorters and improved parts of calculating equipment. The workshop has designed and constructed some very efficient high-speed "sorters" for punched cards. The workshop is now engaged in the batch production of such improved sorters. It is owing to this distinctive feature of its activities that it is known as the Development Workshop.

Statistical Quality Control

Statistical Quality Control is one of the management techniques that has contributed to the efficiency of production in the principal industrial countries during the last decade. The objectives of SQC are ensuring conformance with specifications; increase in productivity ; and optimum utilization of men, machines and products.

The Institute became interested in SQC as early in 1936 and started organizing training courses in SQC from 1945. The visit in 1947-1948 of Dr. W. A. Shewhart of the USA, who is regarded as the father of SQC, gave a great impetus to this work which was further strengthened by the visit of a team of experts deputed by the United Nations Technical Assistance Administration which conducted training courses at different centres in India in 1952-53. As a follow-up, SQC units were set up in 1953-54, under the administrative control of the Institute, at Bombay, Bangalore and Calcutta. Since then three more units have been established at Coimbatore, Delhi and Baroda. These units, which are maintained with the help of grants from the Government of India, are engaged in three types of activities : promotional, training and servicing. A Policy Advisory Committee, constituted by the Government of India, guides the activities of these units. The number of member factories on the rolls of the six units was 49 at the end of March 1959.

INDIAN STATISTICAL INSTITUTE

General Activities

Library : The Institute has one of the finest statistical libraries in the whole world with nearly 76,000 books, over 1500 periodicals, a large number of maps and microfilms. It also has a well-equipped photographic unit and two special units for translation from the Russian and the Chinese languages, and one unit in Tokyo for translation from the Japanese language besides arrangements for translation from French, German, and Italian languages.

Visiting scientists : Since 1938 the Institute has been inviting foreign scientists and scholars to visit India. This programme was greatly expanded from the initiation in 1954 of studies on planning for national development, and the Institute has now become an important centre for the coming together of visiting scientists from all over the world. During the year under review about 30 foreign scientists participated in the work or gave lectures and had discussions in the Institute.

Guest Houses : The Institute maintains Guest Houses at Baranagar for visitors many of whom stay at the Institute for fairly long periods for lectures, research work and technical consultation. The number of such guests during 1958-59 was 124. There is a separate hostel for students of the International Statistical Education Centre in Calcutta, and a guest house at Giridih.

Welfare Activities : The Institute maintains hostels for students, canteens for supplying subsidized refreshments, mess for workers, a circulating library, medical units including a health home at Giridih, its own transport service, and a workers' club for sports, recreation and cultural activities. There is also a workers' cooperative credit society. The Institute provides a good deal of 'in-service' training, and also publishes a house-journal, *Samvadadhvam*.

Associate Organizations : In addition to the work done under the direct control of the Institute, the following associated organizations, located within or near the Institute premises, work in close cooperation with it.

The Statistical Publishing Society was established in 1935, on the initiative of the Institute, as a non-profit association, and registered under Act XXI of 1860, mainly for the publication of *Sankhyā* : The Indian Journal of Statistics, which is the official organ of the Indian Statistical Institute. The Society maintains the Eka Press which is adequately equipped for undertaking the printing of scientific and technical work.

The Indian Calculating Machines and Scientific Instruments Research Society, which was established in 1943, on the initiative of the Institute, as a non-profit society registered under Act XXI of 1860, with the object of promoting research, production and use in India of calculating machines and statistical, mathematical, scientific and engineering instruments, apparatus and appliances, is now working in association with the Institute Workshop.

PART 1 : GENERAL REVIEW OF THE WORK DURING THE YEAR

1. RESEARCH & TRAINING SCHOOL

An important part of the regular activities of the Research and Training School (RTS) during the year consisted of research in theoretical and applied fields. The RTS also provided about ten courses of training at different levels and offered consultation service by attending to scientific enquiries.

The Research and Training School carried out its activities under the general guidance of P. C. Mahalanobis, the Director of the Indian Statistical Institute. C. R. Rao continued to be the head of the division of theoretical research and training. J. B. S. Haldane, as Research Professor, participated in teaching in addition to guiding a large number of research workers in Statistics, Biology and Mathematical Genetics. A. Matthai was in charge of the International Statistical Education Centre, which provides courses for trainees deputed from South East Asian and other foreign countries. Researches in the various applied units, attached to the Research and Training School, were the responsibility of the heads of the different Units, N. K. Bose (Flood Research), B. C. Das (Biometry), R. K. Mukherjee (Sociology), S. J. Poti (Demography), Shib K. Mitra (Psychometric Research and Service), S. L. Jain (Geological Studies) and V. L. S. Prakasa Rao (Regional Surveys).

Research

Research was carried out during the year in many branches of theoretical statistics, such as Methodology, Probability Theory, Estimation and Testing, Multivariate Analysis, Sample Surveys, and Design of Experiments. The Units for applied research in Biometry, Psychometry, Sociology, Demography, Regional Surveys, Geology and Flood Research undertook a number of research projects, mainly of applied interest, but in which the approach is essentially statistical. The main lines of research are briefly outlined below. More details are given under 'Research Summary'. Research papers and other documents published or prepared during the year are listed in appendices 5.1 to 5.5.

Fractile Graphical Analysis : A new technique of Fractile Graphical Analysis was developed which enables, through a graphical representation, a comparison of data relating to two or more groups. The method has great flexibility, being applicable to interval as well as ordinal data and is specially useful when the data cannot provide an adequate summary in terms of a few parameters. The technique has been used in a wide variety of fields, such as economics, demography, anthropology, agriculture, psychology, etc. Some conjectures made regarding the behaviour of Fractile Graphs have been empirically corroborated by model sampling and some others have been theoretically established.

Probability Theory : Convergence of the density function of a normed sum of independent and identically distributed random variables to the normal density function almost everywhere was established. Lower and upper bounds were derived for the right-hand tail probability in a binomial distribution, and this gave necessary and sufficient conditions for the validity of the normal approximation to the tail probability.

Estimation and Testing : Examples were constructed of maximum likelihood estimates that are 'inconsistent' in a certain sense. In another work, strong consistency of maximum likelihood estimate of infinite multinomial distributions was proved. A new criterion was proposed for asymptotic comparison of performances of two test procedure

and its connection with Neyman-Pearson theory brought out. The Pitman limiting power of goodness of fit chi-square was obtained. A large sample test for the mean function of a discrete linear stochastic process was constructed. The chi-square statistic was used to estimate the variance of a frequency in different populations from which samples are available.

Multivariate Analysis : Performance characteristics of discriminatory procedures were studied. Methods for evaluating multivariate probability integrals were developed. A comparative study of some tests on the dispersion matrix was made. The 'step-down procedure was applied to derive new tests and confidence intervals for means and dispersion matrices.

Sample Surveys : For a very general scheme of sampling, an admissible as well as a complete class of linear unbiased estimates for the mean of a finite population was obtained.

Design of Experiments : By evaluating expectations of mean squares in the analysis of variance balanced and partially balanced designs under the most general set-up, the nature of varietal differences which the variance-ratio test can detect was examined. Expected values of mean squares in the case of randomised block or Latin-Square designs with one missing plot were computed. A new class of two replicate incomplete block designs was constructed.

Biometry : In the Biometric Unit, work was continued on studies on biological variation and symmetry, genetics, insect behaviour, blood-group surveys, fish growth and spawn survival rates. The phenomenon of regeneration in rice was discovered; preliminary experiments on an *aus* variety of rice showed that if the ears were removed without drying the soil or damaging the leaves, a second crop was obtained 45 days later. Experiments were conducted to determine the interaction of varieties and species in mixed crops. Clinical studies of human serum protein and haemoglobins were carried out. The relationship between blood-pressure and cholesterol in the blood was investigated.

Psychometry : In the Psychometric Unit, research was continued on development of test procedures for selection of trainees for higher academic courses and of personnel for highly technical jobs. Research studies in industrial psychology include a methodological investigation of job analysis, development of behaviorial indices for personnel selection, and empirical evaluation of screening test for colour vision. Empirical and theoretical studies of performance characteristics of a number of psychometric methods were carried out. Work on development of psychological tests was continued.

Regional Surveys : The Regional Survey Unit completed a report on resources study for planning purposes in Mysore State. Work in progress includes theoretical studies on : (i) delimitation of regions by quantitative and objective methods, (ii) classification of Indian towns and (iii) rural land-use mapping, and the following applied studies: (iv) mapping of regional components of Dandakaranya, (v) mapping at national level to assess regional disparities in India in respect of agricultural efficiency, industrial location and urbanisation, and (vi) a macro-project for South India.

Geological Studies : An important aspect of the work of the Geological Studies Unit, organized by Dr. (Miss) Pamela L. Robinson during October 1957 to April 1958 would be the application of statistical methods to palaeontological materials, specially fossil vertebrates to assess their rate of evolution, dating of Indian rocks on the basis of vertebrate

fossil found therein and establishing a research centre. The Unit organized several expeditions and in collaboration with the Geological Survey of India, announced the discovery of a reptilian fossil, *Lystrosaurus*, from Panchet beds in West Bengal. This discovery goes some way towards providing a geographical link between Sinkiang and South Africa about 180 million years ago. The Unit also discovered a fossil reptile skeleton whose age goes back to 180 million years and also collected a number of fish specimens as old as 120 million years.

Sociology: The Sociological Research Unit, which was established in October 1957, worked on several products among which may be mentioned: study of 'village' as a societal unit in West Bengal and Bihar; study of family structures in undivided Bengal in 1947; and study of inter-group relations at Durgapur and Giridih.

Demography: The Demographic Research and Training Unit was established in 1957 with the assistance of the Ministry of Health particularly for studying factors associated with fertility and mortality. The Unit has carried out several demographic studies on such subjects as social mobility and its demographic effects, prevalence of contraceptive practices and their effects on fertility, and information relating to population for purposes of developmental planning.

Flood Research: A Unit for study of floods, which was set up in May 1958, made a beginning with the investigation of floods in West Bengal with the idea of gradually extending the study over Bihar, Orissa and Assam. Basic data on rainfall, river discharge, catchment areas and occurrence of floods for the last ten years have been collected and critically assessed. On completion of the investigation, it should be possible to suggest appropriate measures for flood control. During the year, the Unit also made two other studies, one on the forecasting of floods of the Jamuna at Delhi (at the desire of the Flood Wing of the Central Water and Power Commission) and the other on medium-range forecasting of rainfall at the instance of the Indian Meteorological Department.

Research Seminars: A number of lectures were given and seminars conducted for the benefit of the staff and trainees of the RTS by visiting experts, details of which are reported in the section on visiting scientists. Two series of seminars on Measure Theory and Operators in Hilbert Space were conducted by senior research scholars.

Technical Publications: The following technical publications were issued by the Research and Training School.

1. Handbook for Practical Work in Statistics, Part I (Techniques of Computation) by J. Roy, I. Chakravarti and R. G. Laha.
2. Operators in Hilbert Space by V. S. Varadarajan.

Consultation Service

The consultation service of the RTS which is open to scientific and research workers in the country attended to enquiries relating to planning experiments, statistical analysis and interpretation of data received from research workers in government departments, business firms and research institutions. Amongst those who sent problems, mention may be made of the Agricultural Research Institute, Ranchi, and the Government Tuberculosis Institute, Madras. Scientific service concerned with psychometric research with reference to the collection, analysis and interpretation of test data and in other fields are described under Summaries of Research Work.

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Training

Ten different courses were arranged by the Research & Training School in 1958-59 including the teaching given in the International Statistical Education Centre (ISEC) in Calcutta (about which details are given in the next section). With the exception of the ISEC and two courses for computers, admission to these courses was normally restricted to persons with a Master's Degree or equivalent qualifications; and special selection tests were conducted for most of the trainees. The following list shows the number of applicants, those appearing at selection tests, and those admitted in the different courses.

NUMBER OF APPLICANTS, THOSE APPEARING AT SELECTION TESTS, AND THOSE ADMITTED

course	number of applicants	appeared	admitted
1. International Statistical Education Centre	39	—	16
2. Officers-on-deputation	—	—	5
3. Research & Advanced Studies	—	—	17
4. Statistical Officer's Course (jointly with CSO)	—	—	22
5. Three-years Course			
third year	94	53	35
second year	—	—	25
first year	301	259	27
6. Short-term Course : March–September 1958			
junior	265	168	35
senior	22	—	10
7. Short-term Course : September 1958–March 1959			
junior	269	163	35
senior	19	—	6
8. One-year Evening Course in Delhi (jointly with CSO) *March 1959—February 1960*	252	—	41
9. Computer's Courses : Junior & Senior			
March—September 1958	137	89	38
September 1958—March 1960	162	82	54
10. Special Course on Electronic Computer Logical Design	—	—	16
total	1530	811	393

Officers on Deputation : From the very beginning (1932) the Institute has offered facilities to officers who come on deputation for special studies. The list of officers on deputation is given in Appendix 10.2.1.

Statistical Officer's Course (jointly with CSO) : In recent years special courses, jointly with the CSO, are being offered to statistical officers selected by the CSO. A list is given in Appendix 10.2.2. The session commenced in September 1958 and was

[1] Technical training was also given in other Divisions such as the National Sample Survey, Electronic Computer Division, Workshop, and Statistical Quality Control.

attended by 22 officers of different State and Central government departments. After the first part of their training for about four months in the RTS, they joined the CSO in New Delhi for further training. Out of these, 13 officers, after completing their training in the CSO, came back to the Institute for specialized training for three months in subjects like machine tabulation, sampling theory and techniques, and statistics of planning.

Selection of Candidates for the Year 1958-1959 : For selecting suitable trainees for the following courses, tests were conducted in July 1958 at eight different centres, namely Banaras, Bombay, Calcutta, Delhi, Hyderabad, Madras, Trivandrum and Waltair :

1. First year of the Two-year Advanced Course for Statisticians.
2. Second year of the Two-year Advanced Course for Statisticians.
3. Advanced Studies and Research in Statistics and Industrial Psychology.

Selection to these courses was made on the basis of test scores, considered together with the academic career of the students. The names of the trainees who attended the various courses during the year, the training calendar and examination details are given in Appendix 10.3 to 10.8.

Advanced Studies : The One-year Apprentice Course mentioned in last year's report was discontinued from July 1958. Some of the previous scholarships were renewed and five additional awards were made for the new academic year. A list of the research scholars and their main fields of work is given in Appendix 10.3. One of the research scholars submitted a thesis for the degree of Doctor of Philosophy.

Two/Three Year Advanced Course for Statisticians (in collaboration with the Central Statistical Organization) : This course which was previously extended over three years has been reorganized into a two-year course. The 25 students in the third year class shown in the previous year's report completed the course in July 1958. 35 students in the second year class of the previous year were all promoted to the third year and in-service training was provided for these students either in the projects or special service divisions of the Institute or in government departments or specialized institutions. Details are given in Appendix 10.4.1.

Out of the 28 students of the first year class during the last year, 20 were promoted to the second year and in addition five were admitted to the second year directly from among fresh applicants. On the basis of admission tests, 27 candidates were admitted to the first year of the course. The lists of students are given in Appendices 10.4.2 and 10.4.3.

As a special feature of the training programme for this year, students of the first year class of the Two-year Advanced Course for Statisticians, undertook statistical research projects which are listed in Appendix 10.4.3.

Short-term Statistician's Course (Junior and Senior) : Two sessions were held, one in March-September 1958 with 10 senior and 35 junior trainees and the other in September 1958-March 1959 with 6 senior and 35 junior trainees (Appendices 10.5.1 to 10.5.4).

Computer's Training Course (Junior and Senior) : Two sessions were held, one in March-September 1958 with 38 trainees and the other in September 1958-March 1959 with 54 trainees (Appendix 10.7).

Evening Course in Delhi (jointly with CSO) : The course is intended primarily for persons in government employment in Delhi. The course consists of two parts each given over a period of about six months. The first part of the course provides basic training in

statistical methods and their applications to different fields. The second part concentrates on official and administrative statistics and sample survey data.

The course was initiated in April 1958 and 40 applicants were admitted from about 800. Of these, 28 completed both parts of the course by March 1959. A list of these trainees is given in Appendix 10.6.

A new session of the course commenced in April 1959. There were about 252 applicants of whom 41 were admitted.

Advanced Courses: A special course on electronic-computer logical design technique was given during February—May 1959 by Mr. Morton Nadler (lately of the Institute of Computing Machines, Prague, Czechoslovakia). It was attended by seven technicians deputed by the Indian Institute of Technology, Kharagpur, the Jadavpur University and the Institute of Radio Physics and Electronics, Calcutta University, besides nine from the Indian Statistical Institute. (List in Appendix 10.1).

2. INTERNATIONAL STATISTICAL EDUCATION CENTRE, CALCUTTA

The International Statistical Education Centre (ISEC), Calcutta, was opened in October 1950 under the auspices of the UNESCO. It is being maintained jointly by the International Statistical Institute and the Indian Statistical Institute with the support of the UNESCO and the Government of India. The Centre provides courses of training in theoretical and applied statistics at various levels to selected participants from countries of the Middle, South and Far East.

The Centre provides each year, over a term of nine months' duration, regular courses for three categories of candidates : (a) officials with previous experience in statistical work, (b) teachers of statistics and research workers and (c) officials who have no previous experience in statistical work. In addition, special courses of varying durations and facilities for research work and advanced studies are provided, on an individual basis, for senior visiting statisticians.

Joint Board of Directors : The Centre was being supervised by a Board of Directors composed as follows : *Chairman:* P. C. Mahalanobis, *Members:* G. Darmois, R. G. D. Allen, E. Lunenberg (ex-officio members representing the International Statistical Institute) V. Sahay (Cabinet Secretary, alternate S. K. Bose, representing the Government of India) C. R. Rao, A. Das and A. Matthai, *Secretary* (representing the Indian Statistical Institute).

Participants : The Eleventh Term, in which 18 participants from 8 countries had attended, concluded in April 1958. The Twelfth Term started in July 1958. During the twelve terms, training was imparted to 324 trainees from the following 18 Asian countries: Afghanistan (2), Burma (30), Cambodia (2), Ceylon (12), India (95), Indonesia (17), Iran (5) Iraq (1), Japan (14), Malaya (2), Nepal (6), Pakistan (64), Philippines (30), Singapore (4) Syria (1), Thailand (20), United Arab Republic (2) and Viet Nam (6). Appendix 10.1 gives the numbers of trainees attending the twelfth term.

The Twelfth Term

The Prospectus of the Twelfth Term together with the application forms was issued from the Permanent Office of the International Statistical Institute at The Hague and countries in the South, Middle and Far East were invited to nominate candidates for training at the Centre.

Fellowships : Under the scheme of Technical Cooperation under the Colombo Plan, the Government of India made available about 20 fellowships to participants of the Twelfth Term of the Centre; and also sanctioned three other fellowships to students from countries outside the Colombo Plan.

Selection of Trainees : In response to the announcement of the Twelfth Term, 39 applications were received from ten different countries. Selection for admission as well as for fellowships of candidates were made by the Board of Directors of the Centre. In all 32 candidates were offered admission, out of whom 23 were awarded fellowships. Altogether 27 nominees from ten different countries joined the Centre. Of the 27 candidates who joined and attended the Twelfth Term, four were teachers and 23 statistical workers in government departments with some previous experience in statistics. (List in Appendix 10.1).

Instruction : The Twelfth Term opened officially on 28 July 1958. Almost all the students had joined the Centre within the first two weeks of the term. The training given according to the curriculum of the Centre consisted of lectures, laboratory work, project training and field work. The first four months were devoted to general statistical methods including the theory of probability, sampling theory and methods, and statistical organizations and procedures. Lectures and practical work on general statistical theory, statistical organizations and official statistics were compulsory for all the participants. During the first four months, approximately 200 hours of lectures, 100 hours of laboratory work and 100 hours of project training were given at the Indian Statistical Institute.

Towards the end of the training, the students paid a two-week visit to Giridih (Bihar) for training in agricultural statistics and crop-cutting experiments at the Institute's Experimental Station. Starting from January 1959, individual training through specialization courses were given in the following fields for a period of about two months: agricultural surveys, industrial statistics, national income estimation and mathematical statistics. The final phase of the training consisted of three-weeks' training in governmental statistics at the Central Statistical Organization, New Delhi.

Examinations and Certificates: During the Term, periodical examinations were held on different subjects, the total number of tests on different subjects being 22. The final examination consistol of two papers on general methodology and three papers on subjects of specialization. On the basis of these examinations, the Board of Directors decided to award Certificates of Merit to 26 candidates and Certificate of Attendance to one candidate.

