

**INDIAN STATISTICAL INSTITUTE**

**ANNUAL REPORT**

**April 1959—March 1960**

**203 BARRACKPORE TRUNK ROAD  
CALCUTTA-35**

## INDIAN STATISTICAL INSTITUTE

**President :** Chintaman D. Deahmukh.

**Vice-President:** Dr. P. N. Banerjee, M.A., D.Sc.; Dr. S. K. Banerji, D.Sc.; Professor S. N. Bose, F.R.S.; Professor D. R. Gadgil, M.A., M.Litt.; Dr. Zakir Hussain, Ph.D.; Professor D. G. Karve, M.A.; Professor K. B. Madhava, M.A., A.I.A.; Sir Shri Ram.

### THE COUNCIL : 1959-60

**Chairman :** Sir D. N. Mitra.

**Vice-Chairmen :** Sri K. P. Goenka; Sri D. N. Mukherjee, M.L.A.; Dr. D. S. Kothari, D.Sc., Ph.D., F.N.I.; Sri S. C. Ray, M.A., B.L.; Professor N. R. Sen, M.A., D.Sc.

**Treasurer :** Dr. Satya Churn Law, M.A., B.L., Ph.D., F.N.I., F.Z.S., M.B.O.U.

**Secretary :** Professor P. C. Mahalanobis, F.R.S., D.Sc.

**Joint Secretaries :** Sri Nihar Chandra Chakravarti, M.A.; Sri Asokananda Das, M.Sc.; Sri Pitambar Pant, M.Sc.

**Members :** Sri S. K. Acharyya, Bar-at-Law; Sri Raghunath Banerjee, I.A.S.; Srimati Chamoli Bose, B.Sc. (London); Sri V. M. Dandekar, M.A.; Sri Mohanlal Ganguly, B.Sc. (London); Professor H. C. Ghosh, M.A., P.R.S.; Dr. Q. M. Hussain, M.A., Ph.D.; Sri D. B. Lahiri, M.Sc.; Srimati Nirmal Kumari Mahalanobis; Sri P. C. Mathew, I.C.S., Sri N. T. Mathew, M.A., M.Sc.; Sri Asok Mitra, I.C.S.; Sri Samar Mitra, M.Sc.; Sri Moni Mohan Mukherjee, M.A.; Dr. C. R. Rao, M.A., Ph.D.; Sri Vishnu Sahay, I.C.S.; Dr. N. Sundararama Sastry, M.A., M.Sc., Ph.D. (London); Sri S. C. Sen, B.A. (Cantab); Sri Sadasiv Sengupta, B.Sc. (London) M.Sc. (Dacca); Sri Satis Chandra Sen, M.A., LL.B.; Sri S. P. Sinha, I.A.S.

### GOVERNING BODY OF THE RESEARCH AND TRAINING SCHOOL : 1959-60

Sir D. N. Mitra, Chairman (*ex-officio*); Professor P. C. Mahalanobis, Director-Secretary (*ex-officio*); Sri Baliram Bhagat, Union Deputy Minister; Sri Vishnu Sahay, I.C.S., Secretary to the Cabinet, Government of India; Dr. N. S. R. Sastry, M.A., M.Sc., Ph.D. (*Reserve Bank of India*); Dr. B. N. Prasad, Head, Mathematics Department, Allahabad University; (*National Institute of Sciences of India*) Dr. U. S. Nair, M.A., Ph.D., F.N.I. (*Inter University Board*); Mr. George Barrell, Managing Editor, Capital (Private) Ltd. (*Associated Chambers of Commerce of India*); Sri G. Basu, B.A., F.C.A., F.S.A.A., F.C.I.S., F.I.C., W.A., M.L.C., J.P. (*Federation of Indian Chambers of Commerce and Industry*); Professor S. N. Sen, M.A., Ph.D. (*Indian Economic Association*); Dr. S. K. Banerjee, D.Sc.; Professor S. N. Bose, F.R.S., D.Sc.; Sri Nihar Chandra Chakravarti, M.A.; Sri K. B. Madhava, M.A., A.I.A., F.N.I.; Sri Pitambar Pant, M.Sc.; Dr. C. R. Rao, M.A., M.Sc., Ph.D. (Cantab); Sir Shri Ram (*Council of the Indian Statistical Institute*).

### COMMITTEE OF THE GOVERNING BODY

Sir D. N. Mitra (*ex-officio*); Professor P. C. Mahalanobis (*ex-officio*); Sri N. C. Chakravarti; Mr. G. Barrell; Dr. N. S. R. Sastry; Sri Vishnu Sahay, I.C.S.; Sri A. C. Phoe.

# IN STATISTICAL INSTITUTE

## ANNUAL REPORT

April 1959—March 1960

### CONTENTS

	PAGE
<b>Introduction : Constitution and Activities</b> ... ..	1
<b>Part 1. General Review of the Work during the year</b> ... ..	11
1. Research and Training School ... ..	11
2. International Statistical Education Centre ... ..	16
3. Statistical Examinations ... ..	18
4. Planning Division ... ..	19
5. The National Sample Survey ... ..	23
6. Electronic Computer Division ... ..	27
7. Statistical Quality Control ... ..	20
8. Library ... ..	30
9. Publications ... ..	32
10. General Administration ... ..	34
11. Society Branches ... ..	39
12. Visiting Scientists ... ..	43
13. Visitors ... ..	46
14. Visits Abroad ... ..	46
15. External Activities ... ..	48
<b>Part 2. Research Summary</b> ... ..	49
<b>Auditor's Report</b> ... ..	64
<b>Part 3. Appendices</b> ... ..	80
1. Twentyeighth Anniversary Celebrations ... ..	80
2. List of Office-Bearers and Members of Committees ... ..	102
3. Visitors to the Institute ... ..	104
4. Professor Mahalanobis' Tours Abroad ... ..	111
5. List of Research Papers, Reports and Scientific Lectures ... ..	113
6. Electronic Computer Division ... ..	141
7. A Note on Demographic Research ... ..	143
8. Library, Central Records and Museum ... ..	148
9. Medical Welfare Unit ... ..	151
10. List of Trainees in the Various Courses ... ..	152
11. List of Successful Candidates in Professional Examinations ... ..	166
12. C. D. Deshmukh's Inaugural Address at Bombay—Training Courses in Statistics ... ..	175
13. Distribution of Staff as on 31 March 1960 ... ..	181
14. List of Scientific and Technical Staff ... ..	182
15. Members of the Syllabus Committee for the Degree Courses ... ..	187
16. External Activities ... ..	188

# INDIAN STATISTICAL INSTITUTE

Twentyeighth Annual Report : April 1959—March 1960

## 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 Mahalanobis was professor of physics at the time. In the course of the next ten years a small group of young men gathered together in what came to be known as 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 conceived the idea of starting a statistical society in India and it was as a result of their initiative that the Indian Statistical Institute was brought into existence by a resolution passed at a public meeting held in December 1931 under the chairmanship of the late Sir R. N. Mukherjee who was elected the first President of the Institute and held that office for 5 years (1931-38). The Institute was registered as a non-profit making 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 28th year (31 March 1960), a staff of about 2000 paid workers, the total expenditure during the year being of the order of Rs. 89 lakhs.

### CONSTITUTION

*Object* : The basic object of the Institute 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 the 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 428 at the end of March 1960.

*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 overall coordination 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. 1,500 from the ICAR mentioned above.

## INDIAN STATISTICAL INSTITUTE

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 coordination.

Sri C. D. Deshmukh has been functioning as the President since 1945, Sri D. N. Mitra as the Chairman since 1955, Sri S. C. Law as Treasurer since 1938 and Professor P. C. Mahalanobis as Secretary and Director from the inception of the Institute.

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

### DEVELOPMENT OF THE WORK OF THE INSTITUTE

*Expansion:* Four stages: The expansion of the Institute's activities, both in volume and range, has taken place since its foundation, broadly speaking, in four 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 tentative 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 started in the very first year on a small scale and on an individual basis. To meet with increasing demand the Institute was obliged gradually to offer organized instructions 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 that 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 making 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 1963, which led to the creation of an Electronic Computer Division.

The third stage followed as a logical consequence to the second when the Institute was called upon by the Government of India in 1960 to take a leading part in organizing the National Sample Survey. The next big step was the inauguration by Prime Minister Nehru in 1964, 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.

The enactment of the Indian Statistical Institute Act in December 1959 marked the beginning of the fourth and the present stage of the Institute's history. This Act declared the Institute to be an institution of national importance and conferred on it the right to hold such examinations and grant such degrees and diplomas as might be determined by the Institute from time to time. Facilities were already available at the Institute for training courses in statistics, and diplomas and certificates were being awarded on the results of examinations held periodically. But the Act gave the Institute the status of a University, and arrangements have been made with effect from 1st July 1960 for regular courses of study for the degrees of Bachelor of Statistics (B. Stat.) and Master of Statistics (M. Stat.). A feature of both these courses is the highly integrated teaching of natural and social sciences as the foundation for the training of professional statisticians.

#### CURRENT ACTIVITIES

The more important among the current activities of the Institute, which cover a very wide field, are briefly outlined below.

1. *Learned Society* : As a learned society, the Institute publishes *Sankhyā*: The Indian Journal of Statistics, as its official organ. *Sankhyā* has a world-wide circulation. It has society branches at Aligarh, Bangalore, Bombay, Madras and Poona.

2. *The Research and Training School (RTS)* 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 the 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.

Since July 1960 the RTS has been conducting regular classes for Bachelor of Statistics (B. Stat.) and Master of Statistics (M. Stat.) degrees.

3. *The International Statistical Education Centre (ISEC)* 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 (NSS)* : The Institute is in charge of design of surveys, the technical work, and the tabulation and processing of the primary data collected

## INDIAN STATISTICAL INSTITUTE

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 Institute and is also engaged in developmental research. Eight high-speed electronic "sorters" were designed and constructed and have gone into batch production; and prototypes 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 an SQC Policy Advisory Committee appointed by the Government of India.

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

### 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 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 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 1959-60 organized training was given to nearly 3,000 persons including 340 foreign trainees in theoretical and applied statistics and, in addition, apprenticeship training was given to about 2,500 persons through participation in project work.

### THE INDIAN STATISTICAL INSTITUTE ACT (1959) AND NEW DEGREE COURSES

Consequent upon the enactment of the Indian Statistical Institute Act (No. 57 of 1959), empowering the Institute to confer degrees in statistics, it was decided to conduct with effect from 1 July 1960, courses of study for preparing candidates for examinations leading to the degrees of Bachelor of Statistics (B. Stat.) and Master of Statistics (M. Stat.). The two higher degrees of Ph.D. and D.Sc. are also proposed to be introduced. With effect from the same session, the two-year advanced professional statistician's course has been

## TWENTYRIGHTH ANNUAL REPORT : 1959-60

discontinued. Almost all the other training courses and examinations that were being conducted up to 1960 will however continue.

From its inception the Institute realized the need for courses of training at different levels for turning out professional statisticians in much larger numbers than theoretical statisticians who are competent to do only teaching or research work. It also realized in organizing the various courses conducted at the Institute that a purely academic type of education imparted through lectures on theory and through laboratory work would not suffice for the making of competent professional statisticians, and that field-work in connection with small and large-scale statistical investigations and actual in-service experience should form an essential part of the training. In this respect it has been held that education and training in statistics should be similar to those in medicine or engineering. It was in accordance with these ideas that the two/three-year professional courses in statistics were organized a few years ago.

Statistical methods as they are known to-day are a powerful tool in other branches of knowledge and in various fields of human activity, particularly in the natural and social sciences, including economics. For the correct and efficient use of statistical methods, it is therefore necessary that the professional statistician should be equipped with basic knowledge at least in the more important fields of application. In regard to imparting this basic knowledge, exclusive specialization in a few of the fields will not only fail to achieve the necessary comprehensiveness, but also may not be feasible in a course which is primarily one in statistics. It has therefore been held that an integrated approach in this respect would be optimal. Incorporation of the professional elements in teaching, and an integrated education in the fields of application of statistics, are two important features of the new B. Stat. and M.Stat. degree courses introduced with effect from July 1960.

### COURSES, EXAMINATIONS, DEGREES, ETC. FROM JULY 1960

With effect from 1 July 1960, the activities of the Institute relating to imparting of education, training and research facilities, and the conduct of all-India examinations fall under the categories mentioned below. (The intake capacity of each of the courses is given in brackets).

#### *Research Guidance*

- (i) Research and advanced studies, general (6)
- (ii) Research leading to the Ph.D. degree of the Institute (15)

#### *Degree Courses*

- (i) Four-year course leading to the B.Stat. degree of the Institute (class of 30 yearly)
- (ii) Two-year course leading to the M.Stat. degree of the Institute (class of 25 yearly)

*Training Courses* (for specialized studies, training of personnel, and for candidates preparing for Diploma and Certificate examinations)

- (i) Short-term Statistician's Course at Calcutta (Junior, 6 months) (50)
- (ii) Short-term Statistician's Course at Calcutta (Senior, 6 months) (25)



## INDIAN STATISTICAL INSTITUTE

(iii) One-year Evening Course in Statistics at Delhi (in collaboration with CSO)	(40)
(iv) One-year Evening Course in Statistics at Bombay	(30)
(v) Statistical Officer's Training Course (Jointly with CSO, 6/9 months)	(25)
(vi) Special Short-duration individual training for officers on deputation	(10)
(vii) Computer's Training Course at Calcutta (Junior, 6 months)	(50)
(viii) Computer's Training Course at Calcutta (Senior, 6 months)	(25)
(ix) Occasional courses on special subjects (short-duration)	
(x) Courses at the International Statistical Education Centre (9 months)	(30)

*Diploma and Certificates Examinations* (all-India examinations open to external candidates)

- (i) Statistician's Diploma Examination
- (ii) Computer's Certificate Examination, Part I,
- (iii) Computer's Certificate Examination, Part II
- (iv) Statistical Field Survey Certificate Examination, Part I
- (v) Statistical Field Survey Certificate Examination, Part II

*Awards for higher professional attainments*

- (i) Associateship of the Indian Statistical Institute (A.I.S.I.) on the basis of report submitted of professional work.
- (ii) Associate Fellowship of the Indian Statistical Institute (A.F.I.S.I.) on the basis of report/thesis submitted of professional work.

*Awards for outstanding contributions*

- (i) D.Sc. degree of the Institute in recognition of outstanding published work in the field of statistics.
- (ii) Fellowship of the Indian Statistical Institute for fundamental contributions in the field of statistics.

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

1. **Theoretical Research :** On the theoretical side of statistics, investigations were undertaken and some results obtained in probability and distributions and communication theory. Certain important contributions were made in the large sample theory of estimation, leading to a reformulation some established concepts.

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 recent studies are those on the yield of rice planted in mixtures, the yield of tasar silk worms the extent of human inbreeding in Andhra Pradesh and ascent of sap on palm trees.

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 study-ling 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 changing 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 specialized 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 resulting in the collection of important fossil material. The work of this Unit is generally concerned with the application of statistical methods to geological studies.

8. *Flood Research Unit* : Important statistical investigations were 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 (ISEC)

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, statisticians from the Government of India and visiting teachers provided by the International Statistical Institute and the United Nations. The Centre has completed the thirteenth term of training, which was spread over 9 months. Since its inception altogether 348 persons from 19 Asian countries including 247 from outside India have received training at the Centre. The fourteenth term of the Centre started in July 1960.

#### 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-survey since 1960. The certificates and diplomas, issued 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 13,385 candidates have registered, 11,090 have appeared and 3,422 have passed in one part or another of these examinations.

## INDIAN STATISTICAL INSTITUTE

Since its inception the Institute has been instrumental in making available about 9,000 trained persons of whom about 3,000 (including about 300 trainees from outside India) received organized courses of instruction, 2,700 received apprenticeship training, and nearly 3,300 became qualified through external examinations conducted by the Institute.

### PLANNING DIVISION

The Institute has been carrying out studies relating to planning for national development since 1954 when a section for such studies was inaugurated by the Prime Minister, Sri Jawaharlal Nehru. The first phase of the work led to the preparation of the "Draft Plan Frame", submitted by Professor Mahalanobis to the Government in March 1955 and accepted as the basis for the formulation of the Second Five-Year Plan. Since then, one Unit, located in Delhi, is cooperating with the Perspective Planning Division of the Planning Commission, 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 taken part in statistical and economic researches on problems of planning in India in collaboration with a number of foreign experts. The Unit in Calcutta is 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 in charge of the teaching of economics in the Research and Training School. An experimental Unit for the study of the economics of cottage industries, called Kalyanaseri, which was started in Calcutta in 1956, 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 Government 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 household, 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.

Fourteen rounds of survey were completed by June 1959 and the field work for the 15th 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 thirty-four have been printed and the remaining reports are in the press.

*Machine Tabulation Section* : The Machine Tabulation Section of the Institute is perhaps the largest in Asia, and has 22 Accounting Machines, 2 Electronic Statistical Machines, 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 of 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 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, Kharagpur; 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 giving 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, and has already 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 of specifications; increase in productivity; and optimum utilization of men, machines and product.

The Institute became interested in SQC as early as 1935 and started organizing training courses in SQC from 1945. The visit in 1947-1948 of Dr. W. A. Shewart of the USA who is regarded as the father of SQC, gave a great impetus. This was 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,

## INDIAN STATISTICAL INSTITUTE

Bangalore and Calcutta. Since then four more units have been established at Coimbatore, Delhi, Baroda, and Madras. 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 seven units was 58 at the end of March 1960.

### GENERAL ACTIVITIES

*Library*: The Institute has one of the finest statistical libraries in the world with more than 82,000 books, 1,700 periodicals, about 22,000 reprints, monographs and microfilms and a collection of over 2,50,000 maps. It has a well-equipped Photographic unit for reproduction of documents. There is a Translation Unit for the translation of scientific literature in foreign languages. Besides translations from Russian, Chinese and Japanese, facilities are also available for translations from French, German, and other European languages. A separate translation unit is working in Japan for the systematic translation of research material in Japanese.

*Visiting Scientists*: Since 1938 the Institute has been inviting foreign scientists and scholars to visit India. Since the initiation in 1954 of studies on planning for national development, the Institute has become an important meeting place for visiting scientists from all over the world. During the year under review about 20 foreign scientists participated in the work of the Institute and some of them also gave lectures and had discussions.

*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 guests during 1959-60 was 78. 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 *Saukhyā*: 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 1934, 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 AND TRAINING SCHOOL

The activities of the Research and Training School during the year consisted broadly of (i) research, theoretical and applied, (ii) conducting training courses, (iii) organizing the new degree courses with effect from July 1960, and (iv) all-India professional examinations for statisticians, computers and field investigators.

The Research and Training School carried out its work with C. R. Rao as the head of the division of theoretical research and training. J. R. S. Haldane, as Research Professor, participated in teaching and also guided research workers in Statistics, Biology and Mathematical Genetics. A. Matthal was in charge of the International Statistical Education Centre, which provides courses for trainees deputed from South East Asian and other foreign countries. Research was carried out in the various applied units, attached to the Research and Training School, under the following heads: N. K. Bose (Flood Research), B. C. Das (Biometry), R. K. Mukherjee (Sociology), S. J. Poti (Demography), Rhea S. Das (Psychometric Research and Service), S. L. Jain (Geological Studies) and V. L. S. Prakasa Rao (Regional Surveys). (See Appendix 14 for full list of staff).