Educational Tours : The students were taken on educational tours to places of interest in India, like Agra, Delhi and Santiniketan.

Teachers : A major portion of the routine teaching was imparted by the staff of the Research and Training School and Project Divisions of the Indian Statistical Institute. In New Delhi, during March-April 1959, a number of government statisticians took part in the training of the governmental statistics at the Central Statistical Organization.

Visiting Teachers : The United Nations very kindly placed the services of Dr. J. B. D. Derksen of Netherlands at the disposal of the Centre to act as its Director of Studies from March 1958 to March 1959. In addition, many visiting teachers from abroad participated in the teaching programme. The International Statistical Institute arranged, with the help of a grant from the Government of India, for Mr. S. A. O. Thore (Sweden)

and Dr. (Miss) Esther Seiden (USA) to teach at the Centre, each for a period of six months. Dr. Nathan Keyfitz (Canada) taught at the Centre for two months with an assignment under the Technical Cooperation Scheme of the Colombo Plan. Other visiting teachers who took part in the instruction during the term included Dr. E. Hofsten (ILO), Dr. Q. M. Hussain (Dacca University), Mr. M. D. Palekar (UN) and Dr. S. S. Zarkovich (FAO). Dr. K. S. Banerjee (Statistical Bureau, West Bengal) and Mr. C. R. B. Menon (Directorate General of Commercial Intelligence and Statistics, Government of India) also delivered a series of lectures.

In addition, the students of the Twelfth Term had the opportunity of attending various lectures and seminars held at the Indian Statistical Institute.

Dr. J. B. D. Derksen (Central Bureau of Statistics, Netherlands) worked as the Director of Studies at the Centre during the term, under an assignment from the United Nations; and A. Das was the Administrative Officer of the Centre.

Arrangements have been made for holding the Thirteenth Term from July 1959 to April 1960. The Prospectus of the Thirteenth Term and invitations to the various countries for nominating participants were issued from the International Statistical Institute, at The Hague in December 1958.

3. STATISTICAL EXAMINATIONS

An Examinations Committee, constituted by the Council of the Institute from among statisticians, economists and other specialists selected from all over the country, have been conducting external examinations known as Professional Examinations, since 1938. The certificates and diplomas issued to successful candidates indicate professional competence at varying levels and are recognized acceptable qualifications for employment by the Government as well as by non-Government institutions and commercial organizations. The external examinations are open to all who possess the requisite academic qualifications or professional experience prescribed for each examination. The examination centres are located in different places in India. The examinations which are ordinarily held twice during each year in March and September are widely advertised. The results are communicated to all candidates, after the approval of the Council. Upto 1959 the total number of candidates who have passed in one part or another of these examinations were 2981, or 31 per cent of 9622 who had appeared at these examinations out of 11,771 registered.

Statistician's Diploma

This was held in September 1958 and again in March-April 1959 at Bangalore, Bombay, Calcutta, Delhi and Poona. At Lucknow the examination was held in September 1958 only. In the September 1958 examination, 146 candidates registered in one or more papers. Of these, 130 appeared and 72 passed in one or more papers. In the March-April 1959 examination, 122 candidates registered in one or more papers. Of these, 110 appeared and 65 passed in one or more papers.

Computer's Certificate—Part 1

This was held twice at Bangalore, Bombay (in September only), Calcutta, Delhi and Giridih. In the September 1958 examination, 145 candidates registered, 132 appeared and 47 passed in one or more papers while in the March-April 1959 examination, 71 registered

Field Survey Certificate (Junior and Senior)

These examinations were held only once in September 1958 at Bangalore, Calcutta and Giridih. In the Junior Certificate Examination, 4 registered, 1 appeared and passed in one paper only while in the Senior Certificate the corresponding numbers were 3, 3 and 1. The Statistical Field Survey Certificate Examinations were not held in March-April 1959.

Appendix 11 contains the names of the successful candidates. Appendix 11.6 gives a summary of results by each paper for all the examinations held from 1951 to 1959.

4. PLANNING DIVISION

A small Central Statistical Unit was established in New Delhi in 1949 which was staffed by Institute workers and which continued to look after the statistical work of the Government of India for two years until the establishment of the Central Statistical Organization. A small Institute office continued to be maintained in New Delhi which actively collaborated in Government work in statistics. In 1953-54 an Operational Research Unit was established to undertake, on a small scale, technical work on planning.

In September 1954 the Institute was asked by the Planning Commission to study jointly with the Central Statistical Organization and the Finance Ministry the possibility of preparing the Second Five Year Plan in such a way that there would be a continuing increase in national income and improvement in the level of living and also a solution of the problem of unemployment, if possible, in ten years.

On 3 November 1954, Prime Minister Jawaharlal Nehru inaugurated in the Indian Statistical Institute studies relating to planning for national development. This led to the formulation of the "Draft Plan-frame" of March 1955 which was accepted as the basis for the preparation of the Second Five Year Plan.

In September 1955 it was decided that the technical work on planning in the Institute should be strengthened and greater attention should be given to perspective planning. Since then work on planning is being done by the Institute in both Delhi and Calcutta.

Delhi Unit

Two new Divisions, one for Perspective Planning and the other for Statistics and Surveys, were established in the Planning Commission to work under Professor Mahalanobis. Since then the Planning Unit of the Institute has been actively collaborating with the Planning Commission, and the Central Statistical Organization in the work on planning.

The Delhi Unit under the guidance of Pitambar Pant, Chief of the Perspective Planning Division, actively cooperated in the preparation of a series of studies on scientific and technical man-power, and technical studies relating to the preparation of an Outline of the Third Five Year Plan (Appendix 5.6). Various studies were also undertaken in 1958-59 in collaboration with Mr. Trevor Swan (Australia) and Mr. I.M.D. Little (UK) who came with assignments from the Centre for International Studies, Massachusetts Institute of Technology. H. W. Arndt (Australia) and Amartya Kumar Sen also worked with the Delhi Unit in 1958-59.

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CALCUTTA UNIT

The work being done in Calcutta covered research, teaching, seminars and discussions, and external and other activities.

Moni Mohan Mukherjee, the former head of the national income unit in the Central Statistical Organization, who had joined the Institute in 1957, was in charge of the Planning Division in Calcutta. Ajit Biswas who had joined in 1956, and Harendra Kumar Majumdar who joined in 1959, were in charge of important sections; and among other workers in Calcutta may be mentioned Asok Rudra (who was on special leave), Ashish Kumar Chakravarti, Gauri Sankar Chatterjee, Mihir Sinha, Nirmal Kanti Chatterjee and N. S. Iyengar.

Research : Work proceeded on a variety of subjects such as inter-industry studies, consumer behaviour, models of economic growth, national income and allied subjects etc. A general account is given in the Section on Research Summary.

Cottage Industries : Certain studies on cottage industries were inaugurated in the Institute in February 1956 in a centre in the Institute premises, known as *Kalyanaeri*. Workers of the centre, numbering about 40 at the end of the year, are not paid any salary but work on a piece-rate basis plus a share of profit on the sale of the products. *Kalyanaeri*, which runs on a broadly self-supporting basis without any budget subsidy, has started repaying the loan on capital account.

Teaching : The Division organized, as in previous years, several courses on economics for the students of the Research and Training School ; and great stress was laid on practical problems.

For the Statistical Officers' Training Programme about 50 lectures were given on planning theory and Indian economic problems, and four officer trainees were given special training in economic statistics and planning methods. Lectures and practicals were also arranged for the International Statistical Education Centre and for the Short Term Statistician's Course (Junior) conducted by the Research and Training School.

Seminars : The Division sponsored thirteen special lectures and seminars, the participants in which included Mr. M. M. Babbar (Costa Rica), Dr. Bo Halvdan Astrand (Sweden) and Dr. Joan Robinson (UK) besides others mentioned above.

Visiting Scientists : Since 1954 a notable feature has been the participation by foreign experts in the studies on planning. During the year under review, many distinguished scientists from abroad worked in or with the Division such as Mr. H. W. Arndt (Australia), Dr. J. Rudolph (East Germany), Mr. J. Sandee (Netherlands), Professor Oskar Lange (Poland). Dr. Sten A. O. Thore (Sweden), Professor Henry Smith and Dr. Daniel Thorner (UK), Mr. V. Maniakin (USSR) and Mr. L. I. Lukin (USSR) and Dr. Hashim Amir Ali, formerly of the Visva-Bharati, Santiniketan and the Agricultural College, Hyderabad.

Publications : The Division has been publishing a mimeographed series "Studies relating to Planning for National Development," incorporating the working papers and technical notes by the visiting experts as well as some by the members of the staff. In course of the year 45 additions were made to the series, the titles of which have been given in Appendices 5.6 to 5.9.

One volume of papers selected from the series including three essays on economic planning by Oskar Lange was published during the year. A second volume on consumer behaviour was in the press.[1]

[1] "Studies on consumer behaviour" by research workers of the Institute was published later in 1959.

5. THE NATIONAL SAMPLE SURVEY

The National Sample Survey (NSS) was started in 1950 at the instance of Prime Minister Nehru with the responsibility of collecting comprehensive and continuing information relating to social, economic and demographic conditions on a countrywide basis. The organization is broadly divided into two branches, one concerned with the field work in charge of the Chief Director, NSS Field Branch under the control of the Cabinet Secretariat, Government of India. The other branch is located in the Institute and is concerned with the design of the survey, processing and analysis of the data, and preparation of statistical reports. The field staff in West Bengal and Bombay city is, however, under the control of the Institute while a statistical section is attached to the Field Branch for special work.

Debabrata Lahiri was in charge of the National Sample Survey. Mohanlal Ganguli, Jitendramohan Sen Gupta, Nimai Charan Ghosh, and Moni Mohan Mukherjee worked as heads of divisions with S. Raja Rao, Naresh Chandra Dutta and Amalendu Ganguly as joint heads, and Deb Kumar Bose, Sitangsu Bhattacharya, H. K. Chaturvedi, K. G. C. Nair Rama Prasad Saha and Ranjan Kumar Som as associate heads of divisions.

Machine Tabulation : The NSS data are processed with the help of machine equipment located at Baranagar, Giridih and Delhi (in the Army Statistical Organization). During the year under review, there were in all one electronic statistical machine, 32 sorters, 22 tabulators, 6 multipliers, 6 collators, 27 reproducers and gang summary punches of the IBM-Hollerith. One sorter manufactured by the Electronics Division of the Institute was in the Army Statistical Office in New Delhi. Total cards handled during the year exceeded five million and total card passage through the tabulators was of the order of 50 million.

Participation by States : A noteworthy feature of the National Sample Survey is the increasing participation of States each of which would conduct an independent survey with the same design and roughly the same or similar size of sample as the central sample. Participation started from the ninth round with the coming in of Bombay and Uttar Pradesh. Kerala joined in the tenth round, Bihar in the eleventh round ; and Andhra Pradesh, Assam, Orissa and Punjab in the fourteenth round. (It may be mentioned that in the eighth round all the States had participated in the land-holding survey). A table showing the number of villages, blocks and households covered by the Central and State samples in different rounds is given below.

Thirteenth and Fourteenth Rounds

Twelve rounds of the NSS had been completed earlier since 1950. During the year under review, the thirteenth round (September 1957-May 1958) was completed, and the fourteenth round (July 1958-June 1959) was started and was nearing completion. Up to the thirteenth round, the number of households covered was of the order of 400,000 in the rural and 200,000 in the urban area; and the number of villages and blocks surveyed was of the order of 47,000 and 21,000 respectively.

Previous Rounds : Subjects covered in different rounds may be grouped into two categories—continuing, and *ad hoc*. Information on consumer expenditure and conditions of household living is being collected from the first round. Other subjects of a broadly continuing nature are employment and unemployment, household manufacturing enterprise, land utilisation and crop production, retail and wholesale prices, village statistics etc. Among

ad hoc surveys in earlier rounds may be mentioned inventory of assets and liabilities (*first round*), newspaper reading (*sixth round*), distribution of landholdings (*eighth round*), household indebtedness (*eighth round*), farming practices (*eighth round*), vital statistics (*ninth round*), weights and measures (*eleventh round*), employment, unemployment and indebtedness of agricultural labour households (*eleventh and twelfth rounds*), production of milk and production and utilisation of cowdung (*twelfth round*). This is not an exhaustive list; and in addition type studies and pilot enquiries are also undertaken from time to time.

SIZE OF SAMPLES AND HOUSEHOLDS SURVEYED IN DIFFERENT ROUNDS

Round	Sample				Central household surveyed			State household expected to be surveyed			total households (Central & State)
	Central		State								
	villages	blocks	villages	blocks	rural	urban	total	rural	urban	total	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1	1833	—	—	—	25494	—	25494	—	—	—	25494
2	1160	—	—	—	10947	—	10947	—	—	—	10947
3	920	490	—	—	10214	3378	13592	—	—	—	13592
4	960	406	—	—	25722	11713	37435	—	—	—	37435
5	960	406	—	—	12878	5942	18820	—	—	—	18820
6	960	444	—	—	18300	5134	23434	—	—	—	23434
7	960	444	—	—	28817	12144	40961	—	—	—	40961
8	1424	488	3112	—	54163	16711	69874	79187	—	79187	149061
9	1824	2108	308	480	25364	47897	73261	4820	10080	14700	87961
10 (i)	1624	1328	448	364	20158	19913	40071	4824	5460	11284	51355
(ii)	3260	—	1000	—	—	—	—	—	—	—	—
11 (i)	1848	584	696	188	32194	10208	32432	12528	3384	15912	48344
(ii)	6330	—	1872	—	—	—	—	—	—	—	—
12 (i)	1848	584	744	202	37700	11968	49668	16824	4242	19866	69534
(ii)	6288	—	1872	—	—	—	—	—	—	—	—
13 (i)	1848	1168	768	426	9707	20088	29795	3840	5538	9378	—
(ii)	3126	—	1074	—	—	—	—	—	—	—	—
14 (i)	2616	2228	1320	1038	90243	15730	105973	22880	8304	31184	—
(ii)	2616	—	1320	—	—	—	—	—	—	—	—
15 (i)	2616	2228	1554	1158	83712	22052	103764	40728	10422	60150	163914
(ii)	2616	—	1554	—	—	—	—	—	—	—	—

(i) Socio economic survey. (ii) Crop survey

N.B..—(1) In the eighth round all states participated only in the survey of land holding. Bombay and Uttar Pradesh have been participating since the ninth round. Kerala joined in the tenth round, Bihar in the eleventh round; Andhra Pradesh, Assam, Orissa and Punjab in the fourteenth round, and Madhya Pradesh in the fifteenth round.

(2) Households surveyed in the State samples of the eighth round were received at the Indian Statistical Institute. State samples of the subsequent rounds have been received by the States and not by the Indian Statistical Institute.

(3) In the fourteenth and fifteenth rounds, crop survey and socio economic enquiries were conducted in the same set of sample villages.

Special Surveys : The most important *ad hoc* surveys in the thirteenth and fourteenth rounds were reader's preference; births, deaths and growth of population in rural areas; and in the fourteenth round, the survey of living conditions of working and middle class families. One important object of these surveys of family living is to improve the base for the calculation of cost of living index numbers (now termed consumer price index numbers). The working class survey was sponsored by the Ministry of Labour and Employment and the middle class survey by the Central Statistical Organization. The working class enquiry was conducted in 32 urban industrial areas, and 10 plantation and 8 mining centres in different parts of India, and covered 23,400 families for information on consumer expenditure and 6600 families for the level of living. The middle class enquiry was carried out in 45 important cities and towns and covered about 26,820 families for consumer expenditure and 8,940 families for level of living.

Manufacturing Industries : The National Sample Survey is carrying out since 1952 (reference year 1951) a survey of manufacturing industries in continuation of the survey which had been started in 1955 by the Directorate of Industrial Statistics. Since the fourth round (reference year 1954) the scope of the survey was extended to include industrial undertakings covered by the Industries (Development and Regulation) Act, 1951 with the exception of coalmining establishments. From the sixth round (reference year 1956), these establishments were also covered. The work of the eighth round (reference year 1958) started in April 1959 and is expected to continue till January 1960. The size of the sample in the seventh round was 6,910 factories (registered under the Factories Act) and 4,570 industrial undertakings and that in the eighth round was 6,339 factories and 5,500 industrial undertakings. The items of information covered in the eighth round were input output, labour employed, wages, value of fixed and working capital etc.

Special Enquiries

Crop Survey in West Bengal : As in the previous years experimental surveys to develop survey techniques were conducted during jute-*aus*, *aman* and *rabi* seasons of the year 1958 in West Bengal. A total of 936 sample villages was selected in each of the three seasons and a sample of clusters was taken from each village for area and yield surveys. Along with the crop survey in the *rabi* season, some particulars about the structures found in the sample plots and the number of persons residing in such structure were collected with the object of finding out whether reliable population estimates can be obtained on the basis of such an integrated survey of population and land utilization. An opinion survey about the area and outturn of *rabi* crops was also carried out in 312 sample villages with a view to evolving suitable methods of crop-forecasting.

Non-household private trading and transport : Special studies were conducted in Calcutta and its neighbourhood to assess the reliability of some provisional frames. The first of these studies related to transport, the appropriate frame for which was the list of motor vehicles maintained by the Public Vehicles Department, Government of West Bengal. It appeared that non-household ownership of transport vehicles was insignificant. Further, the list was not up-to-date in a good number of cases and the response was not very encouraging. The second study related to trading activity, the appropriate frame for which was the list maintained by the Registrar of Joint Stock Companies. The actual survey of the sample companies started in March 1959.

Type Studies

Migration: This was undertaken in Uttar Pradesh and Madhya Pradesh and also in Bombay city primarily to test the concepts and definitions relating to internal migration, and to explore the possibility of using birth place statistics as an indicator of migration.

Population and Vital Statistics: This study has been undertaken in three States, Assam, Bihar and Kerala, for improving the methodology of collection of demographic data in the NSS.

Consumption and disposal of cereals and capital formation by households: The main object of the study which is being conducted in the three States, Punjab, Andhra and Bombay, is (a) to assess the usefulness of the interview method in obtaining information on the quantum of transactions in food grains by members of a household; (b) to obtain a reliable measure of the quantity of consumption of food grains for comparison with similar estimates obtained from the regular NSS enquiries and official sources; (c) to find out the efficiency of the interview method for collecting information on capital formation in the household section.

Employment in village enterprises: This survey is being conducted in the States of Mysore and Uttar Pradesh to study an alternative approach for measuring under employment from the point of productivity as against measuring it by hours worked; as is being done at present in the NSS.

Small-scale manufacture and handicrafts: The survey is being carried out in the States of Bombay, Madras and Rajasthan to study the response behaviour for three dissimilar reference periods, week, month and year in respect of some important items, pertaining to small-scale manufacturing activities.

Pilot Surveys

Block boundary work in urban areas: The sampling frame now being used for the urban survey consists of the block limits taken from the 1951 Census. This frame is now out of date and work has been started to revise it in Calcutta and neighbouring areas.

Pre-testing of draft 1961 Census Questionnaire: At the request of the Registrar General of India, the pretesting of the draft census questionnaire was carried out with the help of NSS Directorate and Institute field-staff in January-February 1959 in 1406 households in rural areas and 1076 households in urban areas. The data obtained are at present being processed.

Testing of the Population Questionnaire of the UN-FAO Experimental Census, Japan: The testing of the questionnaire was carried out in December 1958 by the Institute staff in 351 households to find out whether the items of information given in the questionnaire could be collected without probes, that is, by straightforward questioning, as is likely to happen in a census type of enumeration. A draft NSS working paper was prepared on the basis of the observations in January 1959.

Proportion of area under land utilization: This study was undertaken in two centres of West Bengal during July-October 1958 to test the possibilities of estimating the proportion of the area under a particular crop or in a cluster of plots taken as a whole by eye-estimation on the spot and to compare the method with the usual plot-wise enumeration, i.e. estimating the proportion for each individual plot separately and then arriving at the proportion for the cluster.

Cost of collection of data on consumption expenditure: This study was undertaken in four centres of West Bengal and the city of Calcutta to find out the time actually required to fill up different blocks of the form for the schedule relating to consumer expenditure. The analysis of the data is in progress.

Particulars of the NSS Reports prepared during year under review are given in Appendices 5.10-5.13.