#### RESEARCH

Research was carried out during the year in many branches of theoretical statistics: Methodology, Mathematical Probability Theory, Estimation and Testing Hypotheses, 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 besides some basic research. Research was mainly carried out by the staff of the different units and also by the research scholars attached to them. A brief outline of the important contributions is given below under different fields of research. (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.)

*Mathematics*: A property of the Haar measure on an infinite compact Abelian group has been established.

*Probability Theory*: Research in probability theory included a wide variety of subjects. Some of the important studies were on the existence of ancillary statistics, convergence of distributions in general topological spaces, convergence of densities, estimation and testing of spectral functions, relationships between different definitions of the capacity of a communication channel, and random vectors and radially symmetrical distributions useful in the study of diffusion rate of genes.

*Statistical Inference*: Some important contributions were made to the theory of estimation in large samples. The concepts of efficiency and consistency were reformulated in a meaningful way and some apparent anomalies in the case of maximum likelihood (m.l.) estimation have been explained. It was also shown, contrary to what was believed, that, even in large samples, some distinction could be made between m.l. and other competitive methods such as minimum chi-square etc. The m.l. appears to be better than the others in an appropriate sense. In another study the concept of effective variance of an estimate was developed. This was shown to have the reciprocal of Fisher's information as a lower bound.

## INDIAN STATISTICAL INSTITUTE

*General Statistical Methodology* : Research in methodology was confined to a study of analysis of dispersion tests and classification procedures in the case of multivariate normal populations. The proper use of the discriminant function has been explained with reference to the classification of a fossil discovered in South Africa, about which there has been some controversy.

*Biometry* : Professor Haldane and those working under his supervision have made a series of biological observations and experiments. In this, special stress has been laid on research requiring statistical methods for its evaluation and interpretation, minimum use of imported apparatus and priority to problems concerned with human beings or economically important plants or animals, in keeping with the objective of setting up a model for research and teaching in India. Among the topics investigated were the yield of rice planted in mixtures, the yield of tasar silk worms, the extent of human inbreeding in Andhra Pradesh. Some other studies taken up are : the ascent of sap on palm trees and the variation of segment number in millipedes. A few mathematical and statistical results useful in genetics have also been obtained.

The Unit made considerable progress in the setting up of a biological laboratory to aid the teaching of sciences in the new degree courses.

*Psychometry* : Research on occupational and educational selection methods included the construction of tests of spatial ability, verbal and non-verbal reasoning, clerical and mechanical aptitudes, and validation of a college aptitude test battery. Job description and motion-time study methods were applied to different types of work, with emphasis upon their reliability and validity. Consumer preferences for colour and designs were investigated using psycho-physical scaling techniques.

*Demographic Research* : Two of the major projects undertaken by this Unit during the year have been : (i) a follow-up study of patients of certain Calcutta hospitals, and (ii) a study of mortality pattern in Calcutta city.

*Sociological Studies* : The Unit carried out a few investigations, such as (i) a study of family structure in undivided Bengal, (ii) structural analysis of the growth of townships at Durgapur, (iii) social structure of Giridih township, (iv) urbanization of villages around Giridih township, (v) structural variations in Bengal villages in the light of transport and communication facilities, and (vi) changes in family structures, urban and rural, in West Bengal.

*Regional (Geographical) Surveys* : The Unit concentrated mainly on the last phases of the Mysore survey which was in hand, in addition to preliminary studies relating to a wider survey for South India.

*Geological Studies* : Under its programme of investigating fossil fauna from rocks in the Pranhita-Godavari Valley, the Unit undertook an expedition to collect fossil fishes from the Kota and Maleri rock beds and to investigate new sites near Warora. A few new specimens were added, as a result, to the Unit's collection. Laboratory work on the collected fossils is in progress. Preparations are being made for expeditions to be made next winter and to organize a small palaeontological museum.

*Flood Research* : This Unit conducted statistical studies on the floods in the river Yamuna and also on the 1959 October flood of Damodar river, and has arrived at certain findings.

## TWENTYEIGHTH ANNUAL REPORT : 1959-60

*Research Seminars* : A number of lectures and seminars were arranged for the benefit of the staff and trainees of the Research and Training School by visiting experts, details of which are reported in Section 12 on visiting scientists. Two series of seminars on Stochastic Processes were conducted by senior research scholars.

*Technical Publications* : The following technical publications were issued by the Research and Training School during the year :

- i) Handbook for Practical Work in Statistics, Part II (General Methods of Statistical Analysis) by J. Roy, I. M. Chakravarti and R. G. Laha.
- ii) Riemannian Physics (second edition) by R. L. Brahmachary.
- iii) Introduction of Sampling Theory, Part I by M. N. Murthy.

### TRAINING

During the year, the Research and Training School conducted twelve different courses of training, including the teaching imparted at the International Statistical Education Centre (ISEC) in Calcutta (about which details are given in the next section).

Similar to the short-term statisticians' courses held in the evening at Calcutta and Delhi, a new course was started at Bombay in March 1960 under the supervision of the Bombay Branch of the Institute.

A special course conducted during the year was that on Operational Research for selected candidates from institutions in and around Calcutta.

Special selection tests were conducted for admission to the different courses and selections made on the basis of the test results and the educational attainments of candidates. Tests were conducted in July 1959 at 8 different centres, namely Bombay, Calcutta, Delhi, Hyderabad, Trivandrum, Madras, Banaras and Waltair for selecting suitable trainees for the following courses : 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. Selection tests for other courses were made locally only, in Calcutta, Delhi or Bombay as required.

Promotion to a higher class or qualifying for a certificate of training, in the case of a candidate completing a course, was determined on the basis of periodical and final examinations held for each course.

The names of the trainees who attended the various courses during the year, the training calendar and examination details are given in Appendix 10.

*Officers on Deputation* : The nine officers who came on deputation for special studies belonged to educational or scientific institutions. Each had a problem for study and stayed for a period, varying from one month to one year. Their names, institutions they represent, subject of study and period of stay are given in Appendix 10.2.1.

*Statistical Officer's Course (jointly with CSO)* : The session commenced in September 1959 and was attended by 25 officers belonging to State and Central Government Departments. The first part of the training of about three months in the RTS was completed in December 1959. Thereafter training in Official Statistics was given at the CSC, New Delhi, for another three months. Some of those trainees who continued for specialization returned to the RTS for a further three-month training. The list is given in Appendix 10.2.2.

*Advanced Studies* : There were fifteen stipendiary research scholars working during the year. They were attached to different units according to the topic of research. Some of them also participated in teaching. Appendix 10.3 gives details of these research scholars.



## INDIAN STATISTICAL INSTITUTE

*Two/Three Year Advanced Course for Statisticians (in collaboration with the Central Statistical Organisation)*: The 35 students in the third year class shown in the previous year's report completed the course in July 1959. Out of the 25 students in the second year class of the previous year, 21 were promoted to the third year class. In-service training was provided for these students either in the projects or technical divisions of the Institute or in government departments or specialized institutions. Of the 23 students admitted to the second year class 7 had been admitted directly and the rest by promotion from the first year class. On the basis of admission tests, 27 candidates were admitted to the first year of the course. The list of students are given in Appendices 10.4.1 to 10.4.3. As a part of their training programme, students of the first year class undertook statistical research projects which are listed in Appendix 10.4.3.

*Short-term Statistician's Course (Junior and Senior)*: These courses held in the evening, continued to attract persons in employment desiring to qualify themselves in statistics. Two sessions were held for each course, Junior and Senior, one from March to September 1959 and the other from September 1959 to March 1960. Altogether 25 students for the Senior course and 106 for the Junior course attended. Appendices 10.5.1 to 10.5.4 give the lists of trainees who participated.

*Evening Course in Delhi (jointly with CSO)*: The course has been intended primarily for persons in government employment in Delhi. The trainees admitted in the previous year's session completed the course in February 1960. Out of 41 admitted in that session, 17 passed and 12 were allowed to appear at the examination to be held in 1960-61. From the earlier session 6 passed in the examinations held this year bringing the total number of trainees qualifying for certificates in the current year to 23. The session 1960-61 started in March 1960. As in previous years, there was a large number of applicants for admission to the course, of which 41 were selected and admitted. Of these 31 were from ministries of the Government of India, 5 from research and educational institutions and 5 were either private individuals or attached to private or public enterprises. The trainees are listed in Appendix 10.6.

*Evening Course in Bombay*: A new one-year course similar to the evening courses held at Calcutta and New Delhi was started in March, 1960, at Bombay. There were 125 applicants for this course out of which 32 were selected and admitted. Appendix 10.7 gives the list of trainees.

*Computer's Training Course (Junior and Senior)*: Two sessions were held in the year, with a total of 23 students for the senior course and 57 for the junior course. The list is given in Appendix 10.8.

*Special Course on Operational Research*: In 1957 a special training course on Operational Research was held at the RTS, under the leadership of Dr. Russel Ackoff of Case Institute, U.S.A. In January 1960 a symposium on 'Operations Research and its Potential in Indian Industry' was organized at the Institute. Following this symposium, a two-week training course in the subject was conducted from 2 May 1960 to 14 May 1960. The course was designed to give an exposition of the Operational Research approach and of specialized techniques in scientific management. Eleven persons from different research and scientific institutions and industrial concerns attended the course. Apart from the teachers of the RTS, two visiting experts, Mr. M. J. Solomon (USA) and Dr. J. H. Davidson (USA), assisted in conducting the course. A list of the participants in the course is given in Appendix 10.9.

TWENTYEIGHTH ANNUAL REPORT : 1969-60

THE LIST BELOW SHOWS THE NUMBER OF CANDIDATES APPLYING FOR ADMISSION, THE NUMBER APPEARING AT SELECTION TESTS AND THE NUMBER FINALLY ADMITTED, FOR EACH OF THE COURSES HELD DURING THE YEAR (JULY 1959-JUNE 1960)

course	number of candidates		
	applying for admission	appearing at selection tests	admitted to the course
1. Officers-on-deputation	—	—	9
2. Research and Advanced Studies	—	—	15
3. Statistical Officer's Courses (jointly with OSO)	—	—	25
4. Three-year advanced statistician's course :			
(a) Third year (by promotion)	—	—	21
(b) Second year (direct admission)	85	67	7
(by promotion)	—	—	16
(c) First year	299	226	27
5. Short-term Statistician's course (Calcutta) :			
Junior :			
(a) March-September 1959	198	120	53
(b) September 1959-March 1960	180	103	53
6. Short-term Statistician's course (Calcutta) :			
Senior :			
(a) March-September 1959	—	—	10
(b) September 1959-March 1960	41	—	15
7. One-year Evening Course (Delhi) : (jointly with CSO) :			
March 1960-February 1961	—	—	41
8. Computer's Courses (Calcutta) : Junior :			
(a) March-September 1959	140	62	22
(b) September 1959-March 1960	88	67	35
9. Computer's Courses (Calcutta) : Senior :			
(a) March-September 1959	19	19	15
(b) September 1959-March 1960	22	22	8
10. One-year Evening Course for Statisticians (Bombay) :			
April 1960-February 1961	125	106	32
11. Special course on Operational Research	—	—	11
12. International Statistical Education Centre	40	—	26
total	1215	792	441

ORGANIZATION OF NEW DEGREE COURSES

Considerable preparatory work such as, recruiting staff, collecting equipment, drafting the prospectus, syllabus, etc. was done during the year in connexion with the new degree courses, particularly with regard to the B.Stat. and M.Stat. courses starting in August 1960.

A special meeting of the representatives of various institutions was convened at New Delhi in March 1960 to obtain advice on the syllabus, training programme, bye-laws, etc. of the new degree courses. The names of persons who attended the meeting are shown in Appendix 15.1. The Syllabus Committee (shown in Appendix 15.2) set up by the Governing Body met at Calcutta on 29 and 30 May 1960.

On the basis of the decisions taken at the meeting at New Delhi and the recommendations of the Syllabus Committee, the draft prospectuses and syllabuses were revised. The

## INDIAN STATISTICAL INSTITUTE

Prospectus of Courses together with outline syllabuses was made available for issue by June 1960.

For selecting candidates for the B.Stat. and M.Stat. degree courses, arrangements were made to conduct in July 1960 selection tests at nine centres in India, namely, Banaras, Bombay, Calcutta, Delhi, Hyderabad, Madras, Nagpur, Trivandrum and Waltair. The tests constructed for the purpose have been on Mathematics Knowledge, Reasoning Ability, Statistical Knowledge and Aptitude, General and English Comprehension.

Plans for additional space, equipment, and staff required were worked out. Preliminary arrangements for setting up laboratories for the teaching of sciences, especially in biology, physics and chemistry were made and a Professor in Chemistry and a Lecturer in Physics were recruited.

### 2. INTERNATIONAL STATISTICAL EDUCATION CENTRE, CALCUTTA

The International Statistical Education Centre, which was started in 1950, has so far conducted thirteen terms and has trained 348 candidates representing 19 Asian countries. Most of the candidates trained were statisticians in government departments while a few were officials in other fields interested in statistics, and some were teachers in statistics. Reports have been received that the candidates trained at the Centre have proved themselves to be very useful in carrying out statistical activities in their countries. The Centre has now gained considerable experience in teaching candidates from Asian countries; it has also been steadily endeavouring to improve the facilities at the Centre and to give training at more than one level. It has also been trying to regulate the selection of candidates in order that the different countries may obtain the maximum benefit from the Centre.

In the earlier terms the Centre had conducted a regular course of 6 months which was extended to 9 months for the last few terms. In view of a certain amount of heterogeneity of the candidates who come from different countries of Asia, it was decided in 1956 to provide training at least for three different categories: (i) teachers in statistics, (ii) persons engaged in statistical work, and (iii) persons working in other fields in which a knowledge of statistics is necessary. The training that is now given caters for all the three groups, although the majority of the candidates belong to the second category.

In recent years there has been a demand for specialized training at the Centre on an individual basis. Provision has been made for such training for which some candidates have already offered themselves.

Since 1959 the Centre arranged to accept a limited number of senior student participants and visiting senior statisticians for specialization at the Centre making use of the facilities at the Indian Statistical Institute. Senior statisticians may also participate in the research and teaching work at the Institute.

With regard to the type of instruction provided, particularly for the regular 9 months' course at the Centre, it has also been decided that with effect from the next terms, besides training in statistical organizations and procedures, the training in governmental statistics should be extended to a period of 6 to 8 weeks and that such training is to be given in the first half of the term. Arrangements are being made accordingly.

The system of examinations has been recently tightened up to a certain extent. Periodic examinations are held for each topic covered during training. Two categories of

**TWENTYEIGHTH ANNUAL REPORT : 1959-60**

certificates have also been introduced: (i) certificate of merit and (ii) certificate of attendance, depending upon the performance of the candidates at the periodical and final examinations.

There are arrangements at present for training in each term about 30 students for the regular course and about 6 candidates for the different specialization courses including senior course.

*Joint Board of Directors* : The Centre was in charge of the following Board of Directors during the period of this Report : *Chairman*—Prof. P. C. Mahalanobis; *Members* : G. Darinois, R. G. D. Allen, E. Lunenberg (ex-officio members representing the International Statistical Institute), V. Sahay (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 twelfth term, during which 27 participants from 10 countries attended concluded in April 1959. The thirteenth term started in July 1959. During the thirteen terms, training was imparted to 348 trainees from the following 10 Asian countries : Afghanistan (2), Burma (31), Cambodia (2), Ceylon (13), India (101), Indonesia (24), Iran (6), Iraq (1), Japan (15), Laos (1), Malaya (3), Nepal (6), New Zealand (1), Pakistan (64), Philippines (43), Singapore (4), Syria (1), Thailand (24), Viet Nam (6). Appendix 10.1.1. gives the number of trainees attending different terms.

During the period May—August 1959, two officers nominated by the United Arab Republic attended Specialization Courses.

**THE THIRTEENTH TERM**

*Participation* : The Prospectus of the Thirteenth Term was issued from The Hague in December 1958 and 40 applications from 12 different countries were received; 29 candidates were offered admission of whom 26 joined; (later on, one candidate from India discontinued for official reasons and another from Philippines left on account of indifferent health). Laos and New Zealand are two countries newly represented in this Term.

Under the Colombo Plan scheme of technical cooperation, the Government of India made available 20 junior fellowships. The number of applications received, the number selected etc. are given in the table below :

**TABLE 2**

country	number of applicants	number selected	number joining	number awarded Colombo Plan Fellowships	remarks
1. Burma	1	1	1	1	
2. Ceylon	1	1	1	1	
3. Indonesia	7	7	7	7	
4. Japan	1	1	1	1	
5. Laos	1	1	1	1	
6. Malaya	2	2	1	1	
7. New Zealand	1	1	1	1	
8. Philippines	8	4	4	4	one discontinued
9. Singapore	1	—	—	—	
10. Thailand	8	5	4	4	
11. Iran	2	—	—	—	
12. India	7	6	5	—	one discontinued
<b>total</b>	<b>40</b>	<b>20</b>	<b>20</b>	<b>21</b>	

## INDIAN STATISTICAL INSTITUTE

Of the 26 candidates who joined, 24 had previous experience in statistical work in offices, while 2 were teachers. A full list of the candidates is given at the end of this report in Appendix 10.1.2.

*Instruction :* The Term opened on 15 July 1960. The training given according to the curriculum of the Centre consisted of lectures, laboratory work, project training and field-work. The first four months of the training were devoted to General Statistical Methods including the Theory of Probability, Sampling Theory and Methods, Statistical Organization and Procedures and Acquaintance with Statistical Projects. In November the students paid a two-week visit to the experimental station of the Indian Statistical Institute at Giridih, Bihar, and participated in crop-cutting and other agricultural experiments. From January 1960, in addition to certain general courses in statistical methods, six weeks' specialization courses on subjects of candidates' choice, such as Sample Survey, Statistical Quality Control, Mathematical Statistics, Planning Statistics, were arranged. From 1 March 1960 the trainees were at New Delhi for four weeks undergoing training in governmental statistics at the Central Statistical Organization. Consolidation lectures were held after they returned to Calcutta early in April.

*Examination and Certificates :* Periodical tests were being given from time to time on various topics covered by the candidates. The final examination on the topics covered at Calcutta took place in February before they went to New Delhi. An examination in Government Statistics was held at New Delhi. Certificates were awarded on the basis of the performance of the candidates during training and at the different examinations. The 24 candidates who attended the Term having passed in the final examination, were awarded Certificates of Merit.

*Teachers :* A major part of the teaching at the Centre was imparted by the staff of the Research and Training School and the Project Division of the Indian Statistical Institute. A number of government statisticians took part in training at the Central Statistical Organization in March.

*Visiting Teachers :* Among the visiting teachers who participated during the Term, mention may be made of (i) Mr. V. Kamisto, U.N.; (ii) Miss Dorothy Walters, U.N.; and (iii) Mr. T. Okuno of the National Institute of Agricultural Sciences, Japan (lecturer, arranged by International Statistical Institute). The students of the Centre had also the benefit of attending a large number of seminars and discussions arranged by the Indian Statistical Institute including those held by Professor J. B. S. Haldane, Professor Frank Yates (U.K.), and Professor Th. Dobzhansky (U.S.A.).

The Fourteenth Term of the Centre started on 25 July 1960.

### 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, has been conducting external examinations known as Professional Examinations, since 1938. The diploma and certificates issued to successful candidates indicate professional competence at varying levels and are recognised as 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 proscribed for each examination. The examination centres are located in different

## TWENTYEIGHTH ANNUAL REPORT : 1959-60

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 approval of the Council. The results are also published in the Gazette of India—Part IV. Up to November 1960, 3422 candidates had passed in one part or another of these examinations, that is, 31 per cent of 11,000 who had appeared out of 13,385 who had registered.

### STATISTICIAN'S DIPLOMA

The Statistician's Diploma Examination was held in September 1959 at Bangalore, Bombay, Calcutta, Delhi, Girdih, Lucknow and Poona. Out of 145 candidates who had registered themselves, 128 appeared and 66 passed in one or more papers. The second session of this examination was held in April 1960 at Bangalore, Bombay, Calcutta and Delhi. Out of 123 candidates who had registered themselves, 100 actually appeared and 54 passed in one or more papers. The examination was again held in September 1960 at Bangalore, Bombay, Calcutta, Delhi and Poona. Out of 117 candidates who registered themselves for one or more paper, 104 candidates actually appeared.

Since the institution of this examination, the Statistician's Diploma has been awarded to 46 candidates who have passed in all the papers prescribed for the examination.

### COMPUTER'S CERTIFICATE

The Computer's Certificate Examination—Part I was held in September 1959 at Bangalore, Calcutta, Delhi, Girdih and Trivandrum. 108 candidates registered, 104 appeared and 43 passed in one or more papers. The second session of the examination commenced from 18 April 1960 at Bangalore, Bombay, Calcutta, Delhi and Girdih. Out of 77 candidates, 70 appeared and 34 passed in one or more papers. The examination was held again in September 1960 at Bangalore, Calcutta and Delhi. 75 candidates registered themselves for one or more papers of the examination and 73 appeared.

### STATISTICAL FIELD SURVEYS CERTIFICATE (JUNIOR & SENIOR)

Examinations for the Statistical Field Surveys Certificate (Junior and Senior) were held in September 1959 at Bangalore, Calcutta, Delhi, Girdih and Trivandrum. In the Junior Certificate Examination, 18 registered, 16 appeared and 3 passed in one paper only while in the Senior Certificate 14 registered, 11 appeared and 5 passed in one or more papers. The examinations were held in September 1960 at Bangalore, Calcutta and Delhi. Three candidates registered for and appeared in the Junior Certificate Examination while 8 registered for and appeared in the Senior Certificate Examination.

The names of successful candidates for the examinations held in September 1959 and April 1960 and also a summary of results by each paper for all the examinations held from 1951-52 to 1959-60 and April 1960 are given in Appendix 11.

## 4. PLANNING DIVISION

A small Central Statistical Unit was established in New Delhi in 1949 and was staffed by the Institute workers. This Unit looked 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 for active collaboration in the statistical work of the Government. In 1953-54 an Operational Research Unit was established to undertake, on a small scale, technical work on planning.

## INDIAN STATISTICAL INSTITUTE

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 as to ensure 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 a section in the Indian Statistical Institute for studies relating to planning for national development. These studies 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 paid to perspective planning. Since then work on planning is being done by the Institute in Delhi and Calcutta.

### WORK IN DELHI

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 of planning. The Delhi Unit has cooperated in the preparation of a series of studies on scientific and technical man-power.

The Delhi Unit was engaged in research work of different types during the year. Some of the studies were concerned with the change in the structure of the national economy over the period 1955-1957. Estimates of gross national product, national income and contribution of different sectors to the aggregate income for different points of time, past and future, were worked out in this connexion. Secondly, the change in the pattern of consumer expenditure was studied and projections were attempted. Inter-industrial relations and growth models were also studied in the context of long-range development of the economy. The financing aspect of the long-range development plans was also considered and proximate estimates were worked out. Finally, the foreign trade problem was studied from a long-range point of view. In another group of studies, continued attention was paid to the problem of effective utilization of man-power and costs and benefits of educational courses and scholarships were critically examined. The preparation and analysis of various techno-economic coefficients useful for planning and for studying the implication of any given set of production targets in terms of investment, employment and material consumption engaged the attention of another research group, and the effectiveness of investment in certain fields was studied. Some headway was made in the field of regional planning and the problems connected with locational aspects of development were taken up for detailed consideration. The planning experience of foreign countries relevant in the context of the other work in the Unit was continued to be studied as in the past.

During the last two years a number of economists came to New Delhi under the India-M.I.T. Research Project; some of them such as Dr. I. M. D. Little, Dr. Trevor Swan, Prof. W. R. Reddaway and Dr. H. F. Lydall, worked in close collaboration with the Planning Unit on economic problems of planning.

Dr. M. Kalecki, Vice-Chairman, Planning Commission, Poland, came in the winter of 1959-60 at the invitation of the Institute and the workers of the Unit had the privilege

of working with him for a couple of months on certain problems of planned development under conditions of financial stability. Dr. Thomas Balogh of Oxford University is to come for a brief period on a similar assignment later in 1960-61. Mr. Bruce Mofarlane of Sydney University came under a fellowship scheme of the Institute to work in the Unit for three months on a study of planning methods in India. He gave a number of lectures on planning techniques in Yugoslavia based on his on-the-spot study during an earlier year-long visit to that country. Similarly, in response to a request received from Mrs. U. Rabe, a research fellow from East Germany, facilities were extended to her to work in the Unit for about a month on the subject of Indian Public Finance.

Among Indian scholars, Dr. A. K. Sen, Fellow, Cambridge University worked in association with the Unit for a few months on problems of effectiveness of investment and choice of technology and Dr. I. S. Gulati, Professor of Economics, Baroda University, on some problems of taxation. A scheme of research project, "Rural Man-power Utilization in India", presented by Dr. Chao Kuo-Chun, a visiting scholar from Harvard University, was accepted recently by the Institute and Dr. Chao Kuo-Chun has been offered an assignment for one year to complete the study with necessary assistance from the Institute.

#### WORK IN CALCUTTA

The work of the Calcutta Unit included research, teaching, seminars and discussions, and other activities.

*Research*: The programme followed was mainly the one introduced earlier in 1959. Professor Mahalanobis continued with some of his own work. His studies included the evolution of planning in India, the importance of scientific and technical man-power in the context of economic expansion in India, and the problems of labour in a mixed economy. Several papers and addresses as well as a radio talk were prepared on the basis of these studies.

The main fields of research covered at Calcutta were inter-industry studies, studies on consumer behaviour, growth models, national income and allied studies and miscellaneous studies on planning. The input-output table for 1955-56 was completed at the instance of the Planning Commission. The studies on consumer behaviour mostly centred round the projection of consumer demand for the Third Five-Year Plan and the work was based almost entirely on the National Sample Survey material. The work on national income again was largely based on NSS data and aimed at estimates of contributions to national income by certain unorganized sectors. But there was some work on growth and novel interesting breakdowns. The work on planning was on several interesting subjects such as optimization of plant utilization, the comparative levels of inventories in USA and India, economic planning in Poland, concentration of employment in manufacturing industries, etc.

The Institute was the host to the Preliminary Conference of Econometricians in January 1960 convened by some Indian members of the Econometric Society of the U.S.A., and it was inaugurated by Professor P. C. Mahalanobis. Of the 23 papers presented at the conference, eight were from the Institute (Planning Division). Sri M. Mukherjee and Sri H. Mazumder attended the Asian Conference of the International Association for Research into Income and Wealth held in August 1960 and read papers. The workers of the Division



## INDIAN STATISTICAL INSTITUTE

also contributed materially to the research activities of the Indian Conference on Research in National Income held in August-September 1960 and contributed 8 papers.

To facilitate the preparation of input-output tables at the Institute, the Planning Commission sponsored a committee under the chairmanship of Sri P. C. Mathew, Director, Central Statistical Organization and consisting of Sri M. Mukherjee and the representatives of the various ministries and departments of the Government of India.

Another noteworthy development was the formation of a small field group to undertake a series of surveys on interesting subjects. This was made possible by the transfer of several workers from the Special Technical Unit. The newly-formed group has already completed a survey of domestic servants in Calcutta and a report is under preparation. Sri Nikhilesh Bhattacharyya, former head of the Special Technical Unit, was also among those who joined the Planning Division.

The Calcutta Unit also completed a field study of oil-crushing units of various types in connexion with an enquiry into the problem of choice of techniques.

*Cottage Industries:* Certain studies on cottage industries were taken up in the Institute in February 1956. A centre, *Kalyansri*, started in the Institute for the purpose, has been running more or less on a self-supporting basis, the workers engaged being paid out of the sales proceeds of cottage industry products. A study was also initiated in three selected villages near Calcutta for finding out the improvement of conditions of cottage industry workers when certain facilities were provided to them. A full report was drafted on the economics of operations in *Kalyansri*. A report was also finalized on the study at the three villages.

*Teaching:* The Division organized several courses in economics for the students of the Research and Training School. The course for senior trainees laid particular emphasis on planning and econometrics. For the Statistical Officer's Training Programme, about 50 lectures were given on planning theory and Indian economic problems, and four officer trainees were given special training in economics, statistics and planning methods. Lectures and practical classes were also arranged for the International Statistical Education Centre (ISEC) and for the short-term statistician's training course (junior) conducted by the Research and Training School. Arrangements were made for in-service training of 19 senior students who opted for planning in their final year. There was a specialization course in planning for about a month for some students of the ISEC.

The Calcutta Unit completed the preparation of a syllabus in economics and planning for the B.Stat. and M.Stat. degree courses which were inaugurated in August 1960 by Professor Mahalanobis. Sri A. Biswas and Dr. H. Mazumdar were mainly responsible for teaching economics in the B.Stat. classes.

*Seminars:* An interesting lecture on "A New Approach to Development" by Professor J. K. Galbraith of the Harvard University, was arranged on 18 April 1959. Professor P. C. Mahalanobis and others participated in the discussion which followed. Dr. Solomon Adler, Lecturer in Economics, Cambridge University, gave a series of talks on "The Growth Pattern of the Chinese Economy". Professor Kalecki, Vice-Chairman, Planning Commission, Poland, participated in a series of discussions with the research workers of the Division and also gave a public lecture in the Institute on "Planning in India". Prof. John Perry Miller, Yale University, held a seminar on planning. Prof. W. B. Reddaway, Director, Department of Applied Economics, University of Cambridge, who came to India

on an assignment with the India Project of the MIT, gave a talk on "The Role of Sample Surveys in Supplying Statistics for Planned and Unplanned Economies".

Professor Gerhard Tintner gave a course of lectures on econometrics. He also conducted a series of seminars on

1. 'The Distribution of Variances of Variate Differences in the Circular Case'.
2. 'The Use of Stochastic Linear Programming in Planning'.
3. 'Application of Carnap's Probability Theory and Inventory Problems'.
4. 'Logistic Law of Economic Development'.
5. 'Some Formal Relations in Multivariate Analysis'.

Dr. Asoko Rudra gave two talks on the Third Five-Year Plan.

Sri Nikhilesh Bhattacharyya and Sri N. S. Iyengar conducted a seminar on 'A Study of the Distribution of Consumer Expenditure'.

*Publications* : During the period April 1959–November 1960, 49 additions were made to the series of mimeographed working papers published by the Division. The new issues included a paper on Agricultural Statistics by V. I. Maniakin (USSR) and a paper on Economic Planning in Poland by Oskar Lange (Poland).

Five volumes of the following planning papers in the series, *Studies Relating to Planning for National Development*, were published : 1. *Essays on Economic Planning* by Oskar Lange; 2. *Studies on Consumer Behaviour* by research workers of the Institute; 3. *Planning for India : Selected Explorations in Methodology* by Ragnar Frisch; 4. *A Demonstration Planning Model for India* by J. Sandee, and 5. *Some Basic Planning Problems* by Charles Bettelheim. Two volumes, *Occupational Pattern in Manufacturing Industries, India, 1956*, and *Educated Persons in India, 1955*, in the series Man-power Studies were published by the Planning Commission. The Delhi Unit was actively associated in the preparation of these studies. The following two volumes were published under the auspices of the Planning Division : 1. *Environ of Tagore* by Hashin Amir Ali and 2. *Then and Now* by Hashin Amir Ali.

Two more volumes, *Talks on Planning* by Professor P. C. Mahalanobis and *Statistics and Planning in the Socialist Countries* by several foreign experts, are in the press.

##### 5. THE NATIONAL SAMPLE SURVEY

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

The Central Statistical Organization of the Government of India is the coordinating body in regard to sample designs, the drawing up of tabulation programmes, the fixation of priorities for tabulation work and other related work. A Programme Committee consisting of the representatives of the various Ministries and other interested parties advises the Central Statistical Organization on various aspects of the survey.

## INDIAN STATISTICAL INSTITUTE

Though the Institute has all along been planning the survey, and processing and analysing the data, a noteworthy event of the year under report was that the Institute entered into a contract with the Government of India for performing these items of work.

*Participation by States :* A noteworthy feature of the NSS is the increasing participation by States. The Central and State agencies cover different interpenetrating networks of samples according to the same survey plan. The State agencies also process their own data. 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 the Punjab in the fourteenth round. Madhya Pradesh began its participation from the fifteenth round.

*Machine Tabulation :* The NSS data are processed with the help of the machine equipment installed at Baranagar, Giridih and Delhi (Army Statistical Organization). During the period, there were one electronic statistical machine, 32 sorters, 22 tabulators, 6 multipliers, 6 collators and 27 reproducers and gang summary punches of the IBM and Hollerith. Two sorters manufactured by the Institute Workshop were in the Army Statistical Office, New Delhi and this enabled the Institute to dispense with two ICT and one IBM hired sorters during 1959-60. Total cards handled during the period was about 6 million and the total volume of card passage through the tabulator was of the order of 50 million.

### FOURTEENTH AND FIFTEENTH ROUNDS

Thirteen rounds of the NSS were completed by May 1958. During the period, the fourteenth round (July 1958 to June 1959) was completed and the fifteenth round started in July 1959.

*Previous Rounds :* The subjects covered in different rounds may be grouped into two categories—continuing and *ad hoc*. Information on consumer expenditure and condition of household living is being collected from the first round. Other subjects of a broadly continuing nature are employment and unemployment, household enterprise, land utilization and crop production, retail and wholesale prices, etc. Among the important *ad hoc* surveys conducted in earlier rounds may be mentioned, newspaper reading (sixth round), distribution of landholdings (eighth round), household indebtedness (eighth round), farming practices (eighth round), employment and unemployment and indebtedness of agricultural labour households (eleventh and twelfth rounds), production of milk and production and utilization of cow-dung (twelfth round), births and deaths and growth of population (fourteenth round). Type-studies and pilot enquiries were also undertaken from time to time.

*Manufacturing Industries :* The NSS is carrying out since 1952 (reference year 1951), a survey of manufacturing industries in continuation of the survey which was started in 1950 by the Directorate of Industrial Statistics. Since the fourth round (reference year 1954), the scope of the survey has been extended to include industrial undertakings covered by the Industries (Development and Regulation) Act 1951 with the exception of coal mining establishments which have been covered from the sixth round (reference year 1956). The work of the eighth round (reference year 1958) started in April 1959 and was practically completed in July 1960. The size of the sample in the seventh round was 6,010 factories (registered under the Indian Factories Act) and 4,570 industrial undertakings, and that in the eighth round was 6,000 factories and 7,222 industrial undertakings. The items of

information covered in the eighth round were input, output, labour employed, wage-, values of fixed and working capital, etc.

*Family Living Surveys*: The most important *ad hoc* surveys not covered in the regular rounds of the NSS were the Working Class and Middle Class Family Living Surveys. These were undertaken in July-August 1958 and completed in July-August 1959. One of the main objects of the surveys was to improve the base for the collection of the cost of living index numbers (now termed consumer prices index numbers). The Working Class enquiry, which was conducted in 32 urban industrial, 10 plantation and 8 mining areas in different parts of India, covered 23,400 families for information on consumer expenditure and 6,600 families for the level of living. The Middle Class enquiry was carried out in 45 important cities and towns covering about 26,820 families for consumer expenditure and 8,940 families for level of living.

#### PILOT SURVEYS

*Block Boundary Work in Urban Areas*: The sampling frame so far used for the urban survey consisted of the block limits taken from the 1951 Census. This frame being out of date, work was started to revise it for the towns with a population of 50,000 and above (1951 Census) in the first instance. The survey work was completed in May 1960. The field work was undertaken by the Directorate of the NSS except in West Bengal where it was the responsibility of the Institute.

#### SPECIAL ENQUIRIES AND TYPE STUDIES

*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 1959 in West Bengal. A total of 936 villages was selected in each of the three seasons and a sample of clusters of plots was taken from each village for area and yield surveys. Along with the area and yield surveys, the intensity of sowing in a crop plot was estimated from a sample of a circular area with a radius of 1 ft. and an eye-estimation of the general condition of plant growth was made with a view to exploring the possibility of pre-harvest forecasting of yield. During the *rabi* season, some data were collected about the consumption of cereals by livestock. This was undertaken with the object of studying the gap between the total consumption and the human consumption of cereals. An opinion survey about the area and outturn of crops was also carried out in 312 sample villages during each of the three crop seasons with a view to evolving suitable methods of crop forecasting.

*Crop-cutting Experiments for Jowar*: A crop-cutting experiment to study the difference in the yield rates of *jowar* crop under mixed and unmixed cultivation was undertaken in the spring season in a few villages in Bombay State. Special attention was also given to study the presence of bias, if any, on the part of the investigator to select spots for the location of the sample cuts with a relatively better growth of plants, thus affecting randomness in the selection of the sample cuts.

*Proportion of Area under Land Utilization*: The analysis of the data which were collected in two centres in West Bengal last year to test alternative eye-estimation procedures for estimating the area under crop was completed.

*Estimating the Number of Fruit Trees*: The studies relating to sampling for the estimation of the number of various types of fruit trees were continued.

## INDIAN STATISTICAL INSTITUTE

*Consumption and Disposal of Cereals and Capital Formation by Households* : The object of this study was (i) to assess the usefulness of the interview method in obtaining information on the quantum of transaction in food-grains by members of households; (ii) 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; and (iii) to find out the efficiency of the interview method for collecting information on capital formation in the household sector. The field work was conducted in the Punjab, Andhra and Bombay States.

*Cost of Collection of Data on Consumer Expenditure* : This study was undertaken in the previous year in four centres in West Bengal to examine the cost of collecting consumption data by the interview method. The analysis of the data was completed during the period.

*Estimating Milk Yield by Physical Observation* : The study was undertaken in West Bengal to explore the possibility of estimating milk yield by physical observation. A sample of households possessing cows in milk was selected from a number of sample villages. The yield of milk of each of the cows in these households was recorded for one day by physical observation at the time of milking.

*Population and Vital Statistics* : This study was undertaken in three States, Assam, Bihar and Kerala, for improving the methodology of collection of demographic data in the NSS. The processing of the data is in progress.

*Migration* : The object of this study was 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. The field work was undertaken in Uttar Pradesh, Madhya Pradesh and also in Bombay city. The processing of the data was in progress at the end of the year under review.

*Employment in Village Enterprises* : The survey was conducted in the States of Mysore and Uttar Pradesh to study an alternative approach for measuring underemployment from the point of productivity as against measuring it by hours worked. Till now the NSS is adopting the latter approach for measuring underemployment.

*Small-scale Manufacture and Handicrafts* : The study was carried out in the States of Bombay, Madras and Rajasthan to examine the response behaviour for three dissimilar reference periods, week, month and year. in respect of some important items pertaining to small-scale manufacturing activities.