6. ELECTRONIC COMPUTER DIVISION

Electronic Computers

Samar Kumar Mitra, who went abroad with a UNESCO fellowship to study electronic computers, started the unit in 1950 with the help of a part-time technician. Samar Kumar Mitra was in charge of the Division assisted by Debdas Chaudhuri, Amaresh Ray, Ashis Sen, Ajoy Sen, Mrinal Kanti Pal, Prabhat Kumar Mitra, D. S. Kamat, Dwijesh Dutt Majumdar, Jnan Saran Chatterjee, and Soumyendra Mohon Bose.

Analogue Computer : An analogue-type electronic computer for solving ten simultaneous linear equations was designed and built in 1953 and a paper on some of its novel features was published in the American journal, *Review of Scientific Instruments* in 1955.

Electronic Computer, HEC-2M : A small electronic digital computer of British make called HEC-2M (HEC for Hollerith Electronic Computer), which had been ordered in 1954 and was received in February 1956, was successfully installed by the Institute's own engineers in about a month and has been in operation since April 1956.

Soviet URAL Computer and Equipment : During the visit of a delegation from the Institute to Moscow in July 1954, arrangements were made to obtain a large electronic computer and other equipment from USSR. A number of Soviet engineers visited the Institute in December 1954 and on their recommendation the Soviet Government agreed to give to the Institute a great deal of equipment which, it was decided, would be received through the United Nations Technical Aid Administration (UNTAA). The URAL computer was received in March 1958 and was installed by Soviet engineers between September 1958 and January 1959. Expert advice regarding the use of electronic computers for data processing was also obtained under the Colombo Plan, through Mr. Berners-Lee of Ferranti Computers, UK during his visit in September-October 1958.

Maintenance : The Institute staff not only maintained the HEC-2M computer but also designed and carried out a number of modifications and attachments which have considerably increased its speed and reliability; these were highly appreciated by the suppliers of the machine.

The URAL machine was put on commission for computation work from February 1959, and some trial computation of analysis of rainfall data from the Poona Meteorological Department was done in March 1959[1].

Repair and Maintenance : There is a special section for repair and maintenance which was responsible for the servicing of three tabulators, two summary punches, twenty electric key-punches, six electric verifiers and four sorters of Soviet origin.

[1] The URAL began to work on two shifts from November 1959 and is expected to work on three shifts from early 1960.

Research Section : The research in the Electronic Division is of the applied type and in the beginning was directed to modifying the existing arrangements and adding auxiliary units to the two computers to make them more suited to the special requirements of the Institute work. Backed by the experience accumulated in handling the two digital electronic computers, developmental research has been also started in other directions, and a brief account of the work is given in Appendix 6.

Computation Service

All three computers have been fully commissioned and are carrying on valuable computation work for the Institute and other scientific organizations. This Division now maintains a staff of thirty, of whom five belong to the programming section, ten are engineers, seven are technicians and operators and the rest are administrative or office personnel.

Among important work done for the Institute may be mentioned : (a) scrutiny of data, calculation of standard errors, and supply of random numbers for the National Sample Survey Division, (b) computations relating to theoretical studies of the Research & Training School Section, and (c) optimal solutions of problems of industrial and economic planning for the Planning Division.

Mention may also be made of the following institutions from whom various problems were received : (1) The Andhra University, Waltair; (2) Messrs. Hindusthan Aircrafts, Bangalore; (3) The Indian Association for the Cultivation of Science, Calcutta; (4) The Indian Institute of Science, Bangalore; (5) The Indian Institute of Technology, Khargpur; (6) The Physical Research Laboratory, Ahmedabad; (7) The Saha Institute of Nuclear Physics, Calcutta; and (8) The Tata Institute of Fundamental Research, Bombay.

Development Workshop

A small workshop was started during the war, on the initiative of the Council of the Institute and in consultation with the Government of Bengal, as a non-profit organization called the Indian Calculating Machine and Scientific Instruments Research Society which was registered under the Act XXI of 1860 in September 1943. This workshop was used, by mutual agreement, as a nucleus for a Development Workshop which was started on a somewhat larger scale by the Institute in 1950. The supervising staff of engineers in 1958-59 consisted of Satyaprasanna Bhattacharya (in charge), Harakumar Mukherjee, Gurudev Banerjee, Sivaprasad Sen, Bimalendu Chatterjee and Sunil Baran Ganguly.

High-Speed Sorter : Work on the development of a high-speed sorter, which had resulted in the construction of a proto-type in 1957 and another proto-type in April 1958, continued during this year. The speed of the sorter was increased from 600 cards to 675 cards per minute. The parts were made interchangeable with the custom-built sorters offered by the I.B.M. or Messrs. Hollerith (India) (Private) Limited. The first sorter which was sent to the Army Statistical Organization, New Delhi, in September 1958 has sorted out the record number of 1,25,000 cards in a normal working day. A decision was then taken to produce a batch of 12 sorters for the use of the Institute. Difficulty was experienced in procuring the right type of material for these high-speed sorters, and in getting the parts properly electroplated. The problem was successfully solved with the cooperation of the Ordnance Factory in Cossipore.

Desk Calculators : The development work on desk calculators of which a few prototypes had already been produced was continued during the year, but on a limited scale. A number of press tools were made for the fabrication of the parts. Attention was given to the fabrication of complicated parts which could not be mass-produced due to the non-availability of the special steel required for this purpose.

Twentyfive crop-survey instruments were produced in response to an urgent request from the National Sample Survey Department.

The Institute engineers were also responsible for the maintenance of 311 hand-operated and electrically-driven desk calculators of different types in use in the Institute. 93 desk calculators were repaired and the mechanics attended to 267 service calls. There was a serious breakdown of two Soviet machines which were repaired with the assistance of a Soviet expert, Mr. Ouvarov whose services were kindly lent by the USSR Trade Representative in Calcutta.

Training : Two apprentices were trained during the year.

Assistance to other Organizations : The Civil Aviation Directorate asked for help in repairing a vital part of the radar equipment in Dum Dum Airport, Calcutta, which was out of order and could not be repaired in Calcutta. The Workshop successfully redesigned and fabricated the replacement part, and the radar equipment was again put into commission to the satisfaction of the Civil Aviation authorities. Some parts of the teleprinter equipment of this Directorate which used to be imported from abroad were also made in the Workshop.

7. STATISTICAL QUALITY CONTROL

The Indian Statistical Institute had recommended, as early as 1935, that Government should take appropriate measures to initiate Statistical Quality Control methods in Indian industries. Dr. Walter A. Shewhart (the originator of SQC) came to India at the invitation of the Institute in 1947-48, toured the country and stimulated interest among industrialists. The first all-India Conference on SQC was held in Calcutta in January 1948 with Dr. Shewhart as Chairman. In 1952-53, a team of SQC experts sponsored by the United Nations Technical Assistance Administration conducted intensive training courses in SQC methods in different parts of India. The Institute functioned as the host society and made arrangement for these courses in collaboration with the Central Statistical Organization.

In 1953, an Advisory Committee was set up with Sri C. D. Deshmukh as Chairman and Pitambar Pant as Secretary. Gradually three whole-time SQC units were established in Bombay, Bangalore and Calcutta. Dr. W. A. Shewhart visited India for the second time in 1954-55 and again in 1958-59; the second SQC Conference was held in January 1955 and the third Conference in December 1958. All the three conferences which were held at Calcutta gave an impetus to the movement. Since 1954 a number of SQC experts from Japan, the UK and the USA, have come to help in the work.

New Units : A new SQC unit was started at Baroda during the year. Together with the SQC units in Bombay, Bangalore, Coimbatore, Calcutta and Delhi, six units were in operation in 1959.

SQC can now claim to have become a recognized factor in Indian industry and the National Productivity Council has recently taken up Statistical Quality Control as one of the fronts of its productivity drive.

The salient features during the year were considerable expansion of work in the Calcutta Unit, and an extensive tour programme by Dr. William R. Pabst, the Statistical Quality Control expert assigned to the Institute under the UNTAA scheme. Sri S. C. Sen, who retired as Joint Secretary of the Institute, continues to look after the SQC work in an honorary capacity.

SQC Conference : A conference on SQC was held under the joint auspices of the National Productivity Council and the Indian Statistical Institute in December 1958 and the units were closely associated with its arrangements.

Training : To the training courses organized for men within industry, undertaken partly for promotional purposes and partly to meet the increasing demand for SQC training, the Units have been giving increasing attention with special reference to their quality. The courses are organized entirely by Unit personnel with only occasional assistance from their Indian seniors (only a few are there) and from foreign experts who are available from time to time. The training courses are characterised by a realistic background of SQC work in industrial situations, so that the teachers speak from personal experience and draw illustrations from live examples.

A large number of lectures were delivered by the foreign experts.

8. INDUSTRIAL AND MANAGEMENT RESEARCH UNIT FOR PLANNING

The Industrial and Management Research Unit for Planning (IMRUP) was established in April 1956 with its headquarters at Bangalore. The Unit had studied in previous years three public enterprises with special emphasis on their organization, structure, controls, communications and human relations.

Consultation : During the year, the IMRUP submitted four reports to the Khadi and Village Industries Commission on studies conducted at the Khadi and Ambar Division of their Head Office at Bombay, the Village Oil Industry and Intensive Area Schemes at Delhi and the Zonal Directorate at Kakinada. The IMRUP also conducted preliminary studies relating to the West Bengal State Transport, and in some of the enterprises of the Government of Kerala. Certain studies on stores and inventory were also made within the Institute itself.

Training : Study classes were conducted by Sri H. C. Ramanna, Officer on Special Duty, on Work Study, Production Planning and Control, and Statistics and Cost Accounts. Two engineers were deputed to attend a two-weeks' Residential Study Course on Management Science in Action conducted by the Indian Institute of Science, Bangalore, in June-July 1958.

Termination of Activities : Owing partly to internal management difficulties and partly to the establishment of the National Productivity Council, most of the IMRUP staff was handed over to the Council by agreement, leaving a small residue in the Institute at the end of March 1959.

9. LIBRARY

The Central Library of the Institute, which is now located in the main Institute building, added 8058 volumes to its stock during the year. There was also an increase of 118 in the number of periodicals received. The Library maintains a special section, the "Workers' Circulating Library" consisting of books of general literature and containing over 9800 volumes. Service centres of the Library are maintained at the city office at 9B, Esplanade East and at Giridih. Further details are given in Appendix 8.

Jibananda Saha was in charge as Chief Librarian with Biswajit Roy, Sarat Chandra Banerji and Manoj Kumar Niyogi as deputy and assistant librarians. Debabrata Rej was in charge of Russian translation and Jyoti Prakas Roy Chowdhury of Chinese translation, and Brajakishore Sinha of the Photographic Unit.

Books : The library has a book collection of nearly 76,000 volumes, distributed by subjects as follows: Statistics (theoretical and applied)—21,000; Mathematics—3,500; Physical and Biological Sciences—6,200; Economics and its subsidiary branches—20,000; Sociology, Cultural Anthropology and Demography—8,300; Engineering and Technology (including Agriculture, Medical science and Management sciences)—6,500; Humanities—7,000 and general reference work—3,500. The figures include the bound volumes of periodicals. The library accessioned 8058 volumes compared to 4328 in the previous year; of these 2,196 were gifts, 713 were received in exchange and the remaining 5,149 were purchased.

Periodicals : 1508 periodicals were received, compared to 1390 in the previous year and of these 362 were subscribed for, 687 were received in exchange and 466 were complimentary copies. Subscriptions to 6 periodicals were discontinued and the library stopped receiving one periodical being sent so far on a complimentary basis. 24 daily newspapers were subscribed for the news clipping files being maintained for work in connexion with statistics and planning in India.

Bibliographical Services : Two reading lists on national income and hydrology and flood study were completed from the material available in the library. A bibliography of all printed bibliographies available in the library was also prepared. Publication was continued for the regular bulletins of the library like the Weekly List of Selected Periodicals, Monthly Index to Current Literature and Monthly Bulletin of Acquisitions and Library News.

Translations : An English translation of the Russian book *Programming for the Digital Computing Machine URAL* by V. N. Bondarenko, I. Plotnikov and P. P. Polozov was completed for the Electronics Research Laboratory.

Of the 27 other documents translated into English, 5 were from Russian, 7 from Chinese and 1 from German. The Translation Unit undertook the publication of a Russian-English and English-Russian dictionary of terms relating to statistics, economics and planning. Considerable progress was made in the compiling of the Russian-English portion of the dictionary.

Tokyo Translation Unit : A translation and reference unit, which had been established in 1956-57 at Tokyo, continued to make many valuable translations from the Japanese into the English language.

Service and Circulation : 1339 persons used the library compared to 1171 in the previous year. Books, journals and other materials issued numbered 62,466 as against

56,719 in the previous year. Of these, 14,643 were issued from the Lending Section and 27,850 from the Reference Section. The issue of bound volumes of periodicals numbered 19,973. Requests received totalled 69,296 of which about 10% could not be fulfilled as against 13.3% last year.

The library participates in inter-library loans to promote better understanding among the libraries and to meet the deficiencies caused by a limited budget and unavoidable specializations. Among the important libraries which cooperated in this scheme were the National Library; UNESCO Research Centre; Geological Survey of India; Department of Anthropology, Government of India; Commercial Library; All-India Institute of Hygiene and Public Health; Fuel Research Institute, Dhanbad; University Library of Baroda; Sanskrit College and the Calcutta University Library.

10. PUBLICATIONS

Sankhya : The Indian Journal of Statistics

From 1932 the Institute started holding regular scientific meetings at which statistical papers began to be presented. The need of a journal became pressing and the Council set up a special committee to report on this matter. After a careful review, this committee recommended that a new journal should be started as the official organ of the Institute, but its management and business arrangements should be made independently of the Institute so that no financial liabilities should fall on the Institute. This recommendation was accepted by the Council; and it was decided to start a new journal *Sankhyā : The Indian Journal of Statistics* with P. C. Mahalanobis as Editor. The late Narendranath Mukherjee, the proprietor of the Art Press, very kindly shouldered the management responsibilities while the Editor made himself personally responsible for all financial liabilities. In this way the first number was issued in June 1933.

A little later, on the initiative and the approval of the Council of the Institute a separate, non-profit distributing association called the Statistical Publishing Society was registered under Act XXI of 1860 in September 1935 with Dhirendra Nath Mitra, Girindra Sekhar Bose and P. C. Mahalanobis as Trustees to take over the financial and business responsibility for *Sankhyā*. After the death of G. S. Bose, Satyendranath Bose was appointed the third Trustee. This Society gradually built up the Eka Press which has modern typecasting and monotype equipment and now prints a large variety of scientific publications.

Sankhyā, the official journal of the Institute, soon gained an international reputation and became self-supporting. Publication was partly interrupted during the war but twenty-one volumes had been published by 1959. To cope with the increasing volume of matter, the Council decided that *Sankhyā* should be published from 1960 in two separate series, one mainly for articles of a general or theoretical nature and the other mainly for records and new data.

During the year under review, parts 3 and 4 of volume 19, all the four parts of volume 20 and parts 1 and 2 of volume 21, containing 42 papers and 3 reports, were published. There was a separate issue containing papers on the Bengal Anthropometric Survey, 1945. There were also papers on probability theory, sampling distributions, estimation, multivariate analysis, design and analysis of experiments, biometry and the

reports of the National Sample Survey, etc. Parts 3 and 4 of volume 21 of the journal have since been published. There has been a steady increase in the demand for the journal and a number of new subscribers were enrolled.

Indian Statistical Series: Over fifteen years ago the Institute had considered the possibility of bringing out a series of statistical monographs. The first book was *Some Aspects of Multivariate Analysis* by S. N. Roy (who had undertaken this assignment when he was in the Institute) which was published jointly by the Indian Statistical Institute and John Wiley & Sons, Inc., New York in 1957 for distribution outside India, and an Indian edition was published jointly with the Asia Publishing House, Bombay. Since then, four other monographs have been prepared in the series and are going through the press. The monographs are to be published jointly by the Statistical Publishing Society and the Asia Publishing House under the auspices of the Indian Statistical Institute.

The second publication in the series is *Industrial Statistics* by Dr. A. I. Ezhov, Deputy Director of the Central Statistical Board of the USSR. The book was translated into English from the Russian publication "*Statistika Promyshlennosti*" by Debabrata Rej during the author's stay in the Institute in 1957-58, with the assistance of Mr. L. I. Lukin, senior economist, Central Statistical Board, Moscow, who was also working in the Institute at that time. The third is *Race Elements in Bengal* by D. N. Majumdar (University of Lucknow) and C. Radhakrishna Rao of the Institute; and the fourth, *Essays on Economic Planning* by Oskar Lange of Poland which contains three essays on economic planning written in 1955 and 1956 during the author's stay in the Indian Statistical Institute. The fifth book in the series is *Tables of Random Normal Deviates* by J. M. Sengupta and Nikhilesh Bhattacharya of the Institute.

Samvadadhvam: The *Samvadadhvam* was first published in July 1956 as a house journal of the Institute during a period of rapid growth of the Institute with the object of opening channels of communication, fostering the growth of team spirit and to help the workers to appreciate the purpose of the Institute. The journal has succeeded in attracting contributions from prominent guests and scientists like Professor J. B. S. Haldane as well as those of rank and file workers. Each issue has different sections in English, Bengali and Hindi. During the year, third and fourth issues of the second volume of the journal were published in July and October 1958. The first issue of the third volume was published in July 1959.

11. EXTERNAL ACTIVITIES

Conferences

The First Indian Conference on Research in National Income, inaugurated by Sri Morarji Desai, Finance Minister of India, was held in July 1958 at the Indian Statistical Institute. Sarvasri M. Mukherjee, S. M. Kansal and V. Prakash of the Institute presented papers at the Conference.

The Seventh Central and State Statisticians' Conference, inaugurated by P. C. Mahalanobis, was held in December 1958 at the Indian Statistical Institute. The Conference was organized by the Central Statistical Organization. A large number of the senior staff of the Institute took part in the Conference.

A conference on Statistical Quality Control was held in December 1958 at the Institute under the joint auspices of the National Productivity Council and the Indian

Statistical Institute. Sri T. N. Singh, Member, Planning Commission, inaugurated the Conference. Sir D. N. Mitra, Chairman of the Institute, read the messages to the Conference. Sir Shri Ram, Vice-President of the Institute, spoke on the growth of the SQC movement in India. Dr. C. R. Rao, Dr. A. Matthai, Dr. R. R. Bahadur, Dr. J. Roy and Dr. S. K. Mitra of the Research and Training School participated in the discussions. The general programme was arranged by the SQC staff.

The fourth Indian Sociological Conference was held at the Indian Statistical Institute during January-February 1959, and was inaugurated by Professor P. C. Mahalanobis. Dr. C. R. Rao acted as the Vice-President and Local Secretary of the Conference. Dr. C. R. Rao, Dr. (Mrs.) Rhea S. Das, Dr. Shib K. Mitra, Dr. J. B. D. Derksen, K. B. Pakrasi, A. Beteille, S. Bandyopadhyay, and N. M. Raman of the Institute presented papers and took part in the discussions.

Individual Activities

Professor J. B. S. Haldane, Dr. Helen Spurway and Subodh Kumar Roy of the Biometric Unit attended the Darwin-Wallace Centenary and Linnaeus Bi-Centenary Congress organized by the University of Malaya at Singapore in December 1958. The Centenary and the Bi-Centenary Congress was presided over by Professor Haldane. He also acted as the Chairman in the sectional meeting on Genetics in the Centenary Congress and presided over the symposium on 'Asymmetry' organized under the auspices of the Department of Zoology, University of Malaya.

Professor Haldane and Dr. Spurway served as members of the Zoology Sub-Committee of the University Grants Commission. In this capacity they visited the Marine Biology Station at Cochin in April 1958, and attended committee meetings held in Calcutta.

Professor P. C. Mahalanobis attended the 10th session of the UN Statistical Commission held in New York in April-May 1958, a Royal Society Conversazione in London in June 1958, and the Darwin-Wallace Centenary celebrations at the Linnean Society in July 1958. In September, he attended a special session of the International Statistical Institute held in Brussels and presided over the meeting of the Education Committee and a plenary session. He also attended the Third Pugwash Conference at Kitzbuhel (near Vienna) at the end of the month. He visited Japan in November-December 1958 in response to an invitation from the International House of Japan and also participated in the UN-FAO Regional Census Training Centre for Asia. During these foreign tours, Professor Mahalanobis visited many scientific institutions, gave lectures and took part in a large number of scientific discussions. Further details of his foreign tours are given in Appendix 4.