*Enquiry into Distributive Enterprises of Trading Joint Stock Companies* : A methodological enquiry into distributive enterprises of trading Joint Stock Companies, which was started in Calcutta in March 1959, was completed during this period. The main objects of this enquiry were to test the frame, a list for which was maintained by the Registrar of Joint Stock Companies, and some basic concepts relating to the collection of data for these enterprises and to form an idea of non-response and an approximate field cost for conducting such a survey. A report was prepared on this enquiry. As a sequel to this study, a pilot enquiry into distributive enterprises covering trading Joint Stock Companies registered under West Bengal during 1956-57 was conducted. The main purpose of this enquiry was to obtain the estimates for important varieties and to determine the appropriate sample size for sampling with or without stratification. The note dealing with the above report was

## TWENTYEIGHTH ANNUAL REPORT : 1959-60

in an advanced stage of preparation. A note suggesting improvement in the maintenance of records in the office of the Registrar, Joint Stock Companies, was also prepared.

*Enquiry into Public Transport Activity* : A note on a special survey of public transport activity with road motor vehicles carried on by private non-household agencies in 1958 in Calcutta and 24-Parganas was prepared and submitted to the Government.

*Estimating the Sales of Some Specific Drugs from Sale Vouchers* : The analysis of the data of the pilot survey conducted earlier in Calcutta for estimating the sales of specific drugs by sampling from the sales vouchers of retail shops selected at random was completed.

### 6. ELECTRONIC COMPUTER DIVISION

The most notable activity during the year was the adaptation of the Soviet computer *Ural*, installed in December, 1958, for processing statistical data. The *Ural* was handed over for use in February, 1959, by the Soviet engineers, who installed the machine which has since then been serviced, operated and maintained by the Institute staff. A team of programmers have within a short time learnt the technique of programming the computer.

A number of scientific problems were programmed and run on the machine and a few standard sub-routines were prepared. However, there was a basic draw-back in the machine for utilizing it for statistical data processing work. The input of the *Ural* is a 35 mm. blackened cinema film which is punched for recording data and instructions. But the data for statistical work are usually punched on the 80-column Hollerith cards. Unless the data punched on cards are transcribed on 35 mm. films it is not possible to feed such data into the machine. This fact was clearly recognized at the time of selecting the machine, and it was contemplated to add an alternative card feed unit to the computer. After a few months' experience, it became possible for the Institute engineers to undertake the construction of a card feed unit. A scrapped reproducer was repaired for the mechanical feeding of cards and the associated electronic circuit was designed and built within three months. This alternative input started operating from the end of December, 1959. It became thus possible to analyse and process statistical data punched on the standard 80-column Hollerith cards by means of very complicated mathematical formulae, which was either extremely difficult or impossible to achieve with the help of the usual range of punched card machines.

As the new input unit opened wider possibilities for statistical processing work, the *Ural* was operated in two shifts from the end of 1959.

#### COMPUTATION SERVICE

A number of computation problems which were received from outside institutions and from the various departments of the Institute were programmed and computed on the two electronic computers, HEC2M and *Ural*. There was an increase in the number of problems which involved statistical analysis with a large amount of data. These are listed in the Appendices.

#### RESEARCH AND DEVELOPMENT

*Card Feed Unit for URAL* : A rejected IBM reproducer was repaired for the mechanical feeding of 80-column cards. The decimal number punched on cards were read through usual brushes (9 columns at a time) and passed through a decoder, before being

## INDIAN STATISTICAL INSTITUTE

recorded on the magnetic drum of the computer. The old reproducer could reliably feed about 100 cards per minute. A much higher speed could have been achieved if a faster card reader had been available.

*Development of Computer Components* : The work on the development of magnetic drum storage for computers and data-processing machines was started some time ago with a view to achieving an optimum design as regards reliability, access-time, storage capacity, size and cost. The techniques of coating the drum with magnetic material and of constructing the reading-recording magnetic heads were developed during the year.

*Development of Transistorized Arithmetical and Logical Circuits for Computers* : The work was continued with low-priced computer transistors recently developed by the Philco Corporation.

*Development of an Analogue Machine for the Statistical Analysis of Telemetered Data from Seismographs* : The work was continued and the transducer for converting the displacement of the boom was successfully completed and tried.

### MAINTENANCE SERVICE

The constructive maintenance of punched-card machines continued as before. In addition to two Soviet-made tabulators, two summary punches, 20 electric key punches and six verifiers, one purchased IBM type 416 tabulator was handed over to the maintenance unit. Three high-speed sorters, manufactured in the Development Workshop of the Institute, were sent to the Army Statistical Organization in Delhi and are being maintained by a unit of this Division. A few key punches were rebuilt from scrapped parts of such hand-operated key punches.

### TRAINING

Training facilities in digital computers were provided to four graduate apprentices, Sarbasri Dwarka Nath Bose, Dipankar Chakravarti, Ashoke Ghosh and Amarendra Nath Mukhopadhyay, sent by the Institute of Radio Physics & Electronics, Calcutta University. Training facilities in programming were provided to Sarbasri R. G. Nag and R. S. Srivastava, deputed by the Defence Science Organization in Delhi.

### DEVELOPMENT WORKSHOP

*Production of High-speed Electronic Sorter* : Besides two prototypes built in 1958, the Workshop produced five sorters, of which three were sent to the Army Statistical Organization, New Delhi, and two are being used by the Institute itself. These sorters worked quite satisfactorily. Of the seven sorters on hand, two are expected to be completed soon. A good number of special tools was designed and produced for fabrication of the parts of sorters with a view to ensuring dimensional accuracy and achieving some mechanical advantages in connexion with future mass production.

*Development of Desk Calculator* : The development work on desk calculators was continued and some special tools necessary for producing parts were designed and constructed, but owing to difficulties in procuring special alloy steel the work was slowed down. A programme of work was taken up so as to finalize development work in the next financial year. Two Soviet experts visited the Institute and, after a careful study of the activities

## TWENTYEIGHTH ANNUAL REPORT : 1958-60

of the Workshop, prepared a scheme for utilizing the UNTAA machinery with details in connexion with the production of desk calculators on a mass scale.

*Departmental Jobs :* The Workshop rendered services to the Institute departments as usual. Fifty crop-survey instruments including 15 of improved design were fabricated for supply to the NSS. The mechanical accessories of a printing mechanism for the HEC2M, designed by the Electronic Division and involving high precision, were successfully made; this is working satisfactorily. The Calculating Machine Repair & Maintenance Unit attended 114 service calls, executed major repair work of 204 calculators and maintained 328 machines, both electrical and manual.

*Services to Outside Organizations :* The Workshop rendered valuable services to the Civil Aviation Directorate, National Instruments Ltd., Indian Oxygen Ltd., National Carbon Co. Ltd., and several other organizations by way of executing orders of a very complicated nature and involving a high order of mechanical precision.

*New Installations :* Two UNTAA machines, one jig borer and one slotting machine, were installed. One air-conditioned room was built for housing the jig borer; the Workshop had been greatly handicapped so far in its development work for want of this particular machine and quicker progress may now be expected. The Inspection Wing and Drawing Office were reorganized. A new system of Production Control for the smooth running of the Workshop with facilities for executing jobs at high efficiency through detailed planning was introduced. Sri G. D. Banerjee, engineer-in-charge of development, is mainly responsible for this.

The Transport Section and the Electrical Maintenance Unit were affiliated to the Workshop in September last. The engineers of the Workshop delivered a course of lectures to the RTS students with SQC as their special subject.

Sri S. P. Bhattacharjee was appointed officer-in-charge of the Workshop.

### 7. STATISTICAL QUALITY CONTROL (SQC)

In 1947-48, Dr. Walter A. Shewhart, who may be described as the "father" of SQC, paid a visit to this country and aroused considerable enthusiasm in the idea of SQC both in statistical and industrial circles. Immediately after Dr. Shewhart's visit, the Indian Society for Quality Control was established in Calcutta, but the SQC idea did not really catch on till 1952 when a team of experts deputed by the United Nations Technical Assistance Administration conducted intensive training courses in SQC methods in different parts of the country. The programme in this connexion was organized by the Institute in collaboration with the Central Statistical Organization. SQC has since made fairly steady progress and seven SQC Units are now functioning, one each at Bangalore, Baroda, Coimbatore, Bombay, Calcutta, Delhi and Madras with a coverage between them of 58 factories.

A factor of considerable importance in the progress of SQC has been the three All-India Conferences, held in Calcutta in January 1948, January 1955 and December 1958. Dr. Shewhart who presided over the first conference paid two more visits : in 1954-55 and in 1958-59. An Advisory Committee for the guidance of SQC policy was set up in 1953 with Sri C. D. Deשמך as Chairman and Sri Pitambar Pant as Secretary.

The SQC work has three aspects : 1. promotion, 2. application to industry and 3. training of specialists. The promotional activities are carried on by the organization of conferences, seminars and meetings. During the year under report, an interesting feature



## INDIAN STATISTICAL INSTITUTE

of promotional work done by the Calcutta Unit were two special projects in two of the member-factories.

On the operational side, apart from a few large industrial units which have their own SQC organizations and some of which provide consultants who work on a limited scale, the SQC Units of the ISI are engaged directly in the practice of Quality Control establishments. An idea of the wide scope of the advisory service given by these Units will be apparent from the following list of industries which are covered by SQC work : textiles; metallurgy; toundry & light engineering; electrical; plastics, chemicals & pharmaceuticals; glass & ceramics and process & miscellaneous industries.

Very considerable emphasis is laid on training in SQC work and efforts in this direction had so far been concentrated on the training of men employed in industries. The training courses, which usually last for a fortnight, provide theoretical instruction as well as practical training. The success of SQC work cannot perhaps be assessed in terms of money but the idea has no doubt caught on and the fact that the National Productivity Council has accepted SQC as one of the fronts of its productivity drive is a measure of this success.

### 8. LIBRARY

The Institute's Central Library at Baranagar has a service centre at the City Office, 9B Esplanade East, and branch libraries at Giridih, Delhi, Bombay and Bangalore.

*Resources* : The Library's collection at the end of the year numbered 82,000 volumes in round numbers distributed subject-wise as follows :

Statistics (theoretical and applied)—21,850; Mathematics—3,850; Physical and Biological Sciences—8,750; Economics and its subsidiary branches—21,300; Sociology, Cultural Anthropology and Demography—9,000; Engineering and Technology (including Agriculture, Medical Sciences and Management Sciences)—8,000; Humanities—7,500; and General Reference Works—3,750. There is also a collection of about 22,000 reprints, monographs and specialized technical reports and documents including a large collection of photographs and microfilms.

*Books* : The direct appropriation to the Library for books and journals amounted to Rs. 1,23,000; 5,725 books were acquired, compared to 8,058 in the previous year; of these 695 were gifts, 560 were received in exchange and the remaining 4,470 were purchased.

*Periodicals* : 1,717 periodicals and serials were received, compared to 1,508 in the previous year and of these 447 were subscribed for, 752 were received in exchange of the *Sankhyā* and other occasional publications of the Institute and 525 were received on a complimentary basis. The subscription to four periodicals was discontinued and the Library stopped receiving six periodicals. Twentyfour daily newspapers were subscribed to for the news-clipping files on planning and economic development in India.

*Bibliographic Service* : The library made its contribution not merely through the acquisition of materials but also through putting it to effective use. This was accomplished by reference services of furnishing material to the readers within the Library and answering a multitude of inquiries. The Library made its collection and new arrivals known to the workers of the Institute and outsiders through the regular publication of several documentation lists—*Weekly List of Selected Periodicals*, *Monthly Bulletin of Acquisitions* and *Library News*.

The *Monthly Index to Current Literature* (a documentation list of the articles indexed from periodicals received during a month) was replaced by a new series "*The Index to Statistical Literature*" which includes all articles on theoretical and applied statistics appearing in current periodicals received during a fortnight. This documentation list on current statistical literature has been found very useful for reference and bibliographic purposes and is widely circulated.

The Reference Service also provided several selected bibliographies and reading lists to meet particular demands of the research workers which included lists on (1) Socio-economic Surveys in Calcutta, (2) Operational Research and Quality Control and (3) Census of India Publications.

*The Union List of Learned Periodicals : Calcutta Region* (A selection from the periodicals currently received in certain libraries in Calcutta and its neighbourhood) was published during the year. It received encouraging response from different libraries and scientific workers.

This project was taken up in 1967 to explore the possibility of issuing periodically a union list of learned periodicals being currently received in different libraries within a specified area and to find out the best techniques of compiling such a list. The scope and purpose of this publication are described in the following extract from the preface written by the Director :

"It is essential to develop a dynamic concept of communication services through the circulation of journals among groups of co-operating libraries. This can be realized only on the basis of a regional union list of learned periodicals with the help of which each research centre within the area would be able to formulate its acquisition programme by concentrating on its main interests and depending on other libraries for its subsidiary needs through co-operative exchanges amongst themselves. The shortage of foreign currency in India also calls for the maximum utilization of funds. Thus such a union list can help not only in the promotion of research work but also of national economy.

"In our country where library records are in many cases very incomplete any attempt at building up a Union catalogue of holdings of scholarly periodicals covering the whole of India is likely to suffer from various limitations even when adequate funds are made available for such purpose. It is much easier to undertake the preparation of zonal lists covering periodicals which are being currently received and to issue revisions frequently. If these lists are collected and cumulated at intervals of from three to five years, such cumulated lists would meet most of the demands of the scientific workers as experience shows that a majority of the references are made to current researches within a limit of ten years."

*Translations* : Thirtyfive documents in foreign languages were translated into English. Of these, 25 were in Russian, 1 in French, 2 in German and 7 in Chinese. (See Appendix 8).

The notable work of the Russian Translation Unit was a full translation of 'Problemi Ekonomiki Truda' (Problems of Labour Economics) by S. G. Strumilin, Moscow State Publishing House for Political Literature 1957 (pp. 733) and the compilation of the first part of the "Russian-English and English-Russian" dictionary of terms relating to statistics, economics and planning published by the Statistical Publishing Society and the Indian Statistical Institute.

*Japanese Translation Unit* : A separate translation unit was set up at the International House, Tokyo, Japan, for the systematic collection, selection and translation of research materials in Japanese and the acquisition of documents on Japanese economy in the English language. The unit was organized at the initiative of Professor P. C. Mahalanobis after the work started by the Japanese-Indian Cooperation Office (Asia Kyokai)

## INDIAN STATISTICAL INSTITUTE

in collaboration with the Government of India and the Indian Statistical Institute, was terminated in January 1959. A Committee was formed with Shigeham Matsumoto (Chairman), Kazuuchi Okawa, Saburo Okita and Kosei Ohkata (Secretary) to guide the policy of the unit which is supported by the Institute with a budget of Rs. 60,000 per annum. There is a panel of translators whose work is supervised by an editorial supervisory committee. During the period, 8 titles in the translation series and 26 titles in the documentation series have been supplied to the Institute, bringing the total number of translations from Japanese received in the library to 38 which have been duly processed and filed for reference of the research workers of the Institute. The materials are selected with a view to showing various aspects of Japanese economic and social life.

*Service and Circulation* : 1,366 persons used the library during the year as against 1,339 in the previous year. Books, journals and other materials issued numbered 57,722 as against 62,466 in the previous year. Of these 14,738 were issued from the Lending Section and 20,063 from the Reference Section. The issue of periodicals and vertical file materials numbered 16,921. Requests received totalled 65,601, of which about 12 per cent could not be fulfilled as against 10 per cent in the previous year. 165 outsiders were given special permission to use the library.

Inter-library loan transactions were made with the libraries of the following organizations : Geological Survey of India (Calcutta), UNESCO Research Centre (Calcutta), Scientific Information Bureau (New Delhi), Allahabad Christian College (Bureau of Educational Research), National Chemical Laboratory of India (Poona), Planning Commission (New Delhi), Imperial Chemical Industries, West Bengal State Statistical Bureau, Jadavpur University, Calcutta University, Sanskrit College (Calcutta), Indian Institute of Technology (Kharagpur) and also the Commercial Library (Calcutta) and National Library (Calcutta).

### 9. PUBLICATIONS

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, the 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 independent 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 Dharendra 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 type-casting 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 21, all the four parts of Volume 22 and Parts 1, 2 and 3 of Volume 23, Series B containing 55 papers and 3 reports, were published. There were papers on history of statistics, sampling distributions, stochastic processes, estimation, tests of significance, multivariate analysis, design and analysis of experiments, biometry, economic studies and the reports of the National Sample Survey, etc. Parts 1 and 2 of Volume 23, Series A and Part 4 of Volume 23, Series B are in the press.

*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 Aspect 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 arrangements have been made for the publication of the monographs in this series jointly by the Statistical Publishing Society and the Asia Publishing House under the auspices of the Indian Statistical Institute.

During the year, the following four books were published: *Industrial Statistics* by Dr. A. I. Ezhov; *Race elements in Bengal* by D. N. Mazumdar and C. Radhakrishna Rao; *Essays on Economic Planning* by Oskar Lange; and *Tables of Random Normal Deviates* by J. M. Sen Gupta and Nikhilesh Bhattacharyya.

The sixth book in the series, *Studies on Consumer Behaviour*, contains seven studies prepared by a number of research workers of the Institute. The seventh book, *Demonstration Planning Model for India* by Jan Sandee, was prepared by the author during his stay in the Indian Statistical Institute from October 1957 to the beginning of February 1959.

The eighth book in the series is *Planning for India: Selected Exploration in Methodology* by Ragnar Frisch. This book contains a selection of the studies made by the author on various technical aspects of national planning during his stay in the Indian Statistical Institute from the end of 1954 to the spring of 1955. The ninth and the tenth books in the series are *Environns of Tagore* and *Then and Now*, by Hashim Amir Ali. The first book is a study of the socio-ecological survey of the National Extension Service Block at Sriniketan. The second book is a socio-economic study of some villages in Bengal.

Other books in the series which are in various stages of printing are :

1. *Some Basic Planning Problems* by Charles Bettelheim,
2. *Experiments in Statistical Sampling in Indian Statistical Institute* by P. C. Mahalanobis,
3. *Mysore State Vol. I: An Atlas of Resources* edited by A. T. A. Learmonth and L. S. Bhat,
4. *Mysore State Vol. II: A Regional Synthesis* by A. T. A. Learmonth and
5. *Talks on Planning* by P. C. Mahalanobis.

## INDIAN STATISTICAL INSTITUTE

*Samvadadhvam* : The *Samvadadhvam* was first published in July 1956 as a house journal of the Institute during a period of its rapid growth 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 as well as those of rank and file workers. Each issue has different sections in English, Bengali and Hindi. During the year, the first number of the third volume was published in July 1959, the second in December 1959 and the third and fourth numbers were brought out as a combined issue in March 1960.

### PUBLICATION UNIT

It was established in April 1960, to look after, co-ordinate and expedite the entire publication work of the Institute. Its primary responsibilities are to sub-edit, to determine typography and lay-out and to see through the proofs. To cope with the increasing volume of work a new double-demy, automatic, flat-bed machine has been purchased.

### 10. GENERAL ADMINISTRATION

The Indian Statistical Institute continued to function as a non-profit organization registered on 28 April 1932 under the Societies Registration Act XXI of 1860.

#### CHANGES IN THE CONSTITUTION

The changes in rules which were made in 1956 but kept in abeyance pending statutory recognition were brought into effect from 28 March 1960 after the Indian Statistical Institute Act, 1959 (No. 57 of 1959) was passed by the Indian Parliament in December 1959. Only Rule 6 has not yet been brought into effect owing to certain difficulties. The Indian Statistical Institute Act declared the Institute as an institution of national importance and gave it powers to confer degrees in statistics.

#### MEMBERSHIP

During the year under review, 61 new members of different categories were enrolled and 4 members discontinued, bringing the total membership of the Institute to 428. The number includes 64 Life, 246 Ordinary, 3 Institutional, 92 Student and 15 Sessional members. The remaining eight are Honorary Members.

#### ANNUAL GENERAL MEETING

The Annual General Meeting was held on 30 October 1959 to transact the usual constitutional business, viz., the election of office-bearers and members of the Council of the Institute, adoption of the general report and statement of accounts for 1958-59 audited by P. C. Nandi & Co., Chartered Accountants. The list of office-bearers and members of the Council is given in Appendix 2.

#### MEETINGS OF THE COUNCIL

The Council of the Institute met eight times during the year on 29 April, 13 July, 30 September, 24 October and 19 November in 1959 and 30 January, 8 March and 25 March in 1960. The Council had to consider some of the most important business of the Institute including the Indian Statistical Institute Act, 1959. It was agreed on 30 January 1960

## TWENTYEIGHTH ANNUAL REPORT : 1959-60

that the degree to be conferred by the Institute should be degrees of a professional nature like degrees in engineering and medical sciences and might be termed B.Stat., M.Stat. together with D.Phil. or Ph.D. as Junior Doctorate; the D.Sc. degree might also be awarded as the Senior Doctorate. It was also decided that in making offers of appointment from 1 April 1960, it should be made clear that service under the Institute was transferable to any other office or unit of the Institute situated in any part of India.

### GOVERNING BODY OF THE RESEARCH AND TRAINING SCHOOL

The Governing Body met on 24 October and 19 November 1959 and on 25 March 1960, on the last two occasions under the chairmanship of Sri C. D. Deshmukh, President of the Institute and on the first occasion with Professor K. B. Madhava, one of the Vice-Presidents, in the chair.

### FINANCE COMMITTEES

The Finance Committee of the Council and the Finance Committee of the Governing Body met on 23 October 1959 to consider the audited statement of accounts, the report of the *ad hoc* Committee on the allocation of expenditure, the budget proposals and other matters.

The *ad hoc* joint committee of the Governing Body of the RTS and of the Council of the Institute examined the allocation of expenditure to different projects, on 23 October 1959 and submitted its report to the Finance Committees of the Governing Body and of the Council. A list of members of these committees will be found 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 and the distribution of the staff are shown in Appendices 13 & 14.

*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:

Bhat, V. S., B.E. (Civil), A.M.I.E. (India), 28 March 1960 (*Estate Office*); Chattopadhyay, Kamakshiprasad, 8 March 1960 (*Publication Unit*); Gupta, P. B., 8 December 1959 (*Demography*); Raja Rao, B. K., 18 November 1959 (*SQC Unit*); Sinha, S. P., Former Chief Director, National Sample Survey, Cabinet Secretariat, 24 October 1959 (*Administration*).

The following members of the staff left the Institute on the dates mentioned:

Bhagwati, Jagadish (*Planning Division, Delhi*), March 1960; Chatterjee, Jnanatosh (*IMRUP*), November 1959; Das, Asokananda (*Special Officer*), 31 March 1960; Dutta, S. K. (*Flood Research Unit*), September 1959; Godambi, V. P. (*Research & Training School*), December 1959; Mitra, Shib Kumar (*Psychometry*), November 1959; Ramchandra, K. V. (*IMRUP*), May 1960; Sinha, S. P. (*Administrative Officer*), 31 March 1960.

## INDIAN STATISTICAL INSTITUTE

### ESTATE AND TRANSPORT SECTIONS

The Estate Office designs and supervises all construction work in the Institute and looks after the repair and maintenance of its buildings, roads, grounds, furniture and other equipment. The electric installation and internal telephone system are maintained by a trained group of workers who also look after the refrigeration plants used for air-conditioning some of the laboratories and machine-rooms.

All buildings and hutments of the Institute at Baranagar and Giridih have been designed and constructed so far and are being maintained by the Institute's own staff. The Institute was occupying in 1960 about 1,25,000 sq. ft. of *pucca* buildings and nearly 1,00,000 sq. ft. of hutments in its different premises at Baranagar. The Institute was also occupying over 9,000 sq. ft. in rented premises in the city of Calcutta, and about 42,000 sq. ft. of buildings and 2,000 sq. ft. of hutments at Giridih.

Subodh Chandra Das Gupta was in general charge of the Estate Office. The Institute had started a transport section in 1945-46, and since then a number of light cars are being maintained for official work and the use of Institute guests. The Institute has 14 vehicles of various types in its fleet. 4,382 out of 4,494 requests for transport were complied with during the year.

### WELFARE AND GENERAL SERVICES

#### Visitors and Conferences

Over 500 visitors from India and abroad (from 27 countries) came to see the Institute in the year under review (See Appendix 3).

The Institute was host to a Preliminary Conference of Econometricians convened by the Indian members of the Econometric Society of the U.S.A. and held during 28-30 January 1960.

A Symposium on Operations Research, organized by the Institute, was inaugurated in the Institute premises by Sri Manubhai Shah, Central Minister of Industry, on 20 January 1960.

The Public Relations Unit was responsible for showing the visitors round the Institute and also for the house-organ *Samvadadhvam*.

#### International Guest Houses

Since 1938 distinguished foreign scientists began to come to the Institute as visiting professors and experts; and upto 1952 or 1953 most of them used to stay with Professor and Srimati Mahalanobis. The numbers 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 *Anurapali* were set apart for Institute guests.

In 1963 a House Committee was constituted with Srimati N. K. Mahalanobis as Honorary 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.

In 1955 and 1956 new hutments (East Cottage and North Cottage) were constructed to provide additional accommodation for the trainees of the International Statistical Education Centre and some of the many foreign visitors who came to attend the Twenty-fifth Anniversary Celebrations of the Institute. In this way, by the end of 1956, 32 single and double rooms, many of them with attached baths, became available for guests in these hutments.

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 1959-60 was 78. There is a guest house at *Mahua*, Giridih.

#### Medical Welfare Unit

The Medical Welfare Unit was set up in early 1945 and its benefits are available to the workers, members of their families as well as students and guests. The service includes free consultation, visits to residences at subsidized rates and the supply of medicines on a cost basis. The present staff of the unit is as follows : Dr. B. Goswami as consultant, and Dr. R. Maitra, Dr. S. C. Sen (resident medical officer) and Dr. A. Banerjee.

A separate Medical Unit at Giridih was in the 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 Seiboni Club at Giridih organized annual sports meetings, recreations and varied cultural activities. In addition, a music club *Suradhuni* at Baranagar was given certain facilities for its activities.

The ISI Volley Ball Team became champions in the B Division of the 24-Parganas District Volley Ball League. The representatives of the ISI Club also won the singles title and were runners-up in the doubles even in the 24-Parganas District Table Tennis Championship. The ISI Cricket Team was runners-up in the 24-Parganas District League. The cultural activities of members received considerable impetus with the introduction of a one-act drama competition in which seven teams participated. The two winning plays were staged during the twentyeighth anniversary celebrations of the Institute. The seventh issue of the club journal *Lekha* was brought out in December 1959. The annual social and prize distribution ceremony was held on 19 March 1960.

A rehabilitation loan of Rs. 6,393 was granted to refugee workers of the Institute and a sum of Rs. 16,257 was spent towards educational assistance to workers.

#### OPERATING CENTRES

For the first ten years (1932-1941) the work of the Institute used to be carried out 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' house at 87, now 204 Barrackpore Trunk Road, Calcutta-35 in Baranagar, a suburb of Calcutta) and another part to *Mahua* (Mrs. Mahalanobis' house) at Giridih, Bihar, about 200 miles from Calcutta, both of which were placed at the disposal



## INDIAN STATISTICAL INSTITUTE

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 it. Since 1954 the Institute was using about 8 acres of land and buildings at 202 B. T. Road, Calcutta-35 and the premises known as *Gopturnias* in the same neighbourhood which were placed at its disposal by the Government of India. The Institute subsequently purchased some other pieces of land at Baranagar measuring about three and a half acres.

In this way Baranagar (Calcutta-35) gradually became the headquarters of the the Institute. The Institute has constructed about 65,000 sq. feet of buildings and 25,000 sq. feet of hutments on its own land at 203 B. T. Road, Calcutta; and also occupies about 56,000 sq. feet of buildings and 75,000 sq. feet of hutments in other premises. Over 121,000 sq. feet of buildings and 100,000 sq. feet 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, the Guest Houses, and Central Offices and services are located at Baranagar where roughly 1,100 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, Indian Calculating Machine and Scientific Instruments Research Society (ICMSIRS) is associated with the Development Workshop.

*Calcutta City Offices*: The Institute occupies about 9,000 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 1940, 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 1950 was about 42,000 sq. ft. of buildings and 2,000 sq. ft. of hutments. 4,200 sq. ft. of extra space were acquired on lease the next year.

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 investigations. The National Sample Survey also has a branch at Giridih with a machine tabulation unit of 3 tabulators, 5 sorters, 1 collator, 1 multiplier, 1 reproducer and 3 gang and summary punches.

## TWENTYEIGHTH ANNUAL REPORT : 1959-60

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

The total number of workers at Giridih was 145 in 1960. 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 for the Government of India 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 Sri Pitambar Pant who is the Chief of the Division of Perspective Planning and also helps the Institute as its Honorary Joint Secretary.

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, Head of the Army Statistical Organization; and one SQC Unit which was established in Delhi in 1958 has also been working under his guidance. One small unit in the charge of a senior statistician, Dr. 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 upto 70.

*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.

*Bangalore* : One SQC Unit which is maintained at Bangalore works under the guidance of Sri Srinagabhusana.

*Field Branch* : The Institute has a field branch with a staff of about 220 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.

## 11. SOCIETY BRANCHES

### BOMBAY BRANCH

The annual meeting of the members of the Bombay Branch was held on 25 July 1959 and four meetings of the Council were held on 25 July, 20 August and 29 October 1959 and 16 March 1960 at the office of the Branch.

The meetings on 20 August and 20 October were held specially for discussing the inauguration of evening courses in statistics. The meeting held on 20 August 1959 considered a letter received from Sri N. C. Chakravarti regarding the library and agreed with his

## INDIAN STATISTICAL INSTITUTE

suggestions for its opening. At the meeting held on 25 July 1959, the Council approved the proposal that Sri M. G. Kotibhaskar and Dr. C. Nanjundayya be requested to fill the posts of Honorary Vice-Presidents. It was also decided to appoint an auditor to look into the accounts of the Branch in view of its increasing annual expenditure. Final decisions were taken regarding the conduct of the classes and a committee was appointed to look into the progress of the training course at the meeting held on 16 March 1960.

As there was a shortage of chairs and of office equipment, the Head Office made a grant of Ra. 1000 as contingency fund.

*Annual General Meeting* : Dr. N. S. R. Sastry presided at the meeting of the members of the Branch on 26 July 1960, in which the office-bearers for the year 1960-61 were elected; the minutes of the meeting held on 25 July 1959 were confirmed and the Annual Report and Statement of Accounts for the year 1959-60 was approved. The meeting approved a special report on the progress of the training course for the period April to June. The resignations of Sri V. V. Divatri and Professor M. C. Chakravarti were accepted.

### TRAINING CLASSES

Regular classes started from 6 April 1960. The training courses were formally inaugurated by Sri C. D. Deshmukh, President of the Institute, on 12 May 1960. In all 71 candidates appeared for the admission test out of the 102 candidates who had applied; the first thirty candidates were admitted in order of merit and the names of five were kept on the waiting list. The following persons kindly agreed to participate in the teaching programme: Sri P. K. Bhaumik (Deputy Director, Textile Commissioner's Office), Sri P. Gopalkrishnan (S.Q.C. Bombay), Dr. R. L. N. Iyyanger (Central Cotton Technological Laboratories), Professor V. B. Kamat (Director, Labour Welfare Institute), Sri G. S. Madala (Department of Economics, University of Bombay), Dr. C. Nanjundayya (Bombay Textile Research Association), Dr. S. A. Palekar (Glaxo Laboratories (India) Ltd.), Dr. N. S. R. Sastry (Statistical Adviser, Reserve Bank of India), Sri M. A. Telang (Director, Bureau of Economics and Statistics, Bombay), Sri T. P. Venkatachari (Chief Statistician, State Transport (Central Office) Bombay), Sri S. M. Vidwans (Bureau of Economics and Statistics, Bombay), Dr. M. M. Wagholkar (Bombay Textile Research Association), Dr. A. Matthai, Dr. D. Basu, Dr. J. Roy and Dr. S. K. Mitra (Research and Training School, Indian Statistical Institute, Calcutta).

### Institute Examinations

The Statistician's Diploma Examination was held at the Bombay Centre from 21 to 30 September 1959 and eighteen candidates appeared. The Diploma Examination was held at Bombay from 18 to 28 April 1960 and twelve candidates appeared. The Computer's Certificate Examination was also held at Bombay on 18 and 19 April and only one candidate appeared. The admission tests were held on 5 and 6 July 1959 and thirtyone candidates appeared.

### Library

The Council meeting held on 16 March 1960 appointed a Library Committee to discuss the standing orders. It was decided that the Library attached to the SQC Unit and of the Bombay Branch should be amalgamated and placed under the management of a local committee. The Secretary of the Bombay Branch will be the Chairman (*ex-officio*), Dr. N. S. R.

Sastry and Dr. D. T. Lakdawala, are to be the members; the Officer-in-Charge, SQC Unit, Bombay as Member-Secretary, and Officer-in-Charge, NSS Unit, Bombay as Member and Assistant Secretary. The Library will have to be expanded to meet the requirements of the training classes and every effort is being made in that direction with the assistance of the Head Office.

*Sample Survey* : The field work for the third sub-round of the fifteenth round (NSS) was completed during the year and the work for the fourth sub-round also started. Type studies relating to Consumption of Cereals and Capital Formation are being tabulated. The Migration Study was completed and analysis is on hand. A report on the pilot survey on Artificial Blocks Formation in ten census wards was submitted to the Head Office.

*A research project regarding formulation and testing of the schedules of the census of 1961* : Census economic concepts and categories constituted the main work of the first phase of this project. These were examined in a 'Preliminary Memorandum', issued at the end of February, 1958 in which detailed criticisms were made of the economic questions asked at the census of 1951. Thereafter, the project examined the problem of comparability of the economic data collected at the successive censuses of India since 1881. The results of the inquiry were embodied in a comprehensive three-part memorandum issued in June 1958 under the title, *Comparability of Census Economic Data, 1880-1951*.

Since June 1958, the work of the project has been focussed on three topics : 1. preparation of alternative sets of census schedules; 2. study of problems of classification by industry, occupation, status etc.; and 3. external aggregate checks on census data, particularly comparison of 1951 census data with related data collected by other surveys and sources. The substantive work of the project on these topics was completed. During the third phase, Mrs. Alice Thorner completed a survey on the working force size and occupational distribution in India, 1950-51, and in the fourth phase Dr. Thorner and Mrs. Thorner completed a review of the working force size in India, 1881-1951, reproduced in five parts. Part I gives trends in size and industrial distribution. Parts II and III give tables of Statewise distribution of working force by industry. Part IV gives tables showing the distribution of labour force in agricultural and non-agricultural sectors. Part V contains appendices.

*Visitors* : Mr. J. Yoshinosuke (Director, Japanese Management Association) and Mr. S. Yoshiue (Deputy Director, Planning Bureau, Government of Japan) visited Bombay in April. They met Dr. N. S. R. Sastry and Sri M. A. Telang. They also visited the office of the Branch and met high Government officials and businessmen.

Dr. A. N. K. Chalal (Director of Economic Statistics, Ministry of Planning, Syrian Region) and Miss Duric Mousley (United Arab Republic) visited Bombay on 30 July; Dr. Chalal met the Council Members at tea and had discussions on sample surveys in Syria.

Professor André Phillippe, ex-Finance Minister of France and Professor of Labour Economics, University of Paris, stayed in Bombay during 1-4 December 1959. He had discussions with the Governor, Deputy Governor and Dr. Sastry of the Reserve Bank; and also met prominent Government officials, University professors and trade union leaders. He visited Spinning Mills, an up-to-date technically equipped mill; and met members of the Council of the Branch at tea and had useful discussion on economic problems.

Mr. B. J. Macfarlane, Faculty of Economics, University of Sydney, came to Bombay on 17 December.

Professor P. C. Mahalanobis, who visited Bombay on 2 January in connexion with the Indian Science Congress, met the staff members of the Branch on the evening of

## INDIAN STATISTICAL INSTITUTE

the 4th and left for Delhi the next day. He visited Bombay again from 12 to 14 January, when he gave a stimulating lecture on perspective planning at the Banker's Training College for South East Asia, New Zealand and Australia; had discussions with Dr. Bhabha, visited the Atomic Energy Plant and gave a talk at the Tata Institute of Social Sciences. He discussed organizational matters connected with the SQO Unit and the Bombay Branch on the 13th with Sarbasri M. A. Telang, S. J. Mehta and S. L. Pillay. He also met the Council members of the Branch at tea. He advised the Branch to take up sample surveys on a matching basis with the Bureau of Economics and Statistics and expressed the opinion that the Branch was ideally suited for applying the techniques of SQC on sample surveys.

Sri N. C. Ghosh visited the Branch from 21 to 23 December to discuss a number of problems on sample surveys and visited the SQC Unit.

Dr. M. Kalecki, Vice-Chairman, Planning Commission, Poland, accompanied by Mrs. Kalecki, visited Bombay from 2 to 10 January; he came to India at the invitation of the Indian Statistical Institute. During his stay in Bombay, he had discussions with Professor Gadgil, Director, Gokhale Institute of Politics and Economics.

*Lectures*: Under the auspices of the Branch, Dr. A. N. K. Chalak gave a lecture on 30 July on 'Sample Survey in Syria' and Professor André Phillippe spoke on 'European Common Market' on 4 December.

*Personnel News*: Sarbasri V. S. Sahasrabudhe, V. M. Nadkarni, (NSS investigators), H. V. Khandekar, and K. C. Chandran, typist, resigned. Sri. G. S. Mate joined as investigator on 10 August.

### MYSORE STATE BRANCH

The Sixth Annual Meeting of the members of the Branch was held on 6 May, at the premises of the SKSJ Technological Institute, Bangalore. The Executive Committee of the Branch, on 29 July, elected office-bearers for the year 1959-60: (A list of office-bearers is given in Appendix 2). The office of the Branch was shifted from the premises of SKSJ Technological Institute to 4 Richmond Road, Bangalore from July 1959.

*Membership*: Sri Puttasomachary, M.Sc., District Statistical Officer, Belgaum, was elected as an ordinary member of the Institute. Dr. M. V. Jambunathan, M.A., B.Sc., Ph.D., National Tuberculosis Institute, Bangalore, was elected Life Member. On 18 February, the Executive Committee elected Sri R. Ramaswami, Vice-President as President of the Branch for the remaining period of the year.

*Sample Surveys*: A sub-committee, with the following members, with powers to co-opt, was appointed on 22 August to draft definite proposals for conducting pilot sample surveys on the development of Industrial Estates in Mysore and Madras States: Sarbasri M. C. Satyanarayana (Convener), H. S. Narayana Rao, S. K. Iyengar. Sri P. S. Narayana was subsequently co-opted a member. Sarbasri M. C. Satyanarayana, S. K. Iyengar and P. S. Narayana were requested by the Executive Committee on 24 October to visit the Madras Industrial Estate and the Industrial Estates in Mysore State and to draw up a report thereon for a comparative study, on the basis of which further proposals could be formulated.