Dr. C. R. Rao attended by invitation a number of conferences held abroad during July-September 1958, such as (1) International Colloquium on Probability and Applications, Paris, July 1958; (2) Statistical Conference of the Royal Statistical Society of England, St. Andrews, Scotland, August 1958; (3) International Biometric Conference, Ottawa, August-September, 1958; (4) International Statistical Conference, Brussels, September 1958.

Dr. C. R. Rao attended the Golden Jubilee celebrations of the Calcutta Mathematical Society held in December 1958. He has been elected President of the Statistics Section of the 47th Session of the Indian Science Congress to be held in January 1960. He also served as a member of the Board of Studies of several universities.

Dr. A. Matthai and Sri N. C. Ghosh attended the Second Conference of Asian Statisticians at Bangkok in December 1958 as Institute representatives in the Indian delegation.

Dr. Ramkrishna Mukherjee participated in the Regional Seminar on Techniques of Social Research organized by the UNESCO Research Centre, Calcutta. He also attended the 6th International Conference on Planned Parenthood in New Delhi in February 1959. He has been elected President of the Sociology Section of the 5th Indian Sociological Conference to be held at Lucknow in 1960.

Dr. V. L. S. P. Rao participated in the town planning seminar held in Jainpur in October, 1958. He and L. S. Bhat participated in another seminar on land-use planning arranged by the Indian Council of Geographers at New Delhi in January 1959.

Sri Ajit Biswas participated in a seminar on India's population growth and economic development held at the Delhi University in March 1959.

In May-June 1959, R. L. Brahmachary attended the Summer School of Theoretical Physics, Mussoorie, held under the auspices of the Ministry of Scientific Research and Cultural Affairs, Government of India, and participated in the discussion on relativity and cosmology.

Dr. R. B. Banerjee, who left for the USA in May 1958 on study leave participated in the International Statistical Methods in Radio-Propagation held in the University of California in June 1958.

Dr. Shib K. Mitra served as a consulting editor for *Psychological Studies*, Mysore, and Dr. (Mrs.) Rhea S. Das served as a consulting editor for the *Indian Journal of Psychology* and as a personnel selection consultant for the Bihar Police Commission.

The following members of the RTS staff attended the 46th session of the Indian Science Congress held in January 1959 at Delhi, presented papers, and participated in the discussions: Dr. J. Roy, Dr. N. Chandrasekhar, Dr. V. L. S. P. Rao, K. N. Sharma, Somesh Das Gupta, L. S. Bhat, and J. Sothuraman.

Honours and Awards

Professor J. B. S. Haldane was awarded one of the Darwin Centenary medals issued at the meeting of the Linnean Society of London in July 1958 and was granted an honorary doctorate by the University of Poitiers (France).

Professor P. C. Mahalanobis was elected Foreign Member of the USSR Academy of Sciences in June 1958 in recognition of his services in the fields of Statistics, Mathematics, and Economics, and for his other scientific and social activities. He was also elected an Honorary Fellow of King's College, Cambridge, in November 1958.

Dr. Raghu Raj Bahadur was elected an Ordinary Fellow of the National Institute of Sciences in January 1959.

Dr. G. Kallianpur was elected a Fellow of the Institute of Mathematical Statistics and a Fellow of the American Association for the Advancement of Science.

INDIAN STATISTICAL INSTITUTE

12. VISITING SCIENTISTS*

Since 1938 the Indian Statistical Institute has been inviting distinguished scientists from abroad to come to the Institute as visiting professors. Such visits have not only been of considerable benefit to the Institute and the workers but have contributed to wider knowledge and appreciation of the work of the Institute and of Indian conditions and problems in other countries.

As in previous years, the Institute was fortunate in having a large number of guest scientists from abroad and other institutions in India. During the current year, nearly 30 distinguished foreign scientists participated in the research, training and other activities of the Institute. Some of them stayed for fairly long periods and assisted in the regular work of the Institute, while others came for short periods and participated in lectures and seminars. A list is given below.

ASTRAND, HALVDAN BO, (*Sweden*). Seminar on Income Relations Between Farmers and Industrial Workers. (*August 1958*).

BABBAR, M. M. (*FAO*). *Two Lectures:* (i) Latin America and India, (ii) An Approach to Planning in Agriculture. (*March 1959*).

BERNERS-LEE, C. M., (*UK*). *Lectures:* (i) Language of Machines, (ii) How a Computer Centre Team Goes About Its Work, (iii) Making it Easier to Use Computers, (iv) Some Programmes of Interest to Statisticians, (v) An Example of Data Processing Based on NSS Report No. 8, (vi) Input and Output Equipment, (vii) Some Varieties of Machine Structure. (*September-November 1958*). [Colombo Plan assignment].

DENTON, D. A., (*Australia*). *Lecture:* Sheep and Cows—How They Work. (*October 1958*).

DERKSEN, J. B. D., (*Netherlands*). UNTAA assignment as Director of Studies, International Statistical Education Centre. Research work on econometrics. Lectures on UN Statistical Organization and Statistics for Planning, Market Research. (*March 1958-March 1959*).

FISHER, RONALD A., SIR, (*UK*). *Course of four lectures:* (i) Smoothing of Irregular Data, (ii) Inference, Semantic or Axiomatic, (iii) Genetical Theory, Self-sterility Alleles, (iv) Theory of Junctions in Inbreeding. (*March 1959*).

HOFSTEN, ERLAND V., (*Sweden*). Lectures on problems relating to employment and unemployment in under-developed countries. (*October 1958-May 1959*). [ILO expert from UNTAA].

JANOSSY, L. (*Hungary*). *Lecture:* Functions of Probability. (*February 1959*).

KATZ-SUCHY, JULIUS, His Excellency, Ambassador of Poland (*Poland*). *Lecture:* Planning and National Development in Poland. (*November 1958*).

KEYFITZ, NATHAN, (*Canada*). *Lectures:* (i) Sampling Theory and Sampling Techniques, (ii) Population and Agricultural Census, (iii) Advanced course of lectures on sample survey techniques. (*September-November 1958*). [Colombo Plan assignment].

* A list of visitors is given in Appendix 3.

KUMIN, HOWARD. *Lecture :* Transport Statistics and Measurement Employment and Labour Force. (*December 1958*). [UN assignment].

LANGE, OSKAR, (*Poland*). *Three Lectures :* (i) Output Investment Ratio and Input Output Analysis, (ii) Planning and Management of Socialist Economy in Poland, (iii) Planning in Under-developed Countries. (*February 1959*).

LEARMONTH, A. T. A., (*UK*). Organized regional planning for about two years. Lectures on methods of regional delimitation and analysis applied in the Mysore regional survey. (*August 1956-September 1958*). [Colombo Plan assignment.]

LEVINE, SOLOMON B., (*USA*). *Lecture :* Labour and Management Relations in the USA. (*March 1959*).

MANIAKIN, V., (*USSR*). *Lecture :* Methods of Estimation of Agricultural Production in the USSR. (*March 1959*).

MATUSITA, K., (*Japan*). *Three Lectures :* Decision Rules Based on a Notion of Distance. (*April 1958*).

MIHAILOVIC, K., (*Yugoslavia*). *Lecture :* An Approach to the Solution of Some Economic Problems of Under-developed Countries. (*April 1958*).

NADLER, MORTON.* Lately of the Institute of Computing Machines, Prague, Czechoslovakia, now on Institute staff. *Lectures :* (i) Electronic-Computer Logical Techniques, (ii) Behavioral and Structural Properties required of a Computer, (iii) Elements of Switching Algebra, (iv) Biode Network for Logical Function, (v) Regeneration Circuit, (vi) Buffering, (vii) Clockphase System, (viii) Code Construction, (ix) Design of Sequential Operating Units, (x) Structural Redundance, (xi) Examples. (*January 1959*).

NARAYANA, T. V., (*Canada*). *Lecture :* Some Properties of Composition and their Applications to Probability Theory. (*July 1958*).

PALKHAR, M. D., *A course of six lectures :* National Income Methods and the Future World Census of Population and Agriculture. (*January 1959*). [UN assignment.]

ROBINSON, JOAN (MRS.), (*UK*). *Two Lectures :* (i) Impressions of a Visit to China, (ii) A Plan-frame for Ceylon. (*September 1958*).

ROBINSON, PAMELA (MISS), (*UK*). Organized expeditions to different parts of India with the help of the staff of the Geological Studies Unit of the Institute to collect fossils of research interest. (*December 1958–February 1959*).

SANDEE, JAN, (*Netherlands*). Worked at Planning Division on long-term planning. *Lecture :* A Model for India in 1970. (*November 1957–February 1959*).

SEIDEN, ESTHER (MISS), (*USA*). Special assignment. Taught at ISEC. *Lectures :* (i) Tests of Significance, (ii) Mathematical Statistics, (iii) Design of Experiments. (*October 1958–March 1959*).

SMITH, HENRY, (*UK*). Worked in Planning Division mainly on private sector in India. (*December 1957–June 1958*).

STRUKOV, A., (*USSR*). *Lecture :* Organization of Planning in the USSR. (*March 1959*).

THORE, S. A. O., (*Sweden*). Joint scheme. Taught at ISEC. *Lectures :* (i) Family Budget Statistics, and (ii) Econometrics. (*August 1958–February 1959*).

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* A specialist in the logical design of computers who joined the Institute in January 1959.

ZARKOVICH, S., (*FAO*). *Three Lectures :* World Agricultural Census 1960. (*December 1958*).

A list of external lecturers from Indian Institutions is given below.

1. BANERJEE, K. S., (*Calcutta*). *A course of six lectures :* Construction of Cost of Living Index Numbers. (*September 1958*).

2. CHANDRASEKHAR, S., (*Madras*). *Lecture :* A Population Policy for India. (*November 1958*).

3. MENON, C. R. B., (*Calcutta*). *Lecture :* Trade Statistics. (*December 1958*).

4. SINHA, S. L. N., (*Bombay*). *Three lectures :* The Indian Capital Market. (*November 1958*).

5. SEN, B. K., (*Calcutta*). *Lecture :* Indices of Unit Declared Values of Imports and Exports. (*December 1958*).

13. GENERAL ADMINISTRATION

The Indian Statistical Institute continued to function, on its constitutional side, in accordance with its Memorandum of Association and Rules, as a non-profit organization registered on 28 April 1932 under the Societies Act XXI of 1860.

CHANGES IN THE CONSTITUTION

Extensive changes were made in the Rules on 24 March 1956, which were confirmed on 20 April 1956, in view of the possibility of the Government of India recognizing the Institute as an institution of national importance by an Act of the Parliament. Some of the amended Rules were brought into operation in 1956, and it was decided at a General Meeting of the members of the Institute on 21 October 1956 to keep other amendments in abeyance pending statutory recognition. A Bill was introduced in the Lok Sabha in the November-December session of 1956 but was allowed to lapse. Changes in Rules kept in abeyance have not been brought into force so far.

The Memorandum of Association was amended at a Special General Meeting on 4 January 1958 and the amendments were confirmed at another Special General Meeting on 10 February 1958 when it was decided that these changes should be brought into effect on such date or dates (in respect of different Articles) as may be decided by the Council of the Institute. The Council decided on 2 May 1958 that changes in Articles II, III and IV should come into effect from 1 June 1958 and that Article I (changing the name to Indian National Statistical Institute) should be kept in abeyance until further decision.

MEMBERSHIP

During the year under review, 53 new members of different categories were enrolled, bringing the total membership of the Institute to 376. This included 68 Life Members, 242 Ordinary Members, 3 Institutional Members, 12 Sessional Members and 43 Student Members of which 6, 27, 1, 3 and 16 respectively were enrolled during the year. The remaining 8 are Honorary Members of the Institute.

Annual General Meeting

The Annual General Meeting was held on 29 October 1958 to transact the usual constitutional business, namely, the election of office-bearers and members of the Council of the Institute, adoption of the Annual Report and Statement of Accounts for 1957-58 audited by the Chartered Accountants, P. C. Nandi & Co., etc. The proceedings of the Annual General Meeting have been circulated separately. The list of office-bearers and members of the Council is given in Appendix 2.

Meetings of the Council

The Council of the Institute held 9 meetings during the year on the following dates: 5 April, 2 May, 18 June, 21 August, 11 and 24 October in 1958 and 20 January, 1 February and 21 March in 1959. The Council had to consider during the year under review some of the most important matters in the history of the Institute.

It was decided on 5 April 1958 to request the University Grants Commission (UGC) to give the Institute powers to award degrees. A Committee consisting of Professor S. N. Bose, F.R.S. (Chairman), Dr. P. S. Lokanathan (National Council of Applied Economics), Professor V. V. Narlikar (Banaras University) and Dr. B. D. Laroia (Secretary) which was appointed by the UGC visited the Institute on 19 August 1958 and submitted a report recommending favourable consideration of the Institute's application. The University Grants Commission was, however, unable to accept this recommendation. Our President, Sri C. D. Deshmukh (who is also the Chairman of the UGC) in his speech on the Foundation Day, 15 December 1958, has explained the position in considerable detail (Appendix 1).

During the year under review, informal discussions continued with the Government of India regarding the re-introduction of the ISI Bill in a revised form; and brief reports were made to the Council in this regard on 5 April and 29 October 1958 and 1 February 1959.

In earlier years the Institute used to carry out all projects, whether on behalf of Government or private parties, on the basis of "contract" grants. In the "contract" system the funds provided used to be based, in principle, on costs plus provision for replacement and obsolescence, research and developmental purposes. In this system there was an incentive for the Institute to increase its efficiency because savings from reduction of costs could be used to increase the workers' remuneration and amenities and also to build up the assets of the Institute in the form of land, buildings, books, and equipment.

This was the arrangement, for example, for the large scale crop surveys in Bengal (1937-38 to 1950-51), the Bihar crop survey (1943-44 to 1944-45), tabulation of 1941 census data on a sample basis on behalf of the Government of India (1946–1950), and many other projects prior to 1951-52. The system had worked very successfully and had enabled the Institute to purchase land at Baranagar and at Giridih and to construct its own buildings.

In the case of the National Sample Survey which had started in 1950-51, although the Institute had continually stressed the importance of a "contract" arrangement, deficit financing began to be adopted by Government in practice. There was no longer any direct

relation between quality and quantity of output and funds provided by Government. This had led gradually to much loss of efficiency. Also, owing to rapid expansion of work from 1954-55, a large number of junior operating staff had been recruited who had not fully realized that the Institute was essentially a scientific society and not a Government nor a profit-distributing enterprise. By 1958-59 there was a tendency to think in terms of a standard worker-employer relationship and some unrest had developed among a section of the workers.

On the basis of a report submitted by Professor P. C. Mahalanobis, the Council on 21 August 1958 approved, in principle, the proposal of going back to the contract system for projects; and Professor Mahalanobis started informal discussions with Government to restore the "contract" system for all project work including the National Sample Survey. He also met the workers on several occasions and explained his views in writing in a note dated 30 January 1959.

The position was carefully reviewed by the Council on 1 February 1959; and it was unanimously decided, in principle, to change over to a "contract" system for projects. It was also decided to issue formal notices terminating the services of all employees of the Institute on 31 March 1959, and notices were accordingly issued before the end of the month. There was a good deal of unrest among the workers which led to press reports of a somewhat sensational kind, questions in the Lok Sabha, and also an application on behalf of the workers to the Labour Commissioner, West Bengal.

The position was again reviewed at a meeting held on 21 March 1959 in New Delhi at which a unanimous decision was made to offer re-appointment for one year only from 1 April 1959 to 31 March 1960 to practically the whole staff and this offer was accepted by most of them. The year thus terminated during the period of the gravest crisis since the establishment of the Institute[1].

A brief reference may also be made to the Industrial Management Research Unit for Planning (IMRUP) which had been set up in April 1956 with headquarters at Bangalore in charge of a Board of Directors of three senior and experienced engineers. The IMRUP had submitted several useful reports on a number of enterprizes in the public sector. Internal difficulties had, however, arisen among the three Directors, and, also, the National Productivity Council had been established in the meantime with overlapping interests. The Council, therefore, decided on 21 March 1959 to wind up the work of the IMRUP and hand over its staff to the National Productivity Council.

Governing Body of the Research and Training School

The Governing Body met on 5 April and 24 October 1958 and 21 March 1959, on all occasions under the Chairmanship of Sri C. D. Deshmukh, President of the Institute. These meetings were held jointly with the meeting of the Council of the Institute. A list of members of the Governing Body is given in Appendix 2.

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[1] Although this does not fall within the period under review, it may be added that there was some improvement in the situation by October 1959. A "contract" for the National Sample Survey to the value of Rs. 52.45 lakhs had been accepted for 1959-60 but in October 1959 possibilities were being already explored of undertaking additional NSS work during the remaining part of the financial year.

Finance Committees

The Finance Committee of the Council and the Finance Committee of the Governing Body met on 23 October 1958 to consider the audited statement of accounts, report of the *ad hoc* Committee on the allocation of expenditure, the budget proposals and other matters. A list of the members of these committees is given in Appendix 2.

The *ad hoc* joint committee of the Governing Body of the Research and Training School and of the Council of the Institute examined the allocation of expenditure to different projects etc. on 23 October 1958 and submitted its report to the Finance Committee of the Governing Body and of the Council. Names of the members of the *ad hoc* committee are given in Appendix 2.

The Institute Staff

The Office-bearers are elected by the general members of the Institute and serve in an honorary capacity in accordance with the usual tradition of scientific societies in India. As the Institute began to undertake organized research and teaching, and also special enquiries and large scale projects on a contract basis, it became necessary to appoint a large paid staff for research, teaching, and operating work. A list of the scientific, and technical staff is given in Appendix 12; and the distribution of the staff is shown in Appendix 13.

P. C. Mahalanobis worked as both the Secretary of the Society and the Director of the Institute. Nihar Chandra Chakravarti and Asokananda Das worked as Joint Secretaries and also as whole-time Special Officers in charge of the administrative work in Calcutta assisted by Rabindra Nath Ray as the third Special Officer. Pitambar Pant worked as Hony. Joint Secretary in charge of the planning and administrative work in New Delhi. Subodh Das Gupta assisted by Sarat Chandra Mitra and Chitta Chattoraj was in charge of the Estate Office, Pranoy Kumar Chatterjee of the Field Branch in West Bengal, and Sambhu Haldar of the administrative work at Giridih. The general publications work was in charge of Anikendra Mahalanobis assisted by Krishna Birendra Goswami and Dyutish Banerjee.

Sri Suresh Chandra Sen retired from the Office of Joint Secretary and Joint Director in April 1959 after rendering valuable services to the Institute for nearly ten years. He, however, very kindly agreed to continue to look after the work of the SQC Units in an honorary capacity.

Changes in Senior Staff : The staff of the Institute was strengthened during the year by the addition of the following persons. The date of joining is shown against each name.

Bhagawati, Jagadis,[1] (*Planning Division, Delhi*); Bose, N. K., Ph.D., former Director, River Research Institute, West Bengal, 29 May 1958 (*Flood Research Unit*); Chandrasekhar, K. A., 12 November 1958 (*Planning Division, Delhi*); Chaudhuri, Debdas, B.Sc., M.S., on return from study leave in the Columbia University, New York, 18 August 1958 (*Electronic Computer Laboratory*); Chowdhuri, Sukumar, B.A. (Oxon.), former Conservator General of Forests, West Bengal, 1 May 1958 (*part-time officer on special duty*); Dutta, S. K., Ph.D., 25 March 1959 (*Flood Research Unit*); Gulati, D. V., 4 September

[1] Joined in 1959-60.

1958 (*Planning Division, Delhi*); Kar, K. K., M.A., 11 June 1958 (*National Sample Survey*); Mazumdar, H. K., M.A., M.S.S., Ph.D., 1 October 1950 (*Planning Division*); Pakrasi, K. P., M.Sc., 5 April 1958 (*Sociological Research Unit*); Roy, Jogabrata, Ph.D., on return from study leave in the University of North Carolina, August 1958 (*Research and Training School*); Sinha, Mihir, M.A., formerly of West Bengal Civil Service (Executive), 1 December 1958 (*Planning Division*); Sen, A. K., M.Sc. (Tech.), 18 December 1958 (*Electronic Computer Laboratory*);

The following persons left the Institute on the dates mentioned :

Balachandran, V. K., Ph.D., (*Planning Division, Delhi*), October 1958 to join the Madras University; Chowdhuri, S. C., M.A., LL.B., Secretary, Examinations Committee, October 1958 on expiry of tenure; Joshi, D. D., Ph.D., (*Planning Division, Delhi*), November 1958 to join the Punjab University; Nag, B., M.Sc. (Tech.), (*Electronics Division*), December 1958 to join the Jadavpur University; Nandy, D. P., Lt.Col., (*Special Officer*), January 1959.

Special Technical Unit

The Special Technical Unit was started on 1 April 1955 to provide opportunities for training at various levels within the Institute. The original idea was that all payments would be on a piece-rate basis. The Unit, however, started to function gradually as a miscellaneous unit giving computational services to different departments. Among assignments handled during the year may be mentioned : (i) scrutiny, tabulation and punching services for the National Sample Survey; (ii) model sampling experiments to test certain surmises in connexion with Fractile Graphical Analysis, (iii) special studies on cottage industries on behalf of the Planning Division. Nikhilesh Bhattacharya assisted by Dhiren Sarkar was in charge of this section.

Estate and Transport Sections

The Estate Office is responsible for designing and supervising all construction work in the Institute as well as for the repair and maintenance of its buildings, roads, grounds, furniture and other equipments. The electric installation and internal telephone system are looked after by a trained group of workers who also maintain the refrigeration plants used for air-conditioning some of the laboratories and machine rooms.

It is worth mentioning that all Institute buildings and hutments at Baranagar and Giridih have been designed and constructed so far and are being maintained by the Institute's own staff. In the different premises at Baranagar (Calcutta-35), the Institute was occupying in 1959 about 125,000 sq. ft. of *pucca* buildings and nearly 100,000 sq. ft. of hutments. The Institute was also occupying over 9,000 sq. ft. in rented premises in the city of Calcutta, and about 42,000 sq. feet of buildings and 2,000 sq. feet of hutments at Giridih. Subodh Chandra Das Gupta assisted by Chitta Chattoraj was in general charge of the construction and maintenance work.

The Institute had started a transport section in 1945-46 when communication between Baranagar and the city was very unsatisfactory. Since then daily scheduled services have been maintained by two buses and station wagons. A number of light cars were also maintained for official work and the use of Institute guests.

Welfare and General Services

Visitors and Conferences

Over 900 visitors from India and abroad came to see the Institute during the year including about 400 delegates to the following Conferences held in the Institute premises: the First Indian Conference in Income and Wealth (*July 1958*); the Statistical Quality Control Conference (*December 1958*); the Seventh Central and State Statisticians' Conference (*December 1958*); the Fourth Session of the Indian Sociological Conference (*January-February 1959*).

The Institute has a Public Relations Unit which is responsible for showing the visitors round the Institute and also for the publication of the house organ *Samvadadhvam*. During the year, the unit was in charge of Uday Banerjee and Amal Das Gupta, with Hirankumar Sanyal as Adviser.

Guest Houses for Foreign Visitors

Since 1938 distinguished foreign scientists began to come to the Institute as visiting professors and experts; upto 1952 or 1953 most of them used to stay with Professor and Srimati Mahalanobis. The number of guests increased very considerably with the inauguration of the work on economic planning in 1954 and it became necessary to make some regular arrangements for guests. A portion of the main building at 203 Barrackpore Trunk Road, Calcutta-35, was converted into a guest house, and several suites of rooms at *Amrapali* were set apart for the Institute's guests.

In 1953 a House Committee was constituted with Shrimati Mahalanobis as Hony. Chairman to look after the arrangements for the Institute guests, and the workers who reside at headquarters and in five rented houses in the neighbourhood, the grounds and gardens and sanitation. Jibananda Saha was the Secretary of the House Committee during the year under review.

In 1955 and 1956 new huts were constructed to provide additional accommodation for the trainees of the International Statistical Education Centre and the many foreign visitors who came to attend the Twentyfifth Anniversary of the Institute. In this way, by the end of 1956, 32 single and 28 double rooms, many of them with attached baths, became available for guests.

The Institute maintains these Guest Houses mainly for foreign visitors many of whom stay at the Institute for fairly long periods for lectures, research work and technical consultations. The number of such guests during 1958-59 was 124.

The main section of the Guest House is located in the Institute's main building at 203, B. T. Road. Guests are also accommodated at *Amrapali* and in the huts at 202, B. T. Road known as North Cottage and East Cottage, the latter being generally used as a hostel for students of the International Statistical Education Centre. There is a guest house at *Mahua*, Giridih.

Medical Welfare Unit

The benefits of the Unit which was set up in early 1945 are available to the workers, members of their families as well as students and guests. It includes free consultation and service, visits to residences at subsidized rates and the supply of medicines on a cost basis,

To cope with the increasing use of the Unit's services by the workers, the following new appointments were made in the year : Dr. B. Goswami as consultant and Dr. S. C. Sen and Dr. A. Banerjee, as medical officers, in addition to Dr. R. Maitra.

There was also a separate medical unit at Giridih in charge of Dr. Nirmal Kumar Das on a part-time basis. Further particulars of the two medical units are given in Appendix 9.

Cultural and Other Activities

The ISI Workers' Club at Baranagar, the ISI Field Workers' Club in Calcutta and the Salboni Club at Giridih organized annual sports meetings, recreations and varied cultural activities. The ISI Club team was runners up in the annual 24 Parganas District Athletic Sports held in January 1959. The sixth issue of the Club magazine, *Lekhan*, was brought out in December 1958. The annual social and prize distribution ceremony was held on 2 May, 1959 and Sri A. Das, Vice-President of the Club, was in the chair. The ninety-eighth birth anniversary of Rabindranath Tagore was observed in the mango-grove.

The addition of games like cricket this year to the many games already being played helped to popularize the Club and this was reflected in the increase of membership to 900—the highest so far.

A rehabilitation loan of Rs. 2,500 was granted to refugee workers of the Institute and Rs.16,549.91 was spent towards educational assistance to workers.

The canteen and workers' mess continued to serve light refreshments and meals at subsidized rates and on a cost basis. The canteen took charge of the catering arrangements for the numerous Institute receptions and functions. An advisory committee of workers was formed in October 1958 to help in the work.

Operating Centres

For the first ten years (1932–1941) the work of the Institute used to be done in the Presidency College, Calcutta, and in some rented rooms in the city. At the time of evacuation during the war in 1942, one part of the Institute was removed to *Amrapali* (Professor Mahalanobis's house) at 87, now 204, Barrackpore Trunk Road, Calcutta-35 in Baranagar, a suburb of Calcutta; and another part to *Mahua* (Mrs. Mahalanobis's house) at Giridih, Bihar, about 200 miles from Calcutta, both of which were placed at the disposal of the Institute by the owners free of rent, for the duration of the war and one year thereafter.

Headquarters at Baranagar (Calcutta-35) : From 1946 the Institute has also occupied rented premises at 206 B. T. Road Calcutta-35 (near *Amrapali*) comprising about 8 acres of land. In 1950 the Institute acquired about 3 acres of land at 203 B. T. Road, Calcutta-35, and started constructing buildings on this land. From 1954 the Institute is using about 8 acres of land and buildings at 202 B. T. Road, Calcutta-35 and the premises known as "Gooptu-nivas" in the same neighbourhood which were placed at the disposal of the Institute by the Government of India. The Institute has subsequently purchased some other plots of land at Baranagar.

In this way Baranagar (Calcutta-35) gradually became the headquarters of the Institute. The Institute has constructed about 65,000 sq. feet of buildings and 25,000 sq. feet of huts ments on its own land at 203 B. T. Road, Calcutta; and also occupies about 56,000 sq. ft.

of buildings and 75,000 sq. ft. of hutments in other premises. Over 121,000 sq. ft. of buildings and 100,000 sq. ft. of hutments are thus in the occupation of the Institute in Baranagar.

The Research and Training School with its different laboratories, the International Statistical Education Centre, hostels for students, the bigger part of the National Sample Survey, the Calcutta wing of the Planning Division, the Library, the Electronic Computer Laboratory and Development Workshop, Guest Houses for foreign visitors, and Central offices and services are located at Baranagar where roughly 1200 workers are in daily attendance. The associated non-profit organizations, the Statistical Publishing Society and the Eka Press, occupy adjoining premises at 204/1 Barrackpore Trunk Road and the non-profit organization ICMSIRS* is associated with the Development Workshop.

Calcutta City offices : The Institute occupies about 9000 sq. ft. in rented premises in the city. The SQC Unit has its office at 9B, Esplanade East which is also used for evening training courses and for meetings and lectures of the Institute. The Field Branch of the Institute has its offices at 294/2/1 Upper Circular Road, Calcutta-9 and 210 Cornwallis Street, Calcutta-6; and rooms in the Albert Hall near Presidency College.

Giridih : Since 1941 an operating centre has continued to be located at Giridih. In 1950, the Institute acquired 35 acres of open land adjoining *Mahua* and standing on the river Usri where an agricultural farm has been established. The Institute has put up some hutments on its own land and has also constructed a Health Home for convalescent workers on a piece of land at Pachamba which was received as a gift. Most of the work of the Institute is, however, still being done in rented premises (a part of which is used for residential purposes). The total space in the occupation of the Institute at Giridih in 1959 was about 42,000 sq. ft. of buildings and 2000 sq. ft. of hutments.

The agricultural farm is used for various field experiments and biological studies by the Biometric Unit; and two field units are maintained at Giridih for socio-economic and demographic investigation. The National Sample Survey also has a branch at Giridih with a machine tabulation unit of 3 tabulators, 6 sorters, 1 collator, 1 multiplier, and gang and summary punches.

The professional students of the RTS and the ISEC trainees go in batches every year to Giridih for practical training in crop-cutting experiments and in socio-economic surveys.

The total number of workers at Giridih was 146 in 1959. There are guest houses for visitors, canteen with subsidized tiffin, circulating library, club for sports and social functions, and a medical welfare unit for the workers.

Delhi: In 1949 when Professor Mahalanobis started working as Honorary Statistical Adviser to the Cabinet, the Institute opened a small office in New Delhi which functioned for two years as the Central Statistical Unit for the coordination of the statistical work of Government until the Central Statistical Organization was established in 1951.

The Institute staff was increased from 1954 to work on studies relating to planning and scientific and technical man-power in collaboration with the Planning Commission under the guidance of Pitambar Pant who is the Chief of the Division of Perspective Planning and also helps the Institute as its Honorary Joint Secretary.

* Indian Calculating Machine and Scientific Instruments Research Society.

A considerable amount of tabulation work is being done, on behalf of the Institute in the Army Statistical Office under the guidance of Sri N. T. Mathew, the Head of the ASO ; and in 1958 one SQC Unit was established in Delhi which also is working under his guidance. One small unit in charge of a senior statistician, Tarapada Chaudhuri, looks after the joint training programme in collaboration with the CSO.

The direct Institute staff in Delhi in 1959 was about 60 with an additional computational staff working, on behalf of the Institute, at the Army Statistical Office of varying strength up to 80 or 100.

Bombay : In addition to a society branch, the Institute maintains one operating centre in Bombay working under the guidance of Sri M. A. Telang, with an office for the field work of the National Sample Survey in Bombay city and one SQC Unit. Various special surveys and studies were undertaken from time to time in cooperation with the society branch. An account of the work of the Bombay Branch is given separately in Section 14.

Bangalore : One SQC Unit is maintained at Bangalore which works under the guidance of Sri Srinagabhusana. Upto to March 1959 Bangalore was also the headquarters of the IMRUP (Industrial Management Research Unit for Planning).

Field Branch : The Institute has a field branch with a staff of about 250 which is in charge of the field work of the National Sample Survey in West Bengal, and a staff of about 20 for similar field work in Bombay city, and two small field units at Giridih for pilot studies.

14. SOCIETY BRANCHES

BOMBAY BRANCH

The Annual Meeting of the Executive Council and the General Body of the Branch were held on 7 April 1958 in the office of the Branch. The Annual Report and the Statement of Accounts for the year 1957-58 which were read by the Joint Secretary were approved by the Executive Council and the General Body. (A list of office-bearers is given in Appendix 2).

Another meeting of the Executive Council of the Branch was held in the Finance Minister's Chamber, *Sachivalaya*, on 18 October 1958. Dr. Jivraj N. Mehta, Minister for Finance, Government of Bombay and the President of the Branch, presided. The Council confirmed the minutes passed in the last meeting. As Dr. S. A. Palekar had gone out of the country for some time, Sri V. V. Divatia was elected as Joint Secretary in his place.

Membership : The number of Ordinary Members increased from 3 to 18 during this period. Sixteen persons were enrolled as Associate Members which now numbers 56 Life membership has increased by one.

Sample Surveys

The field work for the NSS 13th round was completed in June 1958 and that for the 14th round was taken up in July 1958. Unlike the previous rounds which were of six months' duration, the 14th round will last for one year. The field work for the first sub-round was completed by the end of December 1958.

The Branch undertook a pilot survey for revision of sampling "blocks". The census blocks of 1951 were being used so far for sampling purposes by the NSS, but it is felt that these blocks have now become obsolete and that for facility of sampling it is desirable that blocks are of equal size. This survey which was started in July 1958 takes into account the number of households, the municipal numbers of the buildings and the limits of the streets for the block formation which facilitates the location of blocks.

Type Studies

The Branch was allotted the work of two type studies which deal with (1) consumption and disposal of cereals and capital formation and (2) migration particulars. The consumption study has been started in Badlapur village of Kalyan Taluka. The migration study has been started in some parts of Bombay City and also in Kalyan and Ambernath, of Kalyan Taluka. The salient features of the studies are the collection of data in "trial" schedules with a view to:

(1) testing the concepts and definitions used in the NSS so far; (2) determining the changes called for in the concepts and definitions; (3) exploring the possibility of using birth place statistics as an indicator of migration; and (4) finding out the attitude of the persons in the labour force to migration with respect to the employment opportunities.

A Research Project regarding the Formulation and Advance Testing of the Schedule of the Census of 1961 : Four main types of work were carried on in the project during the year: 1. The analysis (statistical and conceptual) of economic questions and economic data of earlier censuses of India. 2. The preparation of recommendations for household and individual schedules, and economic tables for the Census of 1961. 3. Field tests of proposed census schedules.

A cyclostyled memorandum of 149 pages entitled *Comparability of Census Economic Data*, 1881-1951 was submitted in June 1958 to the National Income Conference in Calcutta, and also circulated to interested persons both in India and abroad. Another substantial memorandum (60 pp. cyclostyled) entitled *Census Economic Questions and Tables : Some Alternative Try-out Proposals* was circulated in November 1958.

Informal field tests were carried out in Bombay State, Delhi, Punjab and South India. Experiments with the use of revised schedules in English, Hindi, Gujarati and other languages are continuing.

Additional research memoranda are being prepared on the relation of the Census of 1951 data to that obtained in various All-India Sample Surveys, and on the applicability to India of the Economic Classification proposed in the World Population Census Programme.

Seminars

Four seminars were held under the auspices of the Bombay Branch. Dr. V. N. Patankar of Hindustan Lever Ltd., spoke on *Market Research* on 5 April 1958. Dr. Daniel Thorner opened the discussion on *Economic Questions for Population Census of 1961* on 21 June. The third seminar on the *Teaching of Statistics in Colleges* was held on 23 August. Professor M. C. Chakrabarti, Head of the Department of Statistics, University of Bombay,

initiated the discussion in which a number of professors from local colleges participated. At another seminar on 6 December on *Index Numbers and Related Problems*, the discussion was opened by Sri V. N. Murthy, Director, Department of Research and Statistics, Reserve Bank of India.

Lectures

Dr. A. T. A. Learmonth, Liverpool University, met the members of the Council of the Branch and also spoke on *Regional Survey for Planning*. The talk was arranged in collaboration with the Bombay Geographical Association. Dr. Learmonth emphasized the need for the proper processing of statistics and general data available with regard to economic and industrial life of the people. Principal C. B. Joshi of the Ruparel College, Bombay, presided.

Mr. Strukov gave a talk on *The Seven Year Plan for the Development of USSR.*

Visitors

Sri N. C. Chakravarti, Joint Secretary, Indian Statistical Institute, Calcutta, visited the Branch on 6 September 1958. He discussed many of the organizational matters with the staff and some constitutional points with the Secretary of the Branch. Two statisticians Messrs Wu-hui and Kung Chien-Yao from the Bureau of Statistics, Peking, visited Bombay during 24-30 November 1958. Dr. Berners-Lee, electronic computer expert from Ferranti Ltd., UK visited Bombay during 20-22 November 1958. A team of Soviet engineers came to Bombay on 21 January 1959 and left for Agra on 23 January. Mr. Morton Nadler visited the Branch on 22 January 1959 and left the next day. Professor H. W. Arndt, Professor of Economics, Australia, visited the Branch during 16 to 21 January. Mr. K. Ohkata, Programme Officer, International House of Japan, came to Bombay on 10 January and left on the 16th. During his brief stay, he had discussions with high officials, political leaders, trade unionists and University professors. He also visited Poona and met Dr. D. R. Gadgil of the Gokhale Institute. He was entertained to tea by the Council of the Branch.

Mr. A. Strukov, Chief of Unit, Planning Commission, Mr. P. Maniakin and Mr. L. Lukin of the Central Statistical Bureau, USSR, visited Bombay during 19-21 January 1959. They had discussions with the Director, Bureau of Economics and Statistics, Government of Bombay and Dr. N. S. R. Sastry, Statistical Adviser, Reserve Bank of India. They were entertained to tea by the Council Members of the Branch. Dr. (Miss) Pamela Robinson visited Bombay on 12 February 1959. Mr. J. Yoshinosuki and Mr. S. Yoshive visited Bombay from 24-29 April 1959. They met high Government officials connected with planning and business representatives.

Institute Examinations

The admission test for the one-year and two-year courses of the Research and Training School was held in Bombay on 5 and 6 July 1958 and 42 candidates appeared.

The Statistician's Diploma Examination was held in March 1958 at the Bombay Centre. Out of the 15 candidates who appeared, 13 were declared successful in one or more papers. The Statistician's Diploma Examination was held from 15 September 1958 to 4 October 1958. In all 25 candidates appeared, of whom 15 passed in one or more papers. The Statistician's Diploma Examination was held again from 31 March to 10 April 1959 and fourteen candidates appeared.

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Activities

The activities of the Branch, especially seminars, have proved very popular. The scheme for a library of the Branch has been finalised. The starting of training classes for Diploma and Computer's Certificate Examinations is under consideration.

MYSORE STATE BRANCH

Membership : During 1958-59, the Branch had on its register a total of 34 members comprising 29 ordinary members, 1 institutional member, 2 life members and 2 sessional members.

In the absence of Sri H. S. Narayana Rao who went abroad, Sri R. Ramaswami, Vice-President, was requested to continue as Treasurer, also for the current year. (A list of the office bearers is given in Appendix 2).

Surveys

Survey on Consumer's Demand for Cottage Industries in Mysore City : The draft report of the above survey was examined by the technical workers of the Institute at Calcutta and their comments were forwarded to the Branch. Sri K. V. Krishna Sastry, who had taken principal part in the analysis of results and drafting of the report, has taken up further work on the report on the basis of these comments and a further report from him is awaited.

Pilot Sample Survey of Job Satisfaction Among Workers in Industrial Concerns in Bangalore : The report on the above survey was sent to the Centre for comments and further action.

Lectures

Dr. A. T. A. Learmonth, on assignment under the Colombo Plan, delivered two lectures under the auspices of the Branch on *Regional Survey of Mysore State for Planning Purpose*, at the premises of SKSJ Technological Institute, Bangalore, on 17 and 22 September. Sri Ramakrishna Hegde, M.L.A., presided over the first lecture while Sri H. C. Linga Reddy, Deputy Minister for Planning and Development, Government of Mysore, presided over the section. Dr. Learmonth illustrated his lectures with lantern slides.

Training Course for Computer's Certificate Examination

At the Executive Committee meeting held on 24 July 1958, a sub-committee, consisting of the following members was constituted to draw up a programme for conducting training classes for candidates for the Computer's Certificate Examination of the Indian Statistical Institute, Calcutta : Sarvasri A. Ananthapadmanabha Rau, S. K. Iyengar, R. Ramaswami, V. N. Poorna Pregna, S. M. Sundara Raju, and N. S. Sreenivasan (*Convenor*). On the recommendations of the sub-committee it was decided to open training classes.

INDIAN STATISTICAL INSTITUTE

The training course was inaugurated by Sri H. C. Linga Reddy, Deputy Minister for Planning and Development, Government of Mysore, on 22 September 1958 at the premises of SKSJ Technological Institute, Bangalore. Sri Reddy emphasised the need for trained computers in the efficient working of the industrial establishments and other institutions in the country, and congratulated the Branch for its painstaking efforts to conduct training courses for this important examination.