*Examinations*: The Computer's Certificate Examination, the Statistical Field Survey Certificate Examination and the Statistician's Diploma Examination of the Indian Statistical Institute were held at the Bangalore Centre during September 1959, March 1960 and September 1960.

*Training Course in Statistics* : A sub-committee was formed on 24 October 1960 with the following members to formulate proposals to conduct training classes for Computer's Certificate Examinations of the Indian Statistical Institute and Methods of Statistics for Quality Control Workers : Sarbasri S. K. Iyengar, H. S. Narayan Rao, M. C. Satyanarayana, C. A. Setty, M. V. Venkataraman (Convener).

*Lecture* : Under the joint auspices of the Branch and the Quality Control Association, Bangalore, Mr. Morris J. Solomon, TCM expert on Operations Research, USA, gave a talk on "Work Sampling for Better Plant Utilization" on 7 October, 1960. Sri A. K. Bose, Chief Industrial Engineer, Hindustan Aircraft Ltd., presided.

On the eve of his departure on an assignment with the United Nations Organization, the members of the Branch met Sri A. Ananthpadmanabha Rau, President of the Branch, at tea on 26 November 1959. Sri S. C. Sen, Honorary Adviser of the Institute, was also present.

## 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 its workers but have also contributed to a wider knowledge and an appreciation of the work of the Institute and of Indian conditions and problems in other countries.

During the year, a number of 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 of the visiting scientists is given below. The dates in parenthesis indicate the period of their work in the Institute.

1. ADLER, SOLOMON, Lecturer in Economics, University of Cambridge, U.K.  
*Lecture* : Two Years of Economic Development in China (*December*).
2. BARMA, TWUM, Head, School of Agriculture, Kumasi College of Technology, Kumasi, Ghana (*30 January-9 February*).
3. BARTLETT, M. S., University of Manchester, U.K. *Lectures* : (i) Stochastic Process and Statistical Inference, (ii) Stochastic Population Models (*May*).
4. BOHR, NEELS, Nobel Laureate, Director, Institute of Theoretical Physics, Copenhagen, accompanied by Mrs. Bohr visited the Institute on 16 January 1960. Professor Bohr later addressed the workers of the Institute in the mango-grove.
5. CHALAK, A. N. K., Director of Economic Statistics, Ministry of Planning, Syrian Region, Officer on training (*30 April-19 July*).
6. CLARKE, L. W., Assistant Director, East African Statistical Department, Nairobi, Kenya; accompanied by Mrs. Clarke (*11-16 October*).
7. CHRISTOV, CHRISTO, Professor of Theoretical Physics, University of Sofia, Corresponding Member, Bulgarian Academy of Sciences (*19-25 January*).
8. COCHRAN, W. G., Harvard University, Cambridge, U.S.A. *Lectures* : (i) Problems in Multivariate Classification with Qualitative Data ; (ii) Comparison of Methods for Determining Stratum Boundaries in Stratified Sampling (*June*).
9. DAVIDSON, JAMES H., Manager, Mathematical Analysis, General Electric Company, New York; worked in the Institute from July 1959 under the TCM Scheme of the Government of the USA. He gave lecture on 'A way of Looking at Inventory Control' (*September 1959*) and participated in a course of lectures on Operational Research from *July 1959 to August 1960*. He died on *7 August 1960*.

## INDIAN STATISTICAL INSTITUTE

10. DORZHANSKY, TH., Professor of Zoology, University of Columbia, U.S.A. *Lecture: Gene Recombination and Genetic Variance (February).*

11. GALBRAITH, J. K., Professor, Harvard University came to India on 5 April 1959 as a guest of the Indian Statistical Institute for the second time.

12. GATES, RUGGLES, Biologist, University of London; accompanied by MRS. GATES (20 November).

13. GHURRYE, S. G., North-Western University, Evanston, U.S.A. *Lecture: (i) A Convulsive Class of Monotone Likelihood Ratio Families, (ii) A Characterization of Some Location and Scale Parameter Families (August).*

14. GINI, CORRADO, University of Rome, Italy. *Lecture: Some Aspects of the Sex Ratio in Human Populations (June).*

15. HAJOS, G., Head, Section for Mathematical and Physical Sciences, Budapest University (16-23 January).

16. HULUBEI, HORIA, Director, Institute of Atomic Physics, Rumania; member, Rumanian Academy of Sciences (13-20 January).

17. HYPPOLA, J., Director, General Division, Central Statistical Office. Visiting expert under U.N.T.A.A. (14 September-17 November).

18. JEFFREYS, HAROLD, University of Cambridge, U.K. *Lectures: (i) Fundamentals and an Approach to Estimation and Significance Problems, (ii) A Proof of the Pitman-Koopman Theorem Extended to the Case where both the Parameters and the Observable are Capable Only of a Discrete Set of Values (November).*

19. KALECKI, M., Vice-Chairman, Economic Council and Member, Planning Commission, Poland. *Lecture: The Main Problems of the Third Five Year Plan of India. (13 December 1959-29 March 1960).* He worked in the Delhi Unit on problems of planned development and wrote a paper on "An Outline of Financial Policy for the Third Plan".

20. KANNISTO, VAINO, U.N. expert in demographic statistics in Cambodia. Short-term lecturer in I.S.E.C. under U.N.T.A.A. (2-16 September).

21. KONORSKY, JERZY, Corresponding Member, Polish Academy of Sciences (1-5 February).

22. LEWIS, JOHN, P., Professor, Business Economics & Public Policy, School of Business, Indiana University (11-13 November). He worked in the Delhi Unit and helped in preparation of papers on the strategy of development.

23. MACFARLANE, B., University of Sydney, Australia. *Lectures: Planning Techniques in Yugoslavia.* He worked in the Delhi Unit of the Institute to study planning methods in India (December 1959-March 1960).

24. MATHEW, LILY, Registrar, Department of Ophthalmology, Christian Medical College & Brown Memorial Hospital, Ludhiana, Punjab (12 December 1959-3 January 1960).

25. MOUSLI, D. A. L., Officer on training (30 April-19 July).

26. NADLER, MORTON, lately of the Institute of Computing Machines, Prague, Czechoslovakia, joined the Institute in February 1959 and gave a course of lectures on "A Logical-Metric Approach to Confounding".

27. OKUNO, T., Chief, Experimental Design Laboratory, National Institute of Agricultural Sciences, Japan, worked in the International Statistical Education Centre. He participated in the teaching programme of the ISEC (3 November 1959-3 May 1960).

TWENTYEIGHTH ANNUAL REPORT : 1959-60

28. ORLOFF, C. C., University of Belgrade, Yugoslavia. *Lectures* : (i) General Spectral Mathematics, (ii) Practical Spectral Arithmetic (11 November 1959-5 April 1960).
29. PHILIPPE, A., Former Finance Minister of France, Professor, Labour Economics, University of Paris; Chairman, European Socialist Movement for the United States of Europe. *Lecture* : The Role of France in Europe Today (November).
30. POP, EMLL, Professor of Plant Physiology, University of Cluj; member, Rumanian Academy of Sciences (13-20 January).
31. RASE, U. (Mrs.), Research Fellow, Democratic Republic of Germany, worked in the Delhi Unit on the subject of Indian Public Finance (March).
32. REDDAWAY, W. B., Director, Department of Applied Economics, Cambridge University, U.K. *Lecture* : The Role of Sample Surveys in Supplying Statistics for Planned and Unplanned Economies. (February 1960). He worked with the Delhi unit on studies relating to the structure of the Indian economy: 1960-61 to 1965-66; and time lags and phasing.
33. REED, JAMES C., Director, Department of Reading & Study Skills, Wayne State University. Fulbright Scholar (24 August 1959-22 April 1960.)
34. SALAM, ABDUS, F.R.S., Imperial College of Science and Technology. London (30 December).
35. SLATES, H. M., Argonne National Laboratory, Lemont, U.S.A. *Lecture* : The Frequency of Abnormal Genes in Man (October).
36. SOLOMON, MORRIS J., Mathematical Statistician, Sampling, Atlas Powder Company, Wilmington, U.S.A., joined the Institute as a TCM expert in October 1959.
37. SVEJNAR, ZDENEK, research worker, Economic Institute, Czechoslovak Academy of Sciences (3-16 September and 11-18 November).
38. SIKOTI, G., Director, Institute of Technical Physics, Hungarian Academy of Sciences (16-22 January).
39. THORNER, DR. DANIEL & MRS. ALICE, worked in the Bombay Unit from January 1959 to April 1960 on a research project regarding formulation and advance testing of the schedules of the 1961 Census.
40. TINTNER, GERHARD, Iowa State University of Science and Technology, Ames, U.S.A. *Lectures* : Logistic Law of Economic Development, (ii) Statistical Criteria for Definiteness of a Matrix (6 June-17 August).
41. YATES, FRANK, Head, Department of Statistics, Rothamsted Experimental Station, U.K. *Lectures* : (i) Development of Techniques on the Analysis of Surveys on Electronic Computers, (ii) Progress of Agricultural Research in India (December).

Besides the above, the following economists of the Massachusetts Institute of Technology Centre for International Studies in India helped the Delhi Unit of the Institute in the work relating to the subject mentioned against each name from time to time during the year :

42. HUMPHRY, D. : Private investment in the organized manufacturing industries and mining and its financing during the Third Five Year Plan.
43. LITTLE, I. M. D. : Studies relating to public finance and tax policy in the Third Five Year Plan.



## INDIAN STATISTICAL INSTITUTE

44. LYDALL, Dr. H. F. : A study on consumption, saving and incidence of taxation.
45. SWAN, T. : Inter-relationship between investment, output and employment for organized manufacturing.

The following Indian economists were associated with the research work of the Delhi Unit during the period :

46. BHAGWAT, JAODISH, Fellow, Oxford University.
47. GULATI, I. S., Professor of Economics, Baroda University.
48. SEN, A. K., Fellow, Cambridge University.

### 13. VISITORS

Among other visitors may be mentioned SHARIF ADIB-SOLTANI, Economic Division, Plan Organisation, Tehran (23-25 March) ; Air Vice-Marshal BHATIA, Ministry of Defence (12 December) ; ABBAS GHEZELBASH, Head, Statistical Section, Economic Division, Plan Organisation, Tehran (23-25 March) ; JEAN LEQUILLER, Cultural Councillor, French Embassy in India (11 April) ; E. LINDER, Director, U.S. National Health Survey (13 February) ; KINGSLEY MARTIN, Editor, New Statesman (21-22 February) ; ERNST MAYR, Agassiz Professor of Zoology, Harvard University (February 1960) ; J. P. MILLER, Head of Social Science, Yale University (13 January) ; SIR, WALTER C. PUCKEY, Director, International Computers and Tabulators Ltd. (14 January) ; N. C. SEN GUPTA, Joint Secretary, Ministry of Finance, Government of India (30 January) ; EDOAR SNOW, author (18 December) ; and C. N., VAKIL, Director, UNESCO Research Centre (10 November).

A classified list is given in Appendix 3.

### 14. VISITS ABROAD

The Indian Statistical Institute is extremely grateful to the Ford Foundation for a grant which was utilized to pay the whole or a part of the expense for the visits abroad of the following workers :

Sri M. N. Murthy, National Sample Survey, left on 23 February 1960 on a study tour, sponsored by the Indian Statistical Institute, which included visits to the USA, Canada and some other countries in Europe and the Middle East. While in the USA, he studied the organization and function of the U.S. Bureau of Census and also the method used in the various censuses and current surveys. He participated in the work of the 1960 U.S. Census of Population and Housing. On his way back, Sri M. N. Murthy spent two weeks in the U.K. and also stopped at the Hague, Paris, Geneva, Rome, Athens, Cairo and Beirut where he visited a number of statistical organizations and had discussions on different aspects of data collection and compilation. He returned to India in October 1960.

Dr. V. L. S. Prakasa Rao, Regional Survey Unit, went on a study and lecture tour, sponsored by the Institute, in the U.K. Europe and the USSR from October 1959 to March 1960. He visited eleven universities in the U.K., viz., Liverpool, Nottingham, Birmingham, Manchester, Oxford Cambridge, Leeds, Glasgow, Edinburgh, Belfast and Dublin; eleven in Europe, viz., Paris, Belgrade, Bonn, Berlin, The Hague, Brussels, Stockholm, Lund, Upsala, Leipzig and Warsaw, Moscow and Leningrad Universities in the USSR to give lectures and

seminars to postgraduate and research scholars, on regional surveys, delimitation of regions, and area stratification for sampling in regional surveys for planning. He also visited a number of regional survey and planning organizations and cartographical institutes in the U.K., Switzerland, France, Italy, Germany, Belgium, Netherlands, Poland and the USSR to study the practical aspects of regional planning and advanced methods of cartography.

Sri Subodh Kumar Roy, Biometry Unit, went on a study and lecture tour in Europe from the end of *February* 1960 to *December* 1960. He participated in an advanced course in genetics and plant breeding organized by the FAO in Sweden for about six months from *March* 1960. He visited many universities and research institutions in Sweden, Denmark, West Germany, Holland, the United Kingdom, France, Switzerland and the Soviet Union. He was invited to deliver lectures at the Forest Research Institute, Stockholm; Sir Dunn School of Pathology, Oxford University; Department of Genetics, Glasgow University; Department of Botany, University of Edinburgh; Department of Botany, University College, London; Department of Botany, University of Geneva; Main Botanical Garden of the Academy of Sciences, Moscow; Botanical Society, Leningrad; Botanical Institute of the Academy of Sciences, Leningrad.

Sri T. K. Roy Choudhury, Geological Studies Unit, spent a year (*September* 1959-*September* 1960) in the United Kingdom, mainly at the University College, London, taking an advanced course in vertebrate palaeontology, participating in field classes in geology and doing researches on some of the vertebrate fossils discovered and collected by the Unit in the Maleri beds in the Godavari-Franhita Valley, India. He also visited some European museums as part of his research training.

Sri R. K. Som, National Sample Survey, presented a paper to the International Population Conference in Vienna during *August-September* 1959. He also visited centres of population work in Rome, Geneva, Paris, London and Moscow in *September-October* 1959.

Besides the above, the following workers of the Institute also paid visits abroad :

Sri D. B. Lahiri, National Sample Survey attended a meeting of the Working Group of Experts on Sampling Methods of the ECAFE at Bangkok from *14* to *25 September* 1959.

Professor P. C. Mahalanobis went to Moscow on *23 April* 1959 at the invitation of the USSR Academy of Sciences which had elected him as a Foreign Member in the previous year; a brief ceremony was arranged by the Academy to award the diploma. In Moscow he delivered lectures at the Institute of World Economy, the Central Statistical Board, the Institute of Oriental Studies, etc. and held group discussions on the methodology of sample surveys, mathematical statistics, and problem of planning in India.

Professor Mahalanobis had a long interview with His Excellency Mr. Nikita Khrushchov, Prime Minister of the USSR, on *7 May* 1959. He also had discussions on the possibility of international collaboration at a technical and non-governmental level, in studying problems of economic development of pre-industrial countries. He visited Poland, Switzerland, France, the U.K. and Holland, gave lectures on mathematical statistics and planning and had discussions on international cooperation in studying problems of planning; and returned to India on *28 June* after a short halt in Moscow on the way back (Appendix 4).

Sri Moni Mohan Mukherjee, Planning Division, attended, as a delegate from India, the meeting of the Working Party on Capital Formation under the auspices of the UN Bureau of Technical Assistance Operations at Bangkok in *November* 1959.

## INDIAN STATISTICAL INSTITUTE

The Institute sent under the Colombo Plan Programme three Statistical Quality Control specialists, viz., Sri R. G. Narasimhan of Calcutta, Sri P. V. Sivaramakrishnan of Bombay and Sri S. J. Mehta of Baroda, for advanced training in Statistical Quality Control to the Imperial College of Science and Technology, London. They also visited and worked in different factories.

Sri R. G. Narasimhan left India on 28 April 1959 and returned on 4 December 1959. He attended meetings of the Royal Statistical and Operational Research Societies and Conferences on Quality in Industry sponsored by the British Productivity Council and Institute of Production Engineers and Engineering Inspection and also a conference on Operations Research in Paris. He visited and worked in different factories in London, Bristol, Derby, Sheffield and Birmingham.

Sri P. V. Sivaramakrishnan left for the U.K. on 30 September 1959 and came back in April 1960. He visited and worked in a number of plants in the U.K. Sri S. J. Mehta left for the U.K. in February 1960 and stayed there for about seven months.

### 15. EXTERNAL ACTIVITIES

#### CONFERENCES

A Preliminary Conference of Indian Econometricians was held at the Institute in January 1960. The conference, which was convened by some Indian members of the Econometric Society of the USA, was inaugurated by Professor P. C. Mahalanobis and presided over by Dr. N. S. R. Sastry. About 30 delegates from several universities, the Central Statistical Organization, the Reserve Bank of India and the Indian Statistical Institute attended the conference and some of them presented papers.

#### INDIVIDUAL ACTIVITIES

As in previous years the workers of the Institute participated in various conferences, served on Committees and gave lectures at many places in India. An account of these activities is given in Appendix 16 but mention may be made here of some of the more important of these activities.

Professor J. B. S. Haldane and Dr. Spurway continued to serve on the Zoological Sub-Committee of the University Grants Commission. Professor Haldane was invited to give lectures at several universities.

Professor Mahalanobis presided over the third All-India Labour Economics Conference in Madras in January 1960, and delivered an address on "Labour Problems in a Mixed Economy"; he gave the presidential address at the annual general meeting of the Association of Scientific Workers of India which was inaugurated by Sri Jawaharlal Nehru in Bombay in the same month; and also gave a lecture on Fractile Graphical Analysis in the Statistics Section of the fortyseventh session of the Indian Science Congress in Bombay.

Dr. Ramkrishna Mukherjee presided over the Sociology Section of the fifth All-India Sociological Conference held at Lucknow in March 1960 where he gave an address on "Some Considerations on Social Research".

Dr. C. R. Rao presided over the Statistics Section of the fortyseventh session of the Indian Science Congress, the subject of his presidential address being "Multivariate Analysis, an Indispensable Tool in Applied Research".

## 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 also given in this section to relevant papers in Appendix 5.

### RESEARCH AND TRAINING SCHOOL

#### A. THEORETICAL STATISTICS

*Stochastic Process*: The problem of estimating the spectral distribution as well as the spectral density (if it exists) of a weakly stationary process is solved under the sole assumption that the sample covariances converge almost surely and in mean to true covariances. The orders of convergence of the bias and variance to zero are found. Even though the periodogram of a weakly stationary process does not converge to the spectral density in any sense, it has been shown that when it is divided by  $\log \log N$  its superior limit is equal to the spectral density with probability one. (S8)

A theory of the addition of random vectors in space of two or more dimensions was developed, and 'vectorial cumulants' which have properties analogous to those of ordinary cumulants, were described. To calculate the diffusion rate of genes it is necessary to add the vectors of successive generations. Data have been published for Sweden and are accumulating for Orissa on the distribution of distances between birth places of parents and children. Methods are given for their analysis. (P8)

*Probability Theory*: It is shown that the Haar measure on  $G$ , on infinite compact abelian group can be written as the convolution of two singular distributions. It is also proved that in any non-discrete locally compact abelian group there are singular measures whose convolution is absolutely continuous. (S12)

Let  $X$  be a complete separable metric space and  $\mu_n$  ( $n = 1, 2, \dots$ ) a sequence of distribution converging weakly to  $\mu$ . Then the following two questions are investigated: (1) to isolate classes of functions over which  $\int f d\mu_n$  converges uniformly to  $\int f d\mu$ , (2) to find classes of continuity sets over which  $\mu_n(A)$  converges to  $\mu(A)$  uniformly. The applications of these problems to (1) law of large numbers for general random elements and (2) generalization of the Glivenko-Cantelli lemma are also given. (S11)

Let  $X_1, X_2, \dots, X_n$  be independent observations on a random variable  $X$  with mean zero, let  $a$  be a positive constant such that  $P(X > a) > 0$  and let  $p_n = P(X_1 + \dots + X_n \geq na)$ . Under the assumption that the moment generating function of  $X$  exists, an asymptotic expansion,  $q_n$  is obtained which is accurate in the sense that  $q_n/p_n \rightarrow 1$  as  $n \rightarrow \infty$ . (S2).