The lectures of the course which concluded in the second week of March, 1959, were given by : Sarvasri A. Ananthapadmanabha Rau, V. N. Poorna Pregna, B. V. S. Rao, M. C. Satyanarayana, S. K. Iyengar, S. M. Sundara Raju, C. A. Setty, N. S. Sreenivasan, V. B. Subramaniam, and Kumari S. J. Ruprani.

The Branch is grateful to the members of the sub-committee and the lecturers for their enthusiasm in conducting the course with success. Of the candidates who took this course, ten appeared at the Bangalore Centre for the Computer's Certificate Examination of the Indian Statistical Institute, held in March, 1959. The Branch was 'at home' to all the candidates, lecturers and others on 28 March 1959, on the conclusion of the course.

Examinations of the Indian Statistical Institute

The Indian Statistical Institute, Calcutta, conducted the Statistician's Diploma Examination and the Statistical Field Survey Examination during September 1958, and the Computer's Certificate Examination and the Statistician's Diploma Examination, during March-April 1959, at the premises of SKSJ Technological Institute, with Bangalore as Centre.

PART 2 : RESEARCH SUMMARY

A brief account is given in this section of the progress of research in the different divisions and sections of the Institute. Lists of scientific and technical papers published or read at conferences or submitted for publication, and working papers and notes are given in Appendix 5. References are given in this section to relevant papers in Appendix 5.

RESEARCH & TRAINING SCHOOL

A. Theoretical Statistics

Fractile Graphical Analysis : A new technique developed by Professor Mahalanobis (P27)*, enables, through a graphical representation, a comparison of data relating to two or more groups (or 'populations') of individuals or of the same group ('population') over time. This is specially useful when the data do not provide an adequate summary in terms of estimates of a few parameters with respect to which the populations possibly differ. An added attraction is the great flexibility of this method being applicable to interval as well as ordinal data. Its use has been demonstrated in the analysis of data relating to a wide variety of fields, such as economics, population studies, anthropology, agriculture, psychology, etc. (L16).*

The data required are pairs of observations (y, x) on a number of individuals or sample units belonging to any specified group. One of these variables (say, y) is of main interest, while the other (x) is a concomitant variable providing a classification of the individuals. When only a single variable y is available, x is chosen to be the rank of the individual with respect to y, or simply equal to y.

The method consists of (i) classifying the individuals into a number of serially ordered fractile classes on the basis of x, each class containing the same fraction of individuals, (ii) computing the average y within each fractile class, (iii) plotting the average y against the serial number of the fractile class and joining the points by a series of straight lines. The graph, thus obtained, is called a fractile graph. For purposes of comparison, the fractile graphs for the various groups are drawn on the same chart, and conclusions are drawn about the nature of differences at different points of the axis representing the fractile classes. An interesting example is the comparison over time of expenditure on a particular item (y) (corrected for price, if necessary) in a household budget of families classified according to their economic status as indicated by the total expenditure (x).

Some conjectures have been made regarding the behaviour of two fractile graphs based on independent samples from the same population, and also from different populations (P27). Some of these have been theoretically established (S40). Further work on theory and application is proceeding.

Probability Theory : It is proved that the density function of a normed sum of independent and identically distributed random variables with zero mean and unit variance, converges almost everywhere to the normal density function. Extensions are made to cover the case of a stable limiting law. (S37).

* Numbers within brackets refer to papers listed in Appendix 5.

Let $B_n(k)$ denote the probability of obtaining at least k successes in n independent trials, each with success probability p, where $0 < p < 1$ and $np \leqslant k \leqslant n$. Certain upper and lower bounds for $B_n(k)$ are obtained which seem useful when $B_n(k)$ is very small. These bounds yield, in particular, necessary and sufficient conditions in order that $N_n(k)/B_n(k) \to 1$ as $n \to \infty$, where N denotes the normal approximation to B. (S3).*

Estimation and Testing : The problem of consistency of maximum likelihood estimates is considered from the viewpoint of the convergence of the estimated distributions of a single observation to the actual distribution. Examples are constructed which exhibit maximum likelihood estimates inconsistent from this viewpoint. (P1).

It is proved, under a mild restriction, that when the sample space is discrete the maximum likelihood estimate is consistent in the sense of the preceding paragraph. Under additional parametric conditions, the maximum likelihood estimate is identified with a root of the likelihood equation (P38).

A large sample test for testing the mean function of a discrete linear stochastic process is constructed and its consistency properties are discussed for the special case of normal processes. (S36).

Let $T_1, T_2, \ldots$ be a sequence of test statistics for testing a given null hypothesis such that T_n has a continuous limiting distribution in the null case, but $T_n \to \infty$ in the non-null case. For given data, let L_n be the level attained by T_n, i.e. L_n is the probability of T_n exceeding the observed value of T_n. It is argued that the rate at which $L_n \to 0$ is probability in the non-null case is an index of the performance of T_n. It is shown that this rate is calculable, either approximately or exactly, in a large number of cases, and that the respective rates associated with two alternative tests of the same hypothesis provide an asymptotic comparison of the two tests A number of examples are given, and connections with the Neyman-Pearson theory of tests are pointed out. (S1, S2).

The Pitman limiting power for the goodness of fit chi-square is obtained for the case where some parameters occurring in the specification of class probabilities are estimated by an asymptotically efficient procedure. Applications of the limiting power to problems involving planning of experiments are discussed. (P37).

Multivariate Analysis : The construction of the discriminant function requires a knowledge of population parameters characterising the populations to be discriminated between. Wald suggested using a certain statistic when such knowledge is lacking, but did not give its exact distribution. The exact distribution of this statistics was found out in the case when the variance-covariance matrix is known. (S26).

The performance characteristics of some of the procedures usually adopted, when knowledge of the kind required for constructing the discriminant function is lacking, were studied. (S29).

Some simple formulae were obtained for the evaluation of the probability integrals of the multivariate normal distribution and the multivariate t-distribution. (S28, S30).

* Numbers within brackets refer to papers listed in Appendix 5.

A comparative study of some tests of significance for the covariance matrix in multivariate analysis was made. (S27).*

The "step-down" procedure is applied to multivariate analysis of variance and to testing equality of variance-covariance matrices, and some new tests and confidence intervals are obtained. (P44).

Sample Survey : For a very general scheme of sampling an admissible estimate as also a complete class of linear unbiased estimates for the mean of a finite population have been obtained. (S5).

Design of Experiments : A class of two-replicate designs, called simply partially linked block designs, has been obtained as duals of two-associate partially balanced incomplete block designs with two plots per block. A list of these designs which involve ten or fewer plots per block is given, together with the values of their parameters. (P45).

Expected values of mean squares for varieties and error have been obtained under the most general set up, in the cases of BIB and PBIB designs and some conclusions have been drawn regarding the nature of varietal differences which the variance ratio test can detect in those cases. The consequences of non-random allocation of subsets of varieties to blocks and random indexing of varieties have also been studied. (P41).

Expected values of mean squares for varieties and treatments are obtained for the usual analysis of a randomised block design and a latin square with a single missing observation. Even though only the null situation is studied, this could be easily extended on similar lines to more general situations. (S35).

B. Applied Research

Biometric Unit

Variation of Organs of the Same Plant : Bimodal variation of a metrical character has been found in *Bauhinia acuminata* (*J. Genet.* in press). Bimodal variation of leaf tooth number in *Nyctanthes* seems to be recessive to unimodal variation. (C24).

Symmetry : Some characters show a high correlation ($r = 0.8$) between the right and left sides of the same organ or organism. These include tooth and vein number in leaves, and "pearls" in caterpillars. Others, such as nipple number in cattle, buffaloes and goats, show correlations which may be as low as 0.1. (C11, C23).

Life Tables : These are now available for *Antherea mylitta*, the tasar silk moth. Most of the life, which may exceed a year, is usually spent in the cocoon, and life durations are sharply trimodal. (C11).

Regeneration in Rice : Preliminary experiments on an *aus* variety showed that if the ears were removed without drying the soil or damaging the leaves, a second crop, exceeding the first, but not significantly so, was obtained 45 days later. This experiment is being repeated on a large scale with a number of rice varieties and mixtures. (P47).

* Numbers within brackets refer to papers listed in Appendix 5.

Interaction of Varieties and Species in Mixed Crops : When a mixture of wheat and gram was sown each at half the usual density, the joint yield per unit area of each crop was increased. Four mixtures of rice varieties were similarly tried. In three of them one variety gave an improved yield which, however, did not compensate for the lowered yield of the other variety. In the fourth mixture the yield of one variety was unaltered, whilst that of the other rose by 25%. These results are, however, barely significant at the 5% level, and the experiments are being repeated.

Insect Behaviour : When visits of insects of flowers of two colour varieties of *Lantana camara* were recorded, it was found that most species had no marked preference, but some butterflies had a very strong one for one colour or the other. Since these insects pollinate the plants, this leads to homogamy and can cause selection analogous to sexual selection. (P10).

Genetics : Genetical work is in progress on *Vigna sinensis*, where a new lethal gene and a new linkage have been found, on *Oxalis corniculata*, *Antherea mylitta* and other species. The work of the practical class on *Drosophila melanogaster* has revealed novel statistical facts about its genetics.

Mathematical Statistics : The chi-square test has been used to estimate the variance of a frequency in different populations of which samples are available, and a new statistic devised which is related to covariance in a $(n \times 3)$ table as is chi-square to variance in a $(n \times 2)$ table).

Economics of Sericulture : A preliminary study of the production of *tasar* silk cocoons at Gangaramipur, near Giridih, by Santals, indicates that it is very inefficient. Its contribution to the income of the village is being investigated.

Blood-group Surveys : Joint frequency tables have been prepared for ABO, Rh, and MN blood groups in Bengalees and non-Bengalees from the survey of over 1400 persons. A family study, in which ABO, Rh and MN blood group data are being collected for several generations in Bengalee joint families is in progress.

Clinical Studies : Electrophoretic studies of human serum proteins and haemoglobins were carried out. An investigation of systolic and diastolic blood pressure in relation to cholesterol in the blood was completed. Results of several standard liver function tests in the normal Bengalee population were reported. (P43, S6, S8).*

Fish Growth and Biochemistry Investigations : Growth rate data have been collected for two species of Indian carp (*Catla catla* and *Labeo rohita*) under field conditions for the first two years of life. (P7).

Qualitative and quantitative electrophoretic determinations of haemoglobin, serum proteins and lipoproteins were made, and blood sugar and total protein estimated by chemical methods for several species of Indian carp and other freshwater fishes. (P6, S7, C7).

Spawn Survival Experiments : Experimental investigations on the survival rate of Indian major and minor carp during the first three weeks of life were continued. It was found that cobalt nitrate mixed with ruminant stomach extract enhanced survival of major carp as effectively as 25 micrograms of vitamin B_{12}, but at less than 1% of the cost. For minor carp, 80% survived under treatment with yeast alone and with vitamin B complex including B_{12}. (S9, S10).

* Numbers within brackets refer to papers listed in Appendix 5.

Synthetic Plant Hormones Field Experiments : Previous results on the effectiveness of NOXA and IBA, two synthetic plant hormones, in increasing cauliflower weight were confirmed in experiments carried out this year. These two synthetic plant hormones were also found to significantly increase both wet and dry paddy yields. Another experiment on cauliflower suggested that opium treatment has some growth-promoting effects.

Psychometric Unit

Academic Selection Testing : Previous academic selection programmes were continued, including the medical college selection testing programme (for Vellore and Ludhiana Christian Medical Colleges) and the selection of trainees for the RTS for the advanced, short-term and computer courses. An additional programme was initiated at the Spicer Memorial College, Poona. Reports were completed on the medical college selection programme (W11) and the selection of advanced trainees in statistics. (W1).*

Personnel Selection : Tests were developed, administered and scored for NSS field investigators, electronic computer programmers, and for training in card-punching; personnel selection interviews were held for a number of posts within the Institute.

Research Studies in Industrial Psychology : Studies which were completed include a methodological investigation of job analysis, development of behavioral indices for personnel selection, and empirical evaluation of a screening test for colour vision. A survey of the research literature on the effectiveness and dimensions of industrial supervision was completed. Work is being carried out at present on a market research consumer preference problem, motion study techniques for non-repetitive types of work, experimental reorganization of working spaces, and quantitative methods of screening applications for selection of personnel. (S11, S31, S41, C8).

Psychometric Analysis : Empirical and theoretical studies of reliability formulae, effects of the correction for guessing on item analysis statistics, the point biserial correlation and weighting of response categories were carried out. A method for the rapid estimation of percentile scores using the probit transformation was developed. For item analysis, a statistical criterion for item selection and a method of choosing items for parallel tests in terms of difficulty, discrimination and ability were proposed. Factor analysis of predictor and criterion scores obtained in the selection and assessment of advanced trainees in statistics was carried out. A review of the literature on the reliability of essay examinations was completed. (P9, P35, C10, C25).

Test Development : The following tests were developed, tried out and analysed : verbal reasoning, non-verbal reasoning, series completion, mechanical aptitude and mathematical knowledge. Work continued on the non-verbal interest inventory and an introversion-extroversion scale. (C4, C5, C6, C12).

Regional Survey Unit

A pilot project in regional survey for planning in the reorganized Mysore State was initiated in September 1956 to develop new techniques for economic surveys by a combination of geographical with statistical methods. The project was initiated by Dr. A. T. A. Learmonth of the Department of Geography, Liverpool, (UK) who came to the Institute in

* Numbers within brackets refer to papers listed in Appendix 5.

August 1956 on an assignment under the Colombo Plan. On his departure in September 1958, Dr. V. L. S. Prakasa Rao took charge of this Unit. In view of the importance of regional studies for planning and the statistical nature of the work, the Unit was shifted to Calcutta to work in closer collaboration with the Research and Training School. Apart from research in survey techniques, the Unit will also help in providing specialized training to advanced students of the Research and Training School.

An interim report on resource study for planning purposes in Mysore State was prepared and circulated in April 1958 to the members of the Regional Survey Committee and officials of the Mysore Government. Special studies on commodity flow by lorries, urban and population growth were carried out later, and the final report is being published by the Indian Statistical Institute.

A reconnaissance sample survey of towns in Mysore State has been completed and the report circulated to the departments concerned. Based on the findings from the above surveys, detailed studies of rice-land potential in Malnad (Mysore), rainfall distribution and variation have been completed and the reports are being finalised.

The Unit, in collaboration with the IMRUP and Operational Research Association, Bangalore, has completed the preliminary report of the study of "Optimum Capacity of the Karwar Hubli Road (Mysore) for the Transport of Iron Ore by Lorries."

Work in progress includes theoretical studies on (i) delimitation of regions by quantitative and objective methods, (ii) classification of Indian towns: methodology and (iii) rural land-use mapping: methodology, and the following applied studies :

(i) Mapping of regional components of Dandakaranya, taken up primarily to estimate potential cultivable area in Dandakaranya, its distributional pattern and to indicate sites for rehabilitation ; based on a map analysis a brief note has been prepared.

(ii) Mapping at macro-level (national), in which an attempt is being made to assess the regional disparities in India in agricultural efficiency, industrial location and urbanisation.

(iii) Macro-project for South India, namely studies at macro-level in Kerala, Madras and Andhra States to identify the common problems and resources and to suggest coordinated planning schemes at an inter-state level.

Geological Studies Unit

The more important aspects of work of the Unit, which was organized by Dr. (Miss) Pamela L. Robinson of the University College, London, during her six months' stay in India from October 1957 to April 1958, are application of statistics to palaeontological materials, especially fossil vertebrates from India; collecting information on the rate of evolution of such animals; dating the Indian rocks on the basis of the vertebrate fossils found therein; establishing a nucleus of research on vertebrate fossils in India; and disseminating information about the work by holding exhibitions and lectures. When the Unit has collected enough evidence, they would start measuring and then statistics would unite with palaeontology at the Institute.

The Unit has been doing research on very ancient fossil-bones of animals living some 120-180 million years ago. It organized several expeditions to different parts of India to collect fossil materials for its research work. The discovery of a reptilian fossil, *Lystrosaurus*, from Panchet beds in West Bengal was recently announced. This work was

done by the Geological Studies Unit in collaboration with the Geological Survey of India. Some species of this fossil have already been discovered in South Africa and Sinkiang. The new discovery is of interest as it goes some way towards providing a geographical link between Sinkiang and South Africa in the distribution of these species about 180 million years ago.

Another discovery of the Unit is an almost articulated skeleton of the hind-part of a fossil reptile (rhynchosaur) from India. Its age goes back to 180 million years and it was hitherto known in the form of fragmentary pieces. The remains were brought back from Andhra Pradesh and were prepared for study in the Unit. The Unit hopes that in one of their next field trips it would be possible to obtain the skeleton of the interior part as well.

The Unit survey partly collected a number of valuable fish specimens as old as 120 million years. Two exhibitions of some of these fishes were organized, through the kind courtesy of Dr. Pamela Robinson, in England. An announcement of the discovery was published early this year in a British journal. The importance of the specimens is two-fold: these are the only almost complete remains of such fishes from India and most likely the only freshwater fishes known to have existed in that geological age anywhere in the world. A careful study is being carried out to compare their European relatives.

Sociological Research Unit

The Sociological Research Unit was formed in October, 1957 with Dr. Ramkrishna Mukherjee as its head. A brief account is given below of the work in 1958-59.

The Village as a Societal Unit: The study was based on data collected from West Bengal villages by the National Sample Survey in 1951 and 1955. The objective is to examine whether the villages differ in their socio-economic characteristics in either space or time perspective. The "space perspective" is given by the distance of the villages from the nearest point of transport and communication. The "time perspective" relates to the situation at the beginning of the First Five Year Plan (1951) and at its end (1956). A report on *Changing Pattern of West Bengal Villages : 1951-56*, is under preparation. A paper on the informants' attitude to the surveys, based on the available data, has been brought out in the meantime.

The first stage of work on the study of "village" as a societal unit in Bihar was concluded during the year, involving a preliminary survey of all rural households within a radius of 10 miles from the Giridih township.

Family Structures in Undivided Bengal: Work on the study of family structures in undivided Bengal in 1947 was carried out on the basis of *An Enquiry into the Economic Conditions of Rural Population of Bengal* (Undivided), conducted by the Institute in 1947 to furnish data for the formulation of a systematic classification of family-units and to find relations between family structures and other societal groupings, viz. religion and caste hierarchy, economic structure of society, etc.

Inter-group Relations: Pre-pilot surveys on the study of inter-group relations at Giridih and Durgapur were carried out. The objective of this study is to investigate the possible social effects of the establishment of (a) large-scale heavy industry (steel and coke-oven) at Durgapur on the growing township and surrounding villages ; and (b) of mining and processing industries of coal and mica at Giridih on the existing population of the town and neighbouring villages located within a distance from the town up to 10 miles as the crow flies.

A survey of seven villages, selected at random from all the villages around Giridih within a radius of five miles, was carried out in order to examine the role of social groups in the relative use of handicraft and machine-made products. A preliminary note on the survey has been prepared; and further analysis is proceeding.

Demography Unit

In 1937, Professor Mahalanobis pointed out in an article in *Sankhyā* the need of scientifically planned sample surveys to meet the needs of demographic research in the country, and emphasized the importance of the study of the growth of population. Since then studies are being made of population sampling techniques. A good deal of demographic data are also being systematically collected in the National Sample Survey and analytical results are being published from time to time. Besides this, a detailed study was carried out on the comparability of census economic data by Dr. Daniel and Mrs. Alice Thorner under the auspices of the Bombay Branch of the Institute.

A special Demographic Studies Unit, headed by S. J. Poti, which was established with the assistance of the Ministry of Health towards the end of the year 1957, has carried out studies on demographic effects of social mobility, prevalence of contraceptive practices, validity of morbidity and other health statistics collected through the usual agencies.

In the curriculum for advanced professional courses in statistics provided by the Research and Training School, training in demographic techniques forms an important part. Special lectures are also sometimes arranged and mention may be made of a series of lectures given by Professor Haldane on the biological aspects of fertility and mortality.

A detailed note covering the work of this Unit is given in Appendix 7.

Flood Research Unit

Object of Study : Important studies on rainfall and floods had been made by Professor Mahalanobis and some of the workers of what was known as the Statistical Laboratory at that time and, later, of the Institute between 1925 and 1935 among which may be mentioned the report on floods in North Bengal (1926), the report on rainfall and flood in Orissa (1928) which included the first estimates for a multipurpose scheme and which also developed into the Hirakud project, and the report on the Burdwan-Hooghly-Howrah irrigation scheme (1936) which later developed into the Damodar Valley project.