Let  $T_n$  denote the number of classes observed in a sample of size  $n$  from a multinomial population with infinitely many classes. The rates at which  $T_n \rightarrow \infty$  as  $n \rightarrow \infty$  is studied, and a computational method is obtained. This method shows, for example, that if the probability distribution over classes is Poisson and  $\mu_n = \log n / \log_2 n$  then  $T_n/\mu_n \rightarrow 1$  is probability. (S1)

Though the marginal distributions of the ancillary statistics are independent of the parameters, they are not useless or informationless. A set of ancillaries may sometimes summarize the whole of the information contained in the sample. A classification

## INDIAN STATISTICAL INSTITUTE

of the ancillaries in terms of the partial order of their information content is attempted. In general there are many maximal ancillaries. Among the minimal ancillaries there exists a unique largest one. When there exists a complete sufficient statistic, the problem of tacking down the maximal and minimal ancillaries becomes greatly simplified. (P5)

It is first surmised that if a sequence of marginal and conditional distributions converge then the joint distributions also converge. This is shown to be not always true when all the convergences are interpreted to be weak. The problem is then properly formulated and the main content of the surmise established under suitable restrictions. (S13)

Asymptotic equivalence of two sequences of distribution functions  $F_n$  and  $G_n$  is defined. This permits the use of  $G_n$  to approximate  $F_n$  for large  $n$ . Certain properties of asymptotic equivalence are studied. These results are used to justify the normal approximation to the generalized hypergeometric distribution. (S7)

*Information Theory*: For channels with infinite memory a new definition of the rate of transmission is given. By utilizing the representation of a general stationary measure as a direct integral of ergodic measures due to Krylov and Bogolioubov an integral representation for the rate of transmission of any stationary input in terms of the rates of ergodic inputs is obtained. Such a representation leads to two important results: it shows that for any stationary channel the ergodic capacity is equal to the stationary capacity, and that the ergodic capacity is attained whenever the stationary capacity is attained. (S9)

*Fractile Graphical Analysis*: Making use of the concept of fractile graphical analysis new methods of estimating and testing regression functions are proposed. The limiting distributions of the statistics involved are calculated. (S3)

*Estimation*: Some years ago Lecam and Hodges of the University of California constructed examples of what are called super efficient estimates to show that among the class of consistent estimates there is no class of estimates for which the asymptotic variance is uniformly minimum. It was therefore thought that the concept of asymptotic efficiency as defined by Fisher was null and void. A few years back an investigation carried out at the Institute showed that the anomaly was due to a wrong interpretation of consistency as originally defined by Fisher. This was called Fisher consistency (F.C.) to distinguish it from the definition of consistency related to a sequence of statistics  $T_n$  as  $n \rightarrow \infty$ .

Recent research has shown that a more meaningful definition of asymptotic efficiency is that the asymptotic correlation between the statistic  $T_n$  and  $(d \log L/d\theta)$ , the derivative of log likelihood with respect to the unknown parameter  $\theta$ , is unity. With such a definition we need not have any restriction on the statistic  $T_n$  as a function of the observations. An equivalent definition of asymptotic efficiency is

$$|\sqrt{n}(T_n - \theta) - \frac{1}{\sqrt{n}} \frac{d \log L}{d\theta}| \rightarrow 0 \text{ with probability } 1.$$

It is shown that a statistic efficient in the new sense may be super or sub efficient in the old sense. Examples of super efficient estimates with asymptotic correlation less than unity with  $(d \log L/d\theta)$  and therefore inefficient for purposes of statistical inference, have been given. The method of maximum likelihood and also some other methods do yield estimates which are efficient in the new sense. It is further shown that in the case of estimation of a multinomial distribution of the rate of convergence of the difference  $[\sqrt{n}(T_n - \theta) - (d \log L/d\theta)/\sqrt{n}]$  to zero is the highest when  $T_n$  is the maximum likelihood

estimate. The rate is measured by the asymptotic variance of  $\sqrt{n}$  times the above difference, which has been called  $E_n$  the second order efficiency of a statistic. The value  $E_n$  has been computed for a number of methods of estimation including the maximum likelihood for which it has the minimum value (which means most efficient). (C34, C35)

Let  $x_1, x_2, \dots$  be a sequence of independent and identically distributed observations with distribution determined by a real valued parameter  $\theta$ . For each  $n = 1, 2, \dots$ , let  $T_n = T_n(x_1, x_2, \dots, x_n)$  be a statistic such that the sequence  $T_n$  is a consistent estimate of  $\theta$ . It is shown, under weak regularity conditions on the sample space of a single observation, that the asymptotic effective standard deviation of  $T_n$  cannot be less than  $[n I(\theta)]^{-1/2}$ . The asymptotic effective standard deviation of  $T_n$  is defined, roughly speaking, as the solution of the equation  $P(|T_n - \theta| \geq \epsilon/\theta) = P(|N| \geq \epsilon/r)$  when  $n$  is large and  $\epsilon$  is a small positive number, where  $N$  denotes a standard normal variable. It is also shown, under stronger regularity conditions, that the asymptotic effective standard deviation of the maximum likelihood estimate of  $\theta$  is  $[n I(\theta)]^{-1/2}$ . These conclusions concerning estimates are derived from certain conclusions concerning the relative efficiency of alternative statistical tests based on large samples. (P4)

It is shown by an example that if  $B$  and  $C$  are two statistics unbiased for a parameter  $\theta$  and  $C$  has uniformly smaller variance than  $B$  then for testing  $\theta = \theta_0$  against an alternative (say  $\theta > \theta_0$ ), the test based on  $C$  need not have more power than  $B$  locally (i.e., near the null hypothesis). (S14)

*Large Sample Theory* : The distribution of the extremal value (largest or smallest value) of a sample from a normal distribution only tends to the Fisher-Tippett distribution very slowly as the sample size increases. It was shown that the distribution of its square follows this distribution in much smaller samples. (S5)

The asymptotic distributions of a  $U$ -statistic (Hoeffding), sample quantile and extreme ordered statistic are all well known. Under certain mild restrictions it has been established that the joint distribution of the normalized  $U$ -statistic and the  $a_n$ th ordered statistic is (i) bivariate normal in case the ordered statistic is a sample quantile, (ii) the joint distribution of two independent random variables one of which is normal and the other gamma in case  $a_n = \text{constant}$  or  $n - a_n = \text{constant}$  and (iii) the joint distribution of two independent normal variables in case  $a_n \rightarrow \infty$  and  $\frac{a_n}{n} \rightarrow 0$  or  $\frac{n - a_n}{n} \rightarrow 0$ . These theorems are generalized to include several  $U$ -statistic, several ordered statistics and generalized (Lehmann)  $U$ -statistics. (P20)

*Econometric Studies* : A study of concentration curves as description of consumption pattern has been made (P34). The adequacy of the Pareto (P35) and the log-Normal (P36) curves for describing the distribution of per capita expenditures for rural and urban India was examined. Constant elasticity curves (P35, P38) and Tornquist's forms (P36) have been used to describe demand functions for various commodities and elasticity coefficients have been evaluated. Methods have been developed for estimating future national demand for specific commodities. (P35, P38)

*Multivariate Analysis* : The power function of the analysis of dispersion test (multivariate analysis of variance) has been worked out in a form suitable for numerical evaluation when there is a single deviation parameter and its magnitude is small (P19). The sampling distribution of likelihood ratio criteria in tests of independence and symmetry

## INDIAN STATISTICAL INSTITUTE

in multivariate normal populations has been expanded in an asymptotic series in chi-squares and tables of coefficients that occur in this expansion have been prepared. (P18)

The measurements of a number of characteristics of an individual known to belong to one or other of the two populations  $P_1$  and  $P_2$  are available and it is required to classify the individual. If the distribution of these measurements in the two populations are fully known this may be best done using the likelihood ratio. Various authors have suggested the use of various statistics constructed from sample estimates of the parameters in situations where the parameters are not all known. To set up the classification procedure and to evaluate the performance characteristics of the procedure thus set up, we require the distributions of these statistics. The necessary distributions are obtained in the case of statistics proposed by Anderson, Wald and Rao. (P9)

Whether the alternate populations are fully known or not, we can, for each population test whether the measurements provided by the individual to be classified could be an observation from that population. It seems reasonable to assign the individual to the population registering significance at the highest level. The performance characteristics of such a procedure are studied. (P10)

*Design of Experiments*: It has been proved that for any equireplicate design the 'reinforced design' obtained from it has higher efficiency-factor for the original set of treatments. (S15)

A survey has been made of the existing efficiency criteria for incomplete block designs, and a new and simpler one is put forward. (S16)

The accuracy of the various ratio approximation to the null distribution of the  $F$  statistic, arising in the intrablock analysis of a BIBD, has been studied. (P30)

### B. APPLIED RESEARCH

#### *Biometric Unit*

*Rice*: When two varieties are planted together the joint yield per unit is about as often below the mean of the yields when they are grown alone as above it. However one pair of varieties which cooperated in 1958 have now, when planted in alternate rows, given a yield 26% above this mean and 10% above that of the higher yielding variety (8 replications at Giridih). The cooperative action is significantly positive, though lower when the two varieties are grown in the two halves of a 0.01 acre plot surrounded by a bund. On the other hand flooding abolished cooperation, though it did not always lower yields. It is clear that interaction takes place largely through water. The experiments of this year were largely spoiled by floods. However, as will be seen, these yielded some information.

*Silk Worms*: Work on the *tasar* moth continues, and some *mugs* moths have been bred. The patterns of the *tasar* caterpillar yield a  $12 \times 12$  matrix of organic correlations which is under investigation. (S37)

*Human Genetics*: The largest pedigree yet collected showing holandric inheritance (from father to all sons and no daughters' sons) has been sent to press. It is presumably due to a gene on the  $Y$ -chromosome. This research is being further extended. In collabora-

tion with two local physicians, research is being carried out to determine the frequency and genetic consequences of consanguineous marriages in different communities in Andhra Pradesh. (S24)

*Insect Behaviour in Relation to Plant Pollination* : Observations of the preferences of various butterfly species for different colour varieties of *Lantana camara* were extended by observing the preferences of animals which had emerged from their pupae in the laboratory. These preferences, which are often strong, are independent of their previous individual experience. To continue this work, a collection of *Lantana* plants is being made, to which the Central Botanical Laboratory of the Botanical Survey of India, the faculty of Agriculture, Osmania University, Hyderabad, and many private individuals have contributed. (S23, S26)

*Segregation* : The precision of an estimate of a segregation ratio, whether it approximates to 1 : 1 or 3 : 1 as in simple Mendelian inheritance, or depends on a recombination frequency which may have any value between zero and  $\frac{1}{2}$ , is a function of the homogeneity of the data. Only if they are homogeneous can the usual standard errors or confidence intervals be used. A study of segregations (in one case into 32 classes) in *Drosophila melanogaster* has shown that homogeneity was often found, but there were some highly significant exceptions.

*Mutagenesis* : Some data on the production of lethal mutations in mice by gamma rays, obtained at Harwell, England, have been re-examined. It is concluded that the best estimate of the mutation rate in the treated mice is three times that given by the worker concerned. (P30)

*Genetic Equilibria* : It has often been stated that an equilibrium under selection of constant intensity for each genotype at an autosomal locus in a diploid population is only possible if the mean fitness of heterozygotes exceeds that of homozygotes. This has been shown to be incorrect, and a more nearly correct theory has been developed.

*The "Cost" of Natural Selection* : The loss of fitness in a population due to natural selection, sometimes called the "evolutional load" has been recalculated with a considerable gain in accuracy.

*Clinical Studies* : A laboratory investigation of serum cholesterol and blood pressure was completed. The data indicated that, in adult male Bengalis, relationships between serum cholesterol and blood pressure can be attributed at least in part to the influence of weight. The effect of age was most marked on diastolic pressure; its effect on systolic pressure and serum cholesterol was less important. A further investigation on blood pressure was carried out in which 1500 male and female Bengalis, ranging in age from 15 to 70 years, were examined. Serum protein data have been collected in the laboratory, along with cholesterol and inorganic phosphorus measurements, for adult male Bengalis. (P24, S19)

*Fish Ecology* : The initial number or density of fish at the embryonic stage of life was found to affect survival during the first two weeks of life. The relationship between initial number and final proportion surviving was described by a hyperbola and accounted for over 80 per cent of the variance. Treatments with vitamin B<sub>12</sub> and vitamin B complex were observed to reduce the density effect during the first week of life and to eliminate it in the second week. (P22, P23, S20)



## INDIAN STATISTICAL INSTITUTE

### *Psychometric Unit*

*Occupational and Educational Selection* : Selection tests were developed, administered and scored for a number of posts both within and outside the Institute. The medical college selection programme (for Vellore and Ludhiana Christian Medical Colleges) was continued, and the Unit assisted the RTS in the selection of trainees for the advanced, short-term and computer courses. A new project of selecting librarianship trainees by psychometric tests was undertaken at the request of the Bengal Library Association. College Entrance Examination, Graduate Record Examination, Law College Examination etc., were conducted on behalf of the Educational Testing Service, Princeton, U.S.A. Tests were also developed and conducted for the selection of NSS record assistants.

*Studies in Industrial Psychology* : Papers were prepared reporting empirical research on motion-time study for reorganization of workspace, motion study for non-repetitive work, a quantitative rating method for screening job application letters, efficiency of the Ishihara Colour Vision Test, and tests of spatial ability and verbal reasoning. Reviews were completed on personnel selection methods, dimensions of industrial supervision, methods for efficiency appraisal, and quantitative methods for selection of managers. Research is in progress on consumer preference in package colour and design and in textiles. The readability of Hindi type is being investigated. (P53-65, S41)

*Educational Selection Assessment* : Validity studies were reported on personality trait ratings and a college aptitude test battery. Reviews were completed on the reliability of essay-type examinations and university admission procedures abroad. (P53, S43). The analysis of teachers' ratings of students' personality traits was made. (C3). A review of the studies on the bearing of personality on scholastic achievement is under way.

*Psychometric Analysis* : The method of fractile graphical analysis developed by Professor Mahalanobis was shown to be applicable to the analysis of psychometric data. Data illustrating its application to item analysis and reliability were reported, and it was shown how the method could also be applied to validity and age-group norms. Tables were prepared for calculation of percentages and proportions triserial correlations, item validity indices, and standard scores and percentiles. A computational outline for the application of discriminant function analysis was prepared. Analysis of data relating to a musical aptitude test is completed. (C11, C12, C9, C10). Validity studies were reported on the Differential Aptitude Test Batteries constructed earlier.

*Studies in Efficiency Appraisal* : Comparative study as regards the relative superiority of several types of rating form, the relations between rating and actual job performance, between co-worker's rating and supervisor's rating as well as with self-ratings were studied. In addition to this the literate helper group of the ISI were evaluated for their suitability for clerical posts on the basis of a Clerical Aptitude Test Battery developed for this purpose. (W8 to W11)

### *Sociological Research Unit*

*Study of Family Structures in Undivided Bengal (1947) and West Bengal (1950 and 1956)* : The data for the study relate to the surveys conducted under the auspices of the Institute entitled as *An Enquiry into the Economic Conditions of Rural Population of Bengal (1947)* and the *National Sample Surveys* Rounds II, III and X. The data have been analysed and will be made use of for a future report on the changes in family structures in West Bengal.

For the present, the study has helped in the formulation of a systematic classification of family structures and other societal groupings (as for example, religion-caste-community hierarchy, economic structure, etc.), and in the planning of forthcoming investigation into the changes in family structures—urban and rural—in West Bengal. This investigation, sponsored by the Research Programmes Committee of the Planning Commission, will be launched during 1960-61. Meanwhile, a working paper on the classification of family structures and another showing the distribution of different family structures in West Bengal in 1947 have been brought out. (P44 to P47, C1, C2, C4, C27, W1 to W6)

*Structural Analysis of the Growth of Townships at Durgapur, West Bengal* : The study is based on a survey conducted by this unit in 1958 in the D.V.C., Coke Oven, and the steel townships at Durgapur. The data have been analysed; a paper dealing with the high-lights of the findings has been read at the fifth All-India Sociological Conference; a draft report on the study has been prepared; and the final report is expected to be brought out this year. The Unit envisages an intensive study of the townships from the functional approach, and a study of the effect of industrialization on the surrounding areas, provided requisite grants are available. (C29)

*Social Structure of Giridih Township in Bihar* : Data on this multicommunity town were collected by the Unit in 1958, by means of a complete census of residing households. Besides pointing out the characteristics of Giridih's social structure, this study will have its relevance to ascertain the nature of urbanization of the surrounding villages. Preliminary analyses, already done, suggest this usefulness. Further work is in progress. (W2)

*Urbanization of Villages around Giridih Township* : The study envisages a complete census of all villages falling within a radial distance of 20 miles from the town. From a preliminary reconnaissance it was gathered that these villages can be influenced only, or predominantly, by this town. All the villages have been surveyed, upto a radial distance of 10 miles, and the bulk of the data has been analysed. Certain conceptual and methodological problems have also been examined on the basis of the data, such as, the concept of village as unit or variable for studies of rural society, the usefulness of applying societal factors for stratification in social surveys, etc. Two papers which had a bearing upon this study, were prepared and contributed to the First Convention of Indian Anthropologists and the Fifth All-India Sociological Conference. A further analysis on the specific objective of the study is in progress, and the field work has now been extended to the villages falling within the radial distances of 10 and 20 miles from Giridih town. (W2, W3)

*Structural Variations in Bengal Villages in the Light of Available Facilities for Transport and Communication* : The study is based on the data collected by the National Sample Survey organization during rounds II, III and X. A draft report on the study has been prepared, but further work has been found desirable in terms of other factors of variation; the final report has not been brought out. Such work is in progress. The study has, however, helped in the formulation of unit-characteristics of village and several methodological problems. Incidentally, a paper on the informants' attitude to social surveys, based on the survey data, has been brought out in connexion with the Fourth All-India Sociological Conference. (W4)

*Changes in Family Structures—Urban and Rural—in West Bengal* : The Unit was also heavily engaged in the second half of the year under review in planning this study in

## INDIAN STATISTICAL INSTITUTE

the light of the available knowledge on the family as a social institution in West Bengal. Taking account of various factors of variation, such as ecological, historical, sociological, economic, etc. the first phase of the survey was planned during the year. The actual operation is to begin from May, 1960.