After many years a new Unit for the study of floods was set up under the guidance of Dr. N. K. Bose in May 1958. Similar units have also been set up by the Government of India and some of the State Governments; and in their work emphasis naturally has been laid so far on the problem of control of floods owing to their urgency and importance. But to find a permanent and satisfactory solution of the problems created by floods, it is essential to initiate basic studies of these occurrences, especially of the factors causing them. The Unit now set up will concern itself mostly with these aspects of the problem and incidentally suggest broad outlines on measures for their prevention.

Regional Study : A beginning has been made with the investigation of floods in West Bengal with the idea of gradually extending it over Bihar, Orissa and Assam. Though the weather conditions of these four States are governed by almost the same meteorological factors, the geological formations of the terrain through which the rivers of these States flow

are different, and it has, therefore, been considered advisable to undertake the examinations on the following regional basis :

(1) Western portion of Central Bengal, Chhotanagpur and Santhal Parganas of Bihar. (2) North Bengal, Bihar and North-East Assam. (3) Orissa.

Data for Study : The basic data for this study are rainfall, river gauges and river discharges, nature and condition of silt-charge, occurrence of floods, information about catchment areas, information about the flooded areas and information about the river courses. Though these data should cover as long a period as possible, it has been thought advisable to collect them in the first instance for the last 10 years only. A critical estimation is also being made to find out how far the data are truly suitable for the present purpose.

Flood Study : After the preliminary selection of the data was completed, the study proper was undertaken. This followed generally the lines adopted by Professor Mahalanobis in his study of the Orissa floods (1928).

During the year, one specific study on the forecasting of floods of the river Jamuna at Delhi was referred to the Unit by the Flood Wing of the Central Water & Power Commission, New Delhi.

PLANNING DIVISION

Inter-industry Studies*

Some progress was made in the preparation of a final report on the inter-industry transactions for 1953-54 and primary tabulations for 1954-55 in course of the year under review.

A study was undertaken of the nature of the inter-industry transactions, in a closed economy as well as in an open economy, and how to derive the national income accounts from them. Precise definitions were given of the type of transactions which are of interest in this context. (4).

An attempt was made to estimate the aggregate (direct and indirect) import requirements in India by making use of the input-output table for 1951-52. (7).

A study of the input structure at a 'micro' level was made of two industries: coal, for 1954-55 and non-coal minerals for 1954 (22,67).

Another theoretical study dealt with the casual implications of the output-investment ratio in the context of economic growth. The ratio was proved to be the resultant of two factors, namely, (i) the technological conditions of the process of production and (ii) allocation of investment between various sectors of national economy. This was established on the basis of a disaggregative model of the Leontief type. The effects of investment on the rate of increase in gross output, national income and employment were fully analysed. (32)

Studies on Consumer Behaviour

Econometric studies on consumer behaviour were carried on in pursuance of earlier works in the field. Some estimates of elasticity worked out in the Division were used for projections for the Third Plan.

* Numbers within brackets refer to papers listed in Appendix 8.9

Two attempts were made to fit different types of curves to the data on consumption available from the NSS. The earlier attempt was based on the fourth and seventh rounds of the NSS. Tentative estimates were made of the elasticities of expenditure on cereals, salt and milk by fitting second degree curves to the data on cereals and straight lines to the data on salt and milk. (6).*

The other study tried to find the level of satiation for cereals assuming that two straight lines might be made to fit the data, one passing through the origin and the other parallel to the x-axis, i.e. indicating respective elasticities of unity and zero for the ranges given by the line segments. The data related to the fifth and seventh rounds of the NSS. (38,73).

Another study produced on the basis of NSS data estimated the per capita consumption of food in rural India. Estimates were made by 26 major items of food arranged into 8 groups,—by quantity and by calories. The reference period was October 1953 to February 1954 (NSS, seventh round). (12,50).

Among other works on consumption, a historical study was made of the comparative patterns of consumption of 12 main items as in the early 19th century and as in 1953-54, the former data being available from the History, Antiquities, Topography and Statistics of Eastern India (in 3 volumes) by Montogomery Martin 1838. (60). An attempt was made to study real wages in Akbar's time on the basis of Ain-i-Akbari. (1).

The report on the consumption expenditure survey of the households of the employees of the ISI (1955-56) was finalized during the year. (15,20).

An expression for the error of the Lorenz concentration index was derived and an empirical investigation was made to test the equality of two concentration indices. A method was derived to obtain estimates of elasticity from concentration curves on the assumption of distribution of per capita total expenditure. (24).

Growth Models

A fourteen sector demonstration model for economic planning in India was set up with the help of the provisional input-output table for 1953-54 prepared in the Division earlier. The model covered the year 1960 to 1970 and was made to be as 'realistic' as possible. It was solved by linear programming on the HEC-2M electronic computer of the ISI and two papers were produced on the basis of the results. (64 and 65).

By another group of workers a set of projections was made of the principal economic rates, ratios and aggregates for India as a whole. This was a sequel to Dr. Rudolph's paper on long range planning in East Germany produced earlier. (55).

Three simple econometric models for India were presented in one paper. Indian data for 1948-49 to 1954-55 were used to estimate the parameters. (28,29).

National Income and Allied Topics

A paper on flow of funds was produced for the first time in India by Mr. H. W. Arndt opening up a new line of research in India. A working group was set up by the CSO to follow up research in this field.

* Numbers within brackets refer to papers listed in Appendix 8.9

Several topics were taken up with a view to explore possible ways of improving the existing official estimates of national income as well as to obtain new breakdowns of national income.

Two alternative methods are available for deflation of the national income of a country: either to apply the deflators at the stage of production or to do it at the stage of final expenditure. The first method is followed in the Indian official estimates. An attempt was made to use the second method to obtain the real income series, with the help of NSS data on consumer expenditure. (28).*

An interesting work of estimation undertaken was that of the supposedly large stock of gold and silver in India. The estimate covered net additions made during the period from 1493 to 1956 with details for the year since 1835. (56).

An attempt was made to find an appropriate price average for working out the aggregate value of agricultural output when current price data are available by districts while the current figures of outturn relate to the State as a whole. As it was a practical problem, two alternative methods were suggested, depending on whether adequate computational strength was available or not. (40).

Another study was on the distributive trades in India and estimates were made of the margins and traders incomes in retail trade and wholesale trade as well as the long-term trends thereof. Use was made of the NSS material to obtain the estimates. (70).

Ratios between output, capital, labour, wages, profit, etc. were studied for Indian industries classified into five groups, namely, food, producer goods, textile, consumer goods and engineering, on the basis of data given in the Census of Manufactures. (47).

A study was made of the differences between annual average and harvest period prices for a number of crops. (57).

Four papers were produced on the accounting of national income in the USSR, covering the following subjects : (1) preparation of balances of the national economy for planning, (2) organization of investment statistics, (3) balance method and its role in economic planning, and (4) national income estimates. (74, 34, 75 and 76).

Accounting of construction in the USSR featured as the subject of two papers,—one on the preparation of statistical reports on construction and another on the main methodological principles of planning of construction. (35 and 77).

Other Work on Planning

The paper of Professor Mahalanobis presented as the anniversary address at the National Institute of Sciences in India considered the "Next Steps in Planning" for India in the context of the history of industrialization of the more advanced countries of the world.

The significance of the industrialization of the underdeveloped countries as the means to ease the tension in world affairs occupied the attention of Professor Mahalanobis. In the year under review, he published a series of articles on this issue in the pages of the *Sovremennyi Vostok*, December 1958, (*Contemporary East*, USSR.), the *Bulletin of the Atomic Scientists*, USA., and the *Bulletin of the International House of Japan*.

The private sector in Indian economy was the subject of another enquiry. Besides the logic of having a private sector in a socialistically oriented society, the other issues examined were (1) whether alternative policies towards private enterprise might not lead to

* Numbers within brackets refer to papers listed in Appendix 5.9

different rates of growth in aggregate income being associated with the same programme of public investment; and (2) the lines of policy which might lead to the highest rate of income growth being associated with any given public investment programme. (69 and 71).*

A type study had been undertaken on peak period in harvesting *aman* paddy in 5 villages in West Bengal during the period December 1954 to January 1955. The idea was to see whether there was really any surplus population in villages. The report was finalised during the year and it tended to support the view that withdrawal of labour from villages would as such cause a fall in the outturn of crops. (3,46 and 72).

An analysis was made of the relationship between the techniques of planning and the economic "laws". Tackling the problem on an abstract level, the author propounded the view that all attempts at centrally planning the economic activities of the nation must necessarily conform to the logic of the economic laws—whether the social frame-work is "capitalistic" or "socialistic". (63).

An analysis was attempted of the cost of production of various cottage industries in *Kalyanasri*, with detailed treatment of the cost of handloom weaving. An attempt was also made in the same paper to see how the cost structure in *Kalyanasri* stands comparison with that in some other cottage industries centres in India. (19).

An analysis was made of the relation between the railway freight transportation and the growth of industrial activities. Some tentative prediction about the relationship was also attempted for India. (52).

Data available from the household schedule on 'employment and unemployment' in the 9th and 10th rounds of the NSS were made use of in an attempt to estimate the total employment and per capita hours at work in selected services and occupations. (9).

A systematic study was taken up on the economics of milk production with an aim to arrive at approximate pattern of future growth. (13 and 14).

An interesting attempt was made to apply some econometric techniques to the theory of education to find out the optimal rate and optimal pattern to be followed in stepping up education in a country developing in a planned way. (31, 78).

A report was produced on the productivity of *Ambar Charka*, on the basis of the experience in the experimental cottage industries centre (*Kalyanasri*) of the ISI (68).

A group of workers drafted a new classification of economic activities and commodities from the point of view of end-use for long term planning purposes. (16, 53).

A study of the relation between 'size' and 'productivity' of industrial units tended to support the general idea that productivity does increase with size. (21, 30).

Dr. Hashim Amir Ali undertook, on behalf of the Institute, a series of pilot surveys in the villages around Santiniketan with a view to studying comparative conditions economic and sociological, in 1953 and 1958.

A study of the censuses of India was made by Dr. Daniel Thorner on behalf of the Indian Statistical Institute for preparing a report on the comparability of census economic data between 1881-1951. He put forward some suggestions on the basis of his findings for preparing the 1961 census questionnaire. In general, his conclusion is that the census economic data are not strictly suitable for comparison as between one census and another, and he has recommended a household approach in future, instead of the present individual approach for collecting economic information.

* Numbers within brackets refer to papers listed in Appendix 5.9

AUDITOR'S REPORT

P. C. Nandi & Co.
Chartered Accountants.

Lindlie Chambers,
6, Hastings Street,
Calcutta-1.
The 7th October, 1959.

To
The Chairman and Members
of the Indian Statistical Institute.

Dear Sirs,

We beg to report that we have audited the accounts of your Institute for the financial year 1958-59 and have pleasure to submit the present report for your consideration.

In carrying out the audit we have examined the receipts and expenditure accounts —both for the current and the capital expenditure sectors as well as the subsidiary funded accounts of the Institute for the aforesaid year. The statements of accounts as audited by us are appended hereto.

We would in this connection bring to your notice the following points :

In our 1957-58 audit report (paragraph 2(a)) we invited attention to the fact that a total amount of Rs. 22,318 being amounts overspent in earlier years upto 1955-56 had remained unrecovered from the Government. No part of this amount was recovered during the current year also.

Regarding the point raised in paragraph 2(b) of the 1957-58 report, we have been informed that the question of reimbursement of proportionate rent for the Institute main building was still under negotiation with Government during the year under review.

Regarding reimbursement of arrears payable to the leave salary and gratuity funds referred to in paragraph 2(c) of the 1957-58 report, the matter is reported to be still under consideration of the Government and no payment for this purpose has been received from the Government for the year under audit also.

We have invited attention in our 1957-58 report to a large amount having remained in suspense, we are glad to report that a large part of these suspenses have since been adjusted and the total suspense at the end of the year under audit has also come down considerably.

In course of the audit of the current year we came across some minor mistakes and defects such as irregularity in vouchers, want of proper sanction for expenditure, wrong postings and castings of entries etc. Such defects were rectified and the mistakes corrected while the audit was in progress.

We are also glad to report that on the advice which was tendered by us in paragraph 4 of 1957-58 audit report, orders have now been issued restricting the giving of advances to only specified workers of different departments.

Books of accounts as maintained by the Institute have been properly kept and subject to our above remarks and observation, we have obtained all necessary informations and explanations which to the best of our knowledge and belief were necessary for the purposes of audit. The audited statements of account for the year ending 31st March, 1959 appended hereto give a true and correct view of the receipts and expenditure of the Institute.

Yours faithfully,
Sd/- P. C. NANDI
for P.C. Nandi and Co.

Indian Statistical Institute : Receipt and Payments Account

To Receipts

		Rs. nP.	Rs. nP.
1.	Opening balance :		
	(i) Cash in hand and at Banks with Central Office ..	22,438.02	
	(ii) With branches and sub-offices	83,195.35	
	(iii) Unadjusted suspense of 1957-58	1,26,233.57	
	(iv) Loans unrecovered from staff for educational and house building purposes etc. as per last account ..	29,585.14	2,61,362.08
2.	Membership subscription		3,308.50
3.	Machine fees for Training Courses in Calcutta & Delhi ..		21,262.50
4.	Tuition fees for language course		230.00
5.	Examination fees and other receipts		26,227.37
6.	S.Q.C. receipts from non-Government sources :		
	(i) Membership fees	54,000.00	
	(ii) Service charges and Training fees	87,415.00	1,41,415.00
7.	Contribution received from National Productivity Council for S.Q.C. Conference		8,000.00
8.	Recoveries of work done by workshop etc.		67,588.87
9.	Recovery for service charges for work done by IMRUP ..		9,949.62
10.	Block and Project grants from the Government of India for :		
	(i) Research & Training School and Society type activities Sector	9,20,000.00	
	(ii) International Statistical Education Centre ..	91,000.00	
	(iii) Statistical Quality Control Sector	2,05,000.00	
	(iv) Computing Machines & Electronic Laboratory Sector	3,00,000.00	
	(v) Utilisation of Soviet (UNTAA) equipment Sector ..	2,12,000.00	
	(vi) Economic Wing Sector	2,53,000.00	
	(vii) Operational Research Unit for Planning Sector ..	3,14,000.00	
	(viii) Industrial Management Research Unit for Planning Sector	1,93,000.00	
	(ix) Pilot Project for surveys in Regional Planning Sector (in Mysore)	80,000.00	
	(x) National Sample Surveys and Integrated activities Sector	49,58,000.00	75,41,000.00
11.	Translation Unit set up in Japan (expenditure met by the Government of India as per contra : item no. 15) ..		53,848.84
12.	Army Statistical Organisation (direct payment made by Government of India as per contra ; item no. 9.c) ..		73,000.00
13.	Miscellaneous receipts : viz. sale proceeds of waste paper, cards etc.		3,341.80
14.	Amount received from the ECAFE for preparation of a Manual		2,359.23
15.	Amount received from the International Statistical Institute, the Hague for conducting a survey on the teaching of Statistics & report writing		1,956.31
16.	Funds received from the Government of India, Ministry of Finance for disbursement to the trainees of the ISEC (under the Technical co-operation scheme, Colombo Plan) ..		51,008.18
		Carried over :	80,04,886.26

(current expenditure) for the year ending 31 March 1959

By Payments

		Rs. nP.	Rs. nP.
1.	(i) Salary, dearness allowance, honorarium etc. ..	44,14,384.67	
	(ii) Employer's contribution for workers' Provident Fund (outstanding liabilities per contra)	2,54,171.14	
	(iii) Overtime allowance	1,78,071.02	48,46,626.83
2.	Contribution to Leave Salary Fund		1,20,000.00
3.	Contribution to Gratuity Fund		1,80,000.00
4.	Travelling allowance		2,98,873.66
5.	(i) Visiting professors & scientists for R.T.S. Sector ..	50,000.00	
	(ii) Visiting professors, fellows, foreign experts & scientists etc. for other Sectors	88,692.77	1,38,692.77
6.	(i) Scholarships, stipends etc. to trainees of the R. & T. School	1,75,000.00	
	(ii) Fellowship allowance & other assistance to ISEC non-Colombo Plan Trainees	15,422.63	1,90,422.63
7.	Disbursement of fellowship allowance to ISEC trainees under Colombo Plan		85,698.06
8.	Prizes to workers for initiative etc.		19,055.00
9.	Machine Tabulation expenses :		
	(a) Hire and maintenance of tabulating equipment, key punches and verifiers including freight, transport, electricity charges etc.	8,07,441.76	
	(b) Cost of cards, cabinets, etc.	1,40,900.66	
	(c) Payments to Army Statistical Organisation (direct by the Government of India as per contra : item no. 12)	73,000.00	10,81,342.42
10.	Printing and publication (including paper for printing) ..		1,10,211.18
11.	Society type activities		31,641.73
12.	S.Q.C. seminars and conference		13,638.23
13.	Examination expenses		22,687.71
14.	Books and journals (including cost of binding etc.) ..		1,26,016.24
15.	Translation unit set up in Japan (expenditure incurred by the Government of India through Embassy at Japan as per contra : item no. 11)		53,048.84
16.	Workshop, photo and microfilm		19,936.00
17.	Laboratory and Workshop stores, tools and minor accessories etc.		77,365.16
18.	Repairs, maintenance and replacement of machineries, equipment, accessories, furniture, fittings etc.		85,021.67
19.	Stationeries and consumable stores		1,28,703.42
20.	Audit fee		4,500.00
21.	Bank charges and interest		22,502.99
		Carried over :	78,57,736.54

Indian Statistical Institute : Receipts & Payments Account

To Receipts

		Rs. nP.	Rs. nP.
	Brought forward ..		80,04,886.25
17.	Amount received during the year out of the Ford Foundation grant of $72,300.00		1,414.13
18.	Amount received from the United Nations for preparation of a paper on population (arrear dues for previous years' work)		13,571.70
19.	Amount received as sale proceeds of Institute's own publications		3,008.00
20.	Sub-total of items 2 to 19 :		80,22,880.08
21.	Deposit accounts		32,441.95
22.	Outstanding liabilities for payment of employer's share of contribution to I.S.I. General Provident Fund for 1958-59*		2,54,171.14
23.	Outstanding liabilities for goods, services etc.		17,975.06
24.	Temporary loan taken from fund accounts to meet current year's expenditure**		1,25,000.00
25.	Sub-total of items 21 to 24 :		4,29,588.15

26.	Grand Total of items 1, 20 & 25 :	Rs.	87,13,830.31

* The amount has since been paid with interest in September 1959, vide statement of I.S.I. General Provident Fund Accounts.

** No part of Rs. 4,38,000/- which was taken as loan from different funds upto 31.3.58 having been repaid during the year, the amount is not shown in receipt or payment side of this account.

6, Hastings Street, Calcutta-1.
The 7th October 1959.

(current expenditure) for the year ending 31 March 1959

By Payments

		Rs. nP.	Rs. nP.
	Brought forward		76,57,736.54
22.	Telephone, postage, telegram, advertisement, freight charges etc.		1,01,982.07
23.	Other miscellaneous expenses including cooly, cartage, conveyance and hot weather charges etc.		37,149.28
24.	Electricity charges		71,656.77
25.	Rent, rates and taxes (including those of field, camp and out-station premises)		1,80,301.85
26.	Repairs and maintenance of land and buildings including petty constructions		95,888.29
27.	Transport		64,315.41
28.	Workers' Welfare and amenities		1,33,336.31
29.	Development at Director's discretion		19,404.85
30.	Transport freight, installation and storage etc., of Soviet (UNTAA) equipment		32,607.52
31.	Expenditure for 25th Anniversary celebrations of the Institute adjusted during the year 1958-59		4,650.00
32.	Expenditure incurred against "Ford Foundation Grant" for delegates attending the 2nd session of the Conference of the Asian Statisticians at Bangkok		1,500.00
33.	Sub-total of items 1 to 32		84,01,118.69
34.	Repayment of outstanding liabilities (as shown in last year's account)		1,02,475.03
35.	Repayment of old deposit (as per last account) ..		9,362.17
36.	Loans to staff for educational and house building purposes etc.		31,372.10
37.	Amount under suspense with staff and others pending final adjustment :		
	(a) Part payment to contractors and suppliers against work done or goods supplied or ordered, T.A. advances and other advances awaiting adjustment ..	95,229.22	
	(b) For passage, custom deposits, etc. of Visiting Professors and Foreign experts	346.37	95,575.59
38.	Closing balance :		
	(i) Cash in hand and at Banks with Central Office ..	35,308.64	
	(ii) With branches and sub-offices	38,617.89	73,926.73
39.	Grand Total :	Rs.	87,13,830.31

Examined and found correct.
Sd/- P. C. NANDI & Co.
Chartered Accountants & Auditors

INDIAN STATISTICAL INSTITUTE

Indian Statistical Institute : Receipts & Payments Account for the year ending 31 March 1959.

SCHOLARSHIPS, STIPENDS, VISITING PROFESSORS AND FELLOWS FUND

To Receipts

		Rs. nP.
1.	Opening balance : Cash in hand and at Banks	4,706.24
2.	Amount of Budget provision for award of scholarships, stipends etc. transferred from General Account	1,75,000.00
3.	Amount of Budget provision for Visiting Professors, Fellows of the Research & Training School and Society type activities Sector transferred from General Account	50,000.00
4.	Contribution received from the International Statistical Institute, the Hague towards the expenses incurred by the Institute in earlier years for certain foreign scientists and visiting professors in connexion with their participation in the teaching and seminar work conducted in the Institute	11,703.31
	Rs.	2,41,408.55

By Payments

		Rs. nP.	Rs. nP.
1.	Scholarships and stipends awarded during the year :		
	(i) Scholarship etc. for Research workers	45,873.76	
	(ii) Stipends to students and trainees	1,53,316.44	1,99,190.20
2.	Expenses for 32 Visiting Professors and Fellows from U.S.A., U.K., Japan, China, Netherlands, Sweden, Australia and several other countries		39,034.61
3.	Closing balance : Cash in hand and at Banks ..		3,183.74
	Rs.		2,41,408.55

6, Hastings Street, Calcutta-1
The 7th October 1959.

Examined and found correct
Sd/- P. C. NANDI & Co.
Chartered Accountants & Auditors

Indian Statistical Institute : Receipts & Payments Account for the year ending 31 March 1959.

GRATUITY FUND

To Receipts

		Rs. nP.		Rs. nP.
1. Opening balance :				
(i) Cash in hand and at Banks		836.69		
(ii) Advances recoverable as per last account from :				
(a) Capital Expenditure Account		4,40,000.00		
(b) General Account		1,93,000.00		6,33,836.69
2. Contribution to Gratuity Fund for the year 1958-59.. ..				1,80,000.00
	Rs.			8,13,836.69

By Payments

		Rs. nP.		Rs. nP.
1. Gratuity payments				4,783.37
2. Closing balance :				
(i) Cash in hand and at Banks		1,053.32		
(ii) Temporary advances made to—				
(a) Capital expenditure Account :				
as per last account ..	4,40,000.00			
during 1958-59	50,000.00	4,90,000.00		
(b) General Account :				
as per last account ..	1,93,000.00			
during 1958-59	1,25,000.00	3,18,000.00		8,09,053.32
	Rs.			8,13,836.69

6, Hastings Street, Calcutta-1
The 7th October 1959.

Examined and found correct.
Sd/- P. C. NANDI & Co.
Chartered Accountants & Auditors.

INDIAN STATISTICAL INSTITUTE

Indian Statistical Institute : Receipts & Payments Account for the year ending 31 March 1959

Leave Salary Fund

To Receipts

	Rs. nP.	Rs. nP.
1. Opening balance :		
(i) Cash in hand and at Banks	724.37	
(ii) Advances recoverable as per last account from:		
(a) Capital Expenditure Account	5,28,882.80	
(b) General Account	2,45,000.00	7,74,607.17
2. Contribution to Leave Salary Fund for the year 1958-59 ..		1,20,000.00
Rs.		8,94,607.17

By Payments

	Rs. nP.	Rs. nP.
1. Leave salary paid including payments in lieu of leave and for leave vacancy		38,496.56
2. Closing balance :		
(i) Cash in hand and at Banks	1,110.61	
(ii) Temporary advances made to :		
(a) Capital Expenditure Account :		
(i) as per last account .. 5,28,882.80		
(ii) during 1958-59 .. 81,117.20	6,10,000.00	
(b) General Account as per last account	2,45,000.00	8,56,110.61
Rs.		8,94,607.17

6, Hastings Street, Calcutta-1
The 7th October 1959.

Examined and found correct
Sd/- P. C. Nandi & Co.
Chartered Accountants & Auditors.

Indian Statistical Institute : Receipts & Payments Account for the year ending 31 March 1959

Development Fund No. II

(created out of contributions received from Government of India)

To Receipts

	Rs. nP.	Rs. nP.
1. Opening balance :		
(i) Cash in hand and at Banks	3,436.93	
(ii) G. P. Notes at cost (face value—Rs. 50,000/-) ..	45,533.75	
(iii) Advance recoverable from Capital Expenditure Account as per last account	6,64,000.00	7,12,970.68
2. Recovery of advances to small-scale industries experimental unit as shown in last year's account		39,273.70
3. Interest received on investments in G. P. Notes		1,496.00
	Rs.	7,53,740.38

By Payments

	Rs. nP.	Rs. nP.
1. Closing balance :		
(i) Cash in hand and at Banks		1,206.63
(ii) Temporary advances made to Capital Expenditure Account :		
(a) as per last account	6,64,000.00	
(b) during 1958-59	43,000.00	7,07,000.00
(iii) G. P. Notes at cost (face value—Rs. 50,000/-) ..		45,533.75
	Rs.	7,53,740.38

6, Hastings Street, Calcutta.
The 7th October 1959.

Examined and found correct.
Sd/- P. C. Nandi & Co.
Chartered Accountants & Auditors.

INDIAN STATISTICAL INSTITUTE

Indian Statistical Institute : Receipts & Payments Account for the year ending 31 March 1959

I.S.I. General Provident Fund

To Receipts

		Rs. nP.	Rs. nP.
1.	Opening balance :		
	(i) Cash in hand and at Banks		75,663.90
	(ii) G. P. Notes at cost (face value Rs. 13,70,000/-) ..		12,06,296.79
	(iii) National Savings Certificates at cost (face value Rs. 60,000/-)		60,000.00
	(iv) Loans outstanding with workers as per last account ..		1,15,257.00
2.	Recovery of advances outstanding with Institute's Capital Expenditure Account		3,00,000.00
3.	Workers' own subscription in the fund during the year ..	2,54,192.14*	
4.	Amount received towards Employer's contribution on account of a worker on deputation	21.00	2,54,213.14
5.	Workers' voluntary subscription to the fund		25,980.11
6.	Interest received against loan given to members		9,239.86
7.	Interest on investments :		
	(i) G. P. Notes	22,813.50	
	(ii) For loans to the Institute	18,000.00	40,813.50
		Rs.	20,87,463.49

By Payments

		Rs. nP.	Rs. nP.
1.	Repayment of workers' own subscription (on leaving service) ..		19,823.31
2.	Payment of Institute's contribution to workers (on leaving service)		5,470.10
3.	Payment of interest to workers on closing of accounts as in item nos. (1) & (2)		1,225.23
4.	Repayment of workers' voluntary subscription		2,143.58
5.	Payment of interest to workers against voluntary subscription ..		73.12
6.	Loan to members :		
	Outstanding from previous year	1,15,267.00	
	Since added during the year	3,56,698.00	
		4,71,955.00	
	Less amount released during the year	2,58,382.00	2,13,573.00
7.	Temporary advances to Institute's Capital Expenditure Account		3,00,000.00
8.	Closing balance :		
	(i) Cash in hand and at Banks	2,78,858.36	
	(ii) G. P. Notes at cost as per last account (face value Rs. 13,70,000/-)	12,06,296.79	
	(iii) National Savings Certificates as per last account (present value Rs. 72,500/-)	60,000.00	15,45,155.15
		Rs.	20,87,463.49

* An equivalent amount less contribution received from a worker (Rs. 2,54,171.14) was due to the Fund as employer's contribution from the Institute. By reason of non-reimbursement of certain essential capital expenditure incurred during the year there was a shortage of ready funds for which the amount could not be credited to the Fund on 31 March 1959 as per Council resolution dated 29 April 1938. The amount has since been paid with interest in September 1959.

6, Hastings Street, Calcutta-1
The 7th October, 1959

Examined and found correct.
Sd/- P. C. Nandi & Co.
Chartered Accountants & Auditors

PART 3 : APPENDICES

Appendix 1 : Twentyseventh Anniversary Celebrations

1. The twenty-seventh anniversary celebrations of the Indian Statistical Institute commenced at 4.15 p.m. on 15 December 1958 with the singing of a Vedic hymn in the mango-grove at 203 Barrackpore Trunk Road.

Welcome Speech of the Chairman

2. Opening the celebrations, Sir D. N. Mitra, Chairman of the Council, said :

You will find that the report is the 26th Annual Report although this is our 27th Anniversary, because we consider 17 December 1931 to be the Foundation Day as it was decided at a meeting on that date that the Institute should be established. It took a little time to organize the Institute and the members of the Indian Statistical Institute did not think it worthwhile to have any report printed for the period December 1931 to March 1932. We started from a small beginning ; and today we are, gentlemen, only 27 years old and here we have got three thousand people taking part in this meeting. Now, the most instructive part of the report is at the end, as it usually is.

We started work in 1932–33 : and the expenditure (to the nearest Rs. 10) was Rs. 240 ; and the number of workers was only one, excluding the members of the organizing Committee. I showed you the figure for 1932–33 ; the figure for 1957–58 is Rs. 77,73,000 (to the nearest Rs. 10) ; the number of workers 1981. This is an achievement of which the Institute is indeed proud. Amongst those who were present at the beginning, the surviving members are Professor Banerjee, Professor Mahalanobis and myself. We are very glad to be here to welcome those who subsequently joined the Institute.

Introduction of Foreign Guests

3. Introducing the foreign guests, Professor P. C. Mahalanobis said :

We are very fortunate in this Institute to have every year a large number of experts from different parts of the world coming and working with us, and most of them staying here in the Institute. Some of our foreign experts are just now out of Calcutta. From Australia, we have Professor H. W. Arndt who has now gone to Delhi where he is working in our Planning Unit. From the Central Statistical Board of the People's Republic of China, we have two statisticians, Mr. Wu Hui and Mr. Kung Chien Yao.

4. Mr. Wu Hui said in reply :

On this day of the 27th Anniversary of the Indian Statistical Institute, my colleague Kung Chien Yao and I are very glad to congratulate you. In the past 27 years, the Indian Statistical Institute has made spectacular contributions in the statistical fields. Especially its achievement in the application of sampling methods in large-scale surveys has caused wide interest in many countries of the world. We congratulate with all our hearts the great achievement that the Indian Statistical Institute has made and wish it greater and greater success in all its scientific and statistical pursuits. We take this opportunity to express our wish that the personal contact and the friendship between the Indian and the Chinese statisticians will grow from day to day.

5. Professor Mahalanobis next introduced Dr. J. B. D. Derksen, who had come to look after the work of the International Statistical Education Centre as its Director of Studies. Dr. Derksen spoke briefly as follows :

On this Anniversary of the Indian Statistical Institute I offer my sincere congratulation to the Institute, to the Director, and to the staff, and I hope that the coming year will give us a new series of successful studies. It has been a source of great happiness and inspiration for me to have been associated with the Indian Statistical Institute since March of this year. The Indian Statistical Institute is a research centre of international fame and I consider it a great honour to have been given an opportunity to contribute to its future development.

6. Continuing the introductions, Professor Mahalanobis said :

From Sweden we have Dr. Erland v. Hofsten, Chief of the Statistical Section, Social Welfare Board, Stockholm who has come here with an assignment from the International Labour Office, with Mrs. Hofsten, and we also have Dr. Sten Thore with Mrs. Thore.

Dr. Hofsten said :

I think that on this occasion it is appropriate to speak as a Swedish citizen. In doing so, I can say that problems of underdeveloped countries, particularly countries in this part of the world, are receiving increasing attention all over the world. Everywhere people are becoming aware that these underdeveloped countries constitute a basic factor in world tensions of today. Consequently also the importance of Sweden's contribution is being more and more appreciated. In order to develop a country, it is necessary to acquire much knowledge, and much research is essential, and this is where a small country can make a contribution. But I think that one should also stress the fact that research alone cannot solve all problems. It is not only that knowledge has to be acquired but we must also make use of it. If research is not carried out as an integrated part of a programme for development, it will, most often, be made in vain. As I see it, the most important aspect of international cooperation in the field of research and planning is stimulating intellectual discussions by making people aware of the importance of the problems to be solved and of the possibilities available to solve them. It is by hard work, by taking initiatives of all kinds, by stimulating intellectual activities in different ways that this can be achieved. We all know that the Institute, apart from its contributions through science and research, has also very much functioned as a stimulus both within India and in the world as a whole. I wish to express our wish that the Institute shall have opportunities to continue its very important work.

7. Introducing other foreign guests, Professor Mahalanobis said :

Professor J. B. S. Haldane and Mrs. Haldane are out of India attending a scientific conference. We had the pleasure of listening to an address by Professor Haldane last year. We miss them this year. Dr. (Miss) Pamela Robinson from UK came last year and helped in starting a Geological Unit in the Institute. We are glad to have her with us again this year.

Dr. Robinson said :

I am very happy to be back in India once more. It is not just because I changed the cold of the London winter for the more sunny climate of the Indian one, but rather because I now have friends here and I have work to do here. I think many of you are puzzled as to why the study of fossil bones should be carried on in a statistical institute. I promise that the next time I come to India, I will give a talk to the Research and Training School explaining the connexion between palaeontology, or the study of fossils, and statistics. But this I would like to say now. As soon as you ask the question, how fast have animals evolved in the past, then you must start measuring, and measuring means statistics. One day when we have collected enough evidence, we shall have to start measuring, and that is where statistics will finally unite with palaeontology at this Institute. Just now while I am standing here I want to thank the many people in the Institute who have helped our work. In particular, I may mention such things as the blacksmith shop, the carpentry shop and such other parts of the Institute's organisation.

Although it is not on your programme, the Geological Studies Unit will be open to visitors today. Please do visit it if you feel inclined, but please help us by not touching the bones. It will be a great pity if a fossil animal which had lasted for, say, 200 million years, was suddenly to be destroyed through careless movements or handlings. I would like once more to say how happy I am to be back here and working with my colleagues, Dr. Jain and Mr. Chaudhury.

8. Professor Mahalanobis then said : From the USA, we have Dr. Pabst, who has been helping us in the field of Statistical Quality Control and Mrs. Pabst. We also have Dr. (Miss) Esther Seiden in mathematical statistics and Mr. Howard Kumin in economics. Dr. Pabst then spoke as follows :

It gives me real pleasure to congratulate you on this 27th Anniversary. I feel that the Indian Statistical Institute is unique in many ways, and in a sense we have this in common, for it is because of the Indian Statistical Institute that my work with the United Nations is also unique. So far as I know, India has been the only country that has requested technical assistance in the field of Quality Control from the UN. This, I think, is due to the far-sighted imagination of Professor Mahalanobis and the workers in the SQC in recognising how important statistics might be to industry. I also want to recognise the very loyal workers of the Indian Statistical Institute, who are not located here in the main building, but in the SQC Units in Calcutta, in Bombay, in New Delhi, in Coimbatore and in Bangalore. These groups have had contact with more than a hundred of the major firms and companies in India and, I think, are having growing influence in increasing productivity in India. I think the groundwork has been laid through the Indian Statistical Institute for very real progress in this field of increasing productivity, which will be of great value to the National Productivity Council, the Indian Standards Institute, and others who cooperate with the Indian Statistical Institute in this field.

9. The guests from the USSR were then introduced by Professor Mahalanobis who said : From the USSR, this year we have a large team of electronic specialists. We have received through the UN a big electronic digital computer called URAL, and this Soviet team is installing the URAL computer. (The following members of the team were introduced : Mr. Touri Diatlov ; Mr. Dimitri Loobtchinine ; Mr. Alexandre Gorshkov ; Mr. Vladon Vissotski ; Mr. Nikolai Orekhov ; Mr. Alexandre Loginov ; Mr. Boris Komarov ; Mr. Ashraf Akhmed- zianov). We also have from the Presidium of the USSR Academy of Sciences, Mr. P. S. Oraevsky and Mrs. Oraevsky who have been with us for some considerable time.

Mr. Diatlov spoke in Russian, and the interpreter's translation is given below :

Let me on behalf of the Soviet experts congratulate you on the 27th Anniversary of your Institute. In the preceding years, Soviet guests attended this celebration of the Anniversary of the Institute. This is an evidence of the growing scientific ties between our countries. We are glad to inform you that we have completed the installation and testing of the Universal Electronic Computer, URAL, and tomorrow we shall put the computer to work.

Already, in this month, the engineers and technicians of the Institute will start operating the machine themselves independently. The very fact that the Institute will use, for its daily work, a most complicated machine of our time is a testimonial to the high technical level of scientific work carried out in this Institute. The exploitation of the Universal Computer will open to the Institute new and more extensive grounds in scientific investigations. On behalf of the group of the Soviet experts, let me wish you good luck for your future work and development.

Professor Mahalanobis said : I should like to thank Mr. Diatlov, and add that in this Institute, we have been working for nearly three years with a small electronic digital computer (the first of its kind in India), which we had purchased from Great Britain. The machine, which has arrived from USSR and which will be very soon operated by our own engineers and mathematicians, is a much bigger machine of the most modern type, which also will be the first machine of this kind working in our country. We think this will be a great advance in the way of processing statistical data.

INDIAN STATISTICAL INSTITUTE

Introduction of Trainees of the International Statistical Education Centre

10. Professor Mahalanobis said : I will also introduce the following trainees of the International Statistical Education Centre which was started in 1950 and is maintained jointly by this Institute and the International Statistical Institute with the support of the Government of India and the UNESCO.

Burma :	Mr. U. Maung Maung Tin.
Ceylon :	Mr. L. D. Mylvaganam ; Mr. S. Joseph.
Indonesia :	Mr. S. Boediarso ; Mr. Ghozally ; Mr. S. Pranoto ; Mr. R. Prijono ;
Iran :	Miss Galia Karapetian ; Mr. N. Sardari ; Mr. M. Rananpey ; Mr. Ali Madani.
Japan :	Mr. Noboru Machida ; Mr. Kiichiro Saito.
Malaya :	Mr. Lee Yoke Hang.
Philippines :	Miss Angelita A. Costa ; Miss Socorro R. Noble ; Mr. Dominador S. Gorez ; Mr. L. R. Baltazar ; Mr. I. C. Belarmino ; Mr. Romulo M. Alberto.
Singapore :	Mr. C. S. Nair.
Thailand :	Capt. Prasert Suwanasthoti ; Lt. M. L. Somsakdi Choomsai ; Miss Wathi Naiyaphinit.

Review of Work by Professor P. C. Mahalanobis

11. We are very glad to have our President with us this afternoon. We missed him last year. He has been closely associated with the work of the Institute for the last fourteen years. Although we do not have the privilege of having him here very often, I should like to mention, because I know, how much help we receive from him from a distance. We also welcome Srimati Durgabai, and our Vice-President Dr. P. N. Banerjea, who was with us when the Institute was founded, and our Treasurer Dr. S. C. Law who has been helping us in a quiet way in that capacity for nearly 23 years. We are very fortunate in having our leading office-bearers with us. Our Chairman Sir D. N. Mitra has already told you how he has been associated with us from the very beginning, that is, from the drafting of our Constitution.

That was long ago when this Institute was started. Since then it has gradually developed and has increased in size with, I am rather painfully aware, signs of stress and strain and inefficiency in many ways. But we also have had some rather outstanding developments during the year under review. I have already mentionod that some tangible advance is being made in the field of electronics in which we have gathered together a brilliant group of young engineers and mathematicians. It is this human nucleus which is really important. In this I feel we have been fortunate ; and we are looking forward to using the URAL computing machine very soon.

I have also mentioned that recently, in the course of scarcely one year, we have had one small Geological Unit organized under the guidance of Dr. (Miss) Pamela Robinson. This Unit has already made two very important finds of fossil specimens going back to 200 million years or so which may link India of that time with such far off countries as Brazil, Africa and China. During my recent visit to London, I met Professor Watson, one of the outstanding men in this field, and he told me that these new discoveries are very significant from the point of view of the palaeontology of vertebrates.

In mathematical statistics also we have had some success in having certain new methods initiated this year, such as "fractile charts" which, we are confident, would find very wide application.