Some of the research workers of the unit have also conducted personal research, in addition to the research mentioned above and have written or published papers on their own. (W1, W5, W6, C28)

### *Demography Unit*

*Follow-up Study of In-patients of Maternity Wards of Calcutta Hospitals, 1959-60* : 450 out of a total of nearly 3,000 in-patients confined in the maternity ward of the R. G. Kar Medical College Hospital were selected for a follow-up study of maternal and infant health. The selected patients were contacted in their houses and interviewed by trained maternity nurses to elicit information on post-natal maternal morbidity, menstrual history, lactation, infant morbidity and its physical development, etc. The data obtained from hospital records on pregnancy and labour complications, gestation period, birth weight, etc. are being used to evaluate their correlation with post-natal maternal health and infant's survival and physical development. The field work has been completed. The coding and preliminary tabulation work has just commenced. (P38 to P42)

*A Study of Mortality Pattern in Calcutta City* : 500 out of nearly 1,800 deaths registered in the Hindu burning ghats during the period 1-18 November, 1959 were selected for this study. The households of the deceased were visited to elicit information on socio-economic condition, residential status, cause of death, duration of disability prior to death, etc. As the death registration is virtually complete in this city, all efforts were directed to the securing of appropriate exposures. For this purpose the main emphasis is laid on the residential status of the exposed population for which a control sample of 500 households have been selected from the general population. The field work is nearing completion.

### *Flood Research Unit*

*Statistical Study on the Floods in the River Yamuna* : The data utilized for this study are the daily records of the river levels at Kalanur Railway Bridge and Delhi Railway Bridge during the months of July and August for the past ten years, 1948-1957, and the records of daily rainfall in the intermediate catchment. The purpose of the analysis of the said data was to build up a prediction equation to forecast the river level at Delhi, one day in advance, from a knowledge of the river level at Kalanur and rainfall in the intermediate catchment. The statistical analysis has however revealed certain shortcomings in the data, on the basis of which the following suggestions have been made.

In order to aim at a fairly accurate prediction formula, it will be necessary to arrange for (a) recording gauge values at the Kalanur and Delhi Railway Bridge at hourly intervals and (b) automatic rainfall records at all the rain-gauge stations inside the catchment.

*1959 October Flood of Damodar River* : This study was carried out with a view to seeing how the intensity and magnitude of the 1959 flood compared with those of similar known floods in some past years (1913, 1935 & 1958) in the river Damodar.

The basic data from which all the calculations have been carried out, are the daily rainfall records of the rain-gauge sites in the Upper Damodar Valley. The Unit Hydro-graph method was used for this study.

The main findings of the study are the following : (i) Precipitation near the two dam sites (Panchet and Maithon) during the period 1-7 October, 1959 was generally very intense, whereas higher up on the rivers it was comparatively small, (ii) The rain-storm which produced the flood of October 1959 in the river Damodar, was less severe than any of those which caused floods of 1913 and 1935, (iii) 1959 flood was comparable in intensity to that of 1958 only, and it was far less intense than the 1913 and 1935 floods.

*Future Plans* : The Unit proposes to undertake study on "Synchronism of Heavy Rainfall in the Catchment of the Rivers Damodar and Ajoy". The relevant data for the study were collected during the year 1959-60. This study may help in devising ways for controlling floods in the said catchments by transferring water from one catchment to the other.

#### *Geological Studies Unit*

*General Programme* : The Unit is carrying out a programme of winter field expeditions, combined with laboratory work, with the aim of investigating fossil fauna from rocks in the Pranhita-Godavari Valley. The rocks range in age from 270 million years to about 150 million years old, and were formed on land in a very ancient valley which more or less coincides with the present Pranhita-Godavari Valley.

Previous workers had discovered fossil bony animals at two time horizons within this pile of rocks. One set of fossils came from rocks about 200 million years old, known as the Maleri beds, and indicated the presence of amphibians of a kind long extinct (metoposaurs), of reptiles called rhynchosaurus which may have had rather pig-like habits, and of another kind of reptile which resembled a crocodile in appearance, and probably in habits. Lungfishes were represented by characteristic teeth, and there were shells of bivalves, and fragments of fossil wood. Previous material found in these rocks was very fragmentary, and the unit is glad to report that it has discovered good specimens of some of these fossil animals. Partial skulls of the amphibian have been found which will allow a reconstruction of the whole skull to be made for the first time, and it will then be compared with similar amphibians which have been found in Germany and North America. A skeleton of the rhynchosaur has been found, though the Unit has still to excavate for the skull. So far no good specimens of the crocodile mimic have been found, in spite of the fact that its skull was probably about 4-5 feet long, and therefore would hardly be overlooked in the field. A great number of teeth of the lungfish have been found including one which is attached to the jaw. Two kinds of fishes never previously reported from these rocks have also been discovered by the Unit.

A second group of rocks, known as the Kota beds, are probably about 165 million years old. In the last century fossil fishes were found at one locality in these rocks and were described by Egerton. Three genera were represented and seemed to be similar to three known from European rocks whose age was well established. The Kota fishes thus provide the only means so far known of dating the rocks in which they occur, and they represent the only known freshwater fauna of this age, the European fauna being marine. As mentioned briefly in the last annual report, the Unit has been fortunate in finding excel-

## INDIAN STATISTICAL INSTITUTE

lent specimens of these important fishes, both at the original place of discovery and at several other sites.

*Review of Work:* The various fishes discovered during the Unit's field work in the years 1958 and 1959 are being studied by Dr. S. L. Jain. A detailed study of the Indian *Lepidotus* is in progress, with a reconstruction of the whole fish. When completed it will be the first comprehensive account of this Indian fish, and it will be possible to compare it properly with well described species of this genus which have been found in other parts of the world.

In January Dr. Jain made a short field expedition to collect further specimens of fossil fishes from Kota and Maleri rocks, and to investigate some sites near Warora. He was able to add new specimens to the Unit's collection, some were fossil fishes from new sites in the Kotas and which therefore extend the dating of these rocks to other localities.

A preliminary mapping of a particularly interesting belt of rocks in the Pranhita-Godavari area was carried out by Roy Chowdhury last April. The fossil amphibian and the rhynchosaurian reptile are being studied by Roy Chowdhury, who is at present working at the University College, London. Reconstruction drawings of the skull of the fossil amphibian are being made, and this is technically not an easy task. Comparisons are being made with specimens in the British Museum (Natural History) of a very similar amphibian found in Germany.

Preparations are in hand for next winter's field expedition, to extend the Unit's work in the Pranhita-Godavari Valley.

### *Regional Survey Unit*

A pilot project in regional survey for planning in the Mysore State was initiated in 1956 to develop new techniques for economic surveys by a combination of geographical with statistical methods. An interim report was prepared and circulated in 1958. During the current year the Unit concentrated mainly on the last phases of the Mysore Survey in addition to preliminary studies relating to macro-project for South India.

A technical note on the main conclusions from the *Pilot Survey of Mysore State* was prepared and sent to the Government of Mysore and the Planning Commission.

*Planning Regions in the Mysore State:* On the basis of the maps of resources, accessibility, passenger and goods transport, regions for resource planning were delimited and the present administrative structure was examined for correspondence and anomalies in administrative boundaries. Case studies to illustrate the inter-state boundary anomalies were made by field observation and boundary readjustments were indicated. (S39, S40)

*Land-use Potential in the Malnad (Mysore State):* Based on the findings from slope analysis and field work, a study of land use potential in the Malnad has been completed.

*Master Plan of Howrah:* The Unit in collaboration with the Howrah Improvement Trust has also completed preliminary studies relating to the survey of industries and delimitation of urban field of Howrah.

Work in progress includes (i) a study of the distribution of resources and trends in development in South India during the First and Second Five-Year Plan periods, (ii) area stratification for sample surveys, (iii) population studies in Mysore, (iv) experiments in cartographic representation, (v) designing maps for rural and urban planning and (vi) preliminary studies on urbanization in India.

## TWENTYEIGHTH ANNUAL REPORT : 1959-60

### PLANNING DIVISION

#### INTER-INDUSTRY STUDIES

Considerable progress was made in the preparation of the draft report on the 1953-54 input-output table. Chapter drafts of the report are being circulated to the members of the Inter-industry Committee and the report is being revised in the light of the comments received. Good progress was also made on the construction of the 1955-56 table, a preliminary copy of which has been submitted to the Planning Commission.

In a paper on input-output analysis the procedure of construction of Inter-industry tables was explained by way of approximations from simple hypothesis. The equivalence of the conventional definitions of national income was demonstrated with analytical precision from the input-output scheme. As a by-product, the author also pointed out a few alternative definitions of national income. An exposition of the applications of input-output technique to planning problems was furnished. In conclusion, it was suggested that linear programming grafted to input-output analysis might be used as a powerful tool in planning.

The Indian small-scale industry featured as the subject of an interesting piece of work. A study was made (for the year 1954-55) of industrial units employing less than ten workers and using power or employing less than twenty workers and not using power—from the point of view of their input-output structure. (1)\*

On the basis of the data available in the Railway Board's annual reports on the Indian Railways and the General Manager's annual reports on certain zones an attempt was made to compute the input-output magnitudes of the Indian Railways for the years 1954-55 and 1955-56. (51)

Another paper completed during the period attempted a review of inter-industry studies made in India. Both empirical and theoretical works were summarized and an exhaustive bibliography was presented. The paper also considered the prospects for future development of inter-industry studies in India.

Certain aspects of the studies of the Indian Economy was related in a paper with the aid of the 1953-54 input-output table prepared in the Division and its inverse computed by the Electronics Division of the Institute. (9)

Wholesale and retail distributive margins for the years 1953-54 and 1954-55 for urban India were completed on a paper on the basis of NSS data. (26)

The cost structure of rural transport was analysed in a paper on the basis of data thrown up by the NSS enterprise schedules. This probing work was necessary for improving the estimates presented in the input-output tables. (28)

#### STUDIES ON CONSUMER BEHAVIOUR

Historical study of the pattern of consumer expenditure continued to be a part of the research programme. A technical note was prepared on the family budget data dating from 1807 to 1921 and the same was computed with the NSS data for the years 1951-54 and 1955-56. (52)

\* Numbers within brackets refer to papers listed in Appendix 5.3.

## INDIAN STATISTICAL INSTITUTE

In the main line of work in the field of consumer behaviour analysis, a working paper by A. Biswas endeavoured to present some estimates of increase in the demand for food and cereals during the Third Five-Year Plan period on the assumption of some dimensional hypotheses concerning the basic economic categories. (5)

In another paper, the author in collaboration with D. K. Bose worked out projection of related items of consumption over the period of the Third Five-Year Plan. (4)

The purchasing power equivalent of a Rupee, as related to consumer expenditure, was the subject matter of two papers; while one dealt with the variation in prices between states of India, the other examined the rates of exchange between Dollar and Rupee, and Yuan and Rupee. (36, 37)

A working paper was produced on the basis of a study of the effect of changes in expenditure distribution on consumer demand. This was admittedly a preliminary analysis but some interesting conclusions could be drawn, particularly as to the extent of change in elasticity co-efficient as a result of a given change in the expenditure distribution. (45)

Another paper studied the effects of changes in concentration of income (total expenditure) of individuals on the projection of future levels of consumption of both necessities and luxuries. The author showed that if one does not take into account the real changes in the income distribution in the direction of egalitarianism one is likely to underestimate the need for essential goods and services. (29)

In the period under consideration certain empirical studies were made of the data on consumer expenditure as available from the NSS. It was established in a paper that for the food items use of the 'week' as the reference period yielded estimates which were consistently higher than those made with the 'month' as the reference period. (32)

Certain detailed tabulation of consumer expenditure data for working out demand projection were taken up at the instance of H. Lydall of the M.I.T. Centre, New Delhi.

Quantity of consumption concerned as a function of total expenditure and average price as obtained from quantity and value data given in consumption schedules was studied in a paper. (30)

### GROWTH MODELS

A further study of the Mahalanobis model was concerned with the implications of removing the assumption of unchanging prices; with the help of projection made on this basis, relative price changes as between consumer goods sectors and investment goods sectors were analysed for their characteristics. (41)

A joint paper by P. C. Mahalanobis and M. Mukherjee reviewing all existing work on the Mahalanobis model was submitted to the Operational Research Conference to be held in France.

### NATIONAL INCOME AND ALLIED TOPICS

A descriptive paper dealt with the system of agricultural statistics in the USSR. (38)

A paper completed in the period was concerned with the contribution to the national income made by the less organized part of the transport activity, namely, the road transport for the year 1954-55. (10)

## TWENTYEIGHTH ANNUAL REPORT : 1959-60

An attempt was also made to estimate the factor shares in national income of India, 1956-57, using NSS and other data (12). The available estimates on factor shares in India were reviewed in another paper under preparation.

An analysis was made of the magnitude of the incremental net-output investment ratio in periods of rising and falling income. The view was tentatively forwarded that the ratio did change over the economic cycles and it might be more useful to make this distinction instead of assuming an average overall ratio for planning purposes. (43)

The growth of the Indian economy was studied historically for the period 1888 to 1922. The attempt was to construct connected series of indices of prices and money and real wages both industrial and agricultural. (53)

In a joint paper by M. Mukherjee and N. S. R. Sastry, an estimate of tangible wealth of India was presented.

Year to year variation of crop output was studied in one paper. (33)

Certain historical studies of growth of national income during the period 1857-1957 were taken up and a comprehensive paper was provided on the subject. (48)

A detailed study was also made of the Indian national income estimates for the period 1944-45, 1947-48. (15)

A particular formulation of correlation in space was studied in relation to space distribution of agricultural prices: (44)

In one paper, NSS consumption data were utilized to work out a preliminary estimate of size distribution of personal income. (42)

A number of papers were produced on contributions to national income by the various sectors of the economy. In one paper, official data were used to obtain an estimate of value added by financial intermediaries (50). Official data and certain other information were utilized in two papers to arrive respectively at, structures of mining enterprise (27) and cotton textile industries (25); finally, two papers were based on detailed analysis of NSS enterprise data and related to the contribution to national income by professions and services. (13, 14)

One paper was concerned in presenting an analysis of the financing of capital formation in India. (39)

### OTHER WORK ON PLANNING

In course of the year Professor Mahalanobis undertook the study of some specific subjects fitting into the perspective of planning in India. Among other topics the problem of the organization and supply of scientific and technical man-power continued to engage his attention. Some of the findings in this line of work were presented by Professor Mahalanobis in a talk broadcast from All-India Radio and in a paper on the institutional aspects of scientific work in India. His address at the annual meeting of the Association of Scientific Workers of India also made some use of these materials.

In two of his papers, Professor Mahalanobis drew upon his technical as well as personal connection with planning in India: while the article written for the commemorative volume published on the occasion of the seventieth birthday of Prime Minister Nehru primarily dealt with the genesis of planning in India, the other paper prepared as a lecture



## INDIAN STATISTICAL INSTITUTE

before the Third Session of the SEANZA Central Banking Course presented in outline the basic thinking on perspective planning.

Labour problems vis-a-vis planned economic growth was another subject studied by Professor Mahalanobis. The organization of a reserve army of labour to be sponsored by the Government was his radical recommendation made in course of an address at the Labour Economic Conference, Madras.

Labour productivity and wages in the Indian manufacturing industries continued to be studied. A second paper was produced by A. Chatterjee on the subject, covering fourteen industries. The period covered was 1946 to 1963, the main source of data being the census of Indian manufacturers.

India's foreign trade during the years 1940 to 1968 was analysed for discovering the basic trend. A new classification of the items of trade was made from the point of view of the end use and it was suggested that this might be more useful for planning purposes.

The concentration of employment in the major Indian industries was the subject of an enquiry. Lorenze curves were fitted to the employment data available from the CMI data and the merits of this method of analysis vis-a-vis those of the other methods were studied. (31)

Oskar Lange's paper on economic planning and management in Poland was actually a summary of his lecture delivered in the Institute earlier in 1959. It traced the developments taking place in economic thinking as experienced in Poland. (34)

The economy of the Indian livestock was the subject matter of seven working papers, the specific issues talked being the food costs involved in the production of milk, nutritive values of straws from pure rice strains, the effect of manure on fodder, some anomalies in the existing official statistics, etc. (16, 17, 18, 19, 20, 21, 22)

An econometric study was concerned with isolating certain factors influencing the raising of coal (7); localization and productivity of jute textile industry was studied in another paper. Demand for wheat in India was analysed in another econometric study. (8)

H. Mazumdar and Morris J. Solomon made a penetrating study of the inventory holding by Indian and US manufacturing industries. The study indicated that the holdings are considerably higher in India in comparison with USA. (40)

The possibility of overstaffing with an idea to optimize plant utilization in India was explored in a paper by Morris J. Solomon with some positive results. (54)

### NATIONAL SAMPLE SURVEY RESEARCH AND OTHER STUDIES

1. A fractile graphical analysis of ownership holdings of West Bengal and Andhra was made from part of the materials collected in the eighth round.

2. The fractile graphical analysis of the consumption of cereals, sugar, vital food, medicine, medical services and clothing was done on the data of the seventh and ninth rounds.

3. Sri M. N. Murthy completed his book *Introduction to Sampling Theory—Part I*. The book is available to the trainees of the Institute in a cyclostyled form.

TWENTYEIGHTH ANNUAL REPORT : 1959-60

4. A bibliography of the literature on sampling was almost complete.
5. Some studies were being made with the object of determining adult consumption units.
6. Error studies for a number of items were in progress. Among others, studies relating to estimates of errors of a few population variables were included. An analysis was being proposed for these items to obtain the margins of uncertainty from the differences of the estimates of two interpenetrating networks of samples, and to obtain the estimates of sampling errors by the method of analysis of variance.
7. Some results of the study of recall lapse in demographic data were obtained and work on this line was continuing.
8. A method of calculation of the implicit rate of marriage from age-sex-marital status data of two successive censuses was derived and the work was being undertaken for the census data of Uttar Pradesh for 1941 and 1951.
9. A technical note on the sampling design and other related aspects on Family Living Surveys, Working Class and Middle Class, was almost ready.
10. At the request of the Working Group set up to examine the discrepancies between the NSS and official estimates of area and production of crops, some special tables were prepared from the data collected in the thirteenth round and were furnished to the Working Group.
11. At the instance of the Ministry of Labour and Employment, a note on the method of estimation of unemployed persons on the basis of the records in the live register of employment exchange was prepared.
12. Tables on pattern of consumer expenditure on the basis of the data of the fourth, fifth, seventh, eleventh and twelfth rounds were prepared for the ILO Year Book.
13. Tables on extent, purposes and sources of debt based on the data of the eleventh and twelfth rounds, Schedule I.1, were prepared to meet some requirements of the Ministry of Labour.
14. Some tables on consumer expenditure prepared for the rural areas from Schedule I.1, thirteenth round were furnished to the Ministry of Finance.
15. Preliminary estimates of the production of major cereal crops based on the data of the fourteenth round were submitted to the Cabinet Secretariat, Government of India.
16. A report on the sampling enquiries conducted by the National Sample Survey and by the NSS Department of the Institute in the year 1959-60 was prepared and submitted to the Central Statistical Organization, Government of India, for incorporation in their annual report on 'Sample Surveys of Current Interest'.

INDIAN STATISTICAL INSTITUTE

Auditor's Report

LOVELOCK & LEWES  
Chartered Accountants.

Post Box No. 900  
4, Lyons Range, Calcutta-1

In your reply please  
Refer to No. MKR/PN

To the Chairman and the Members of the Indian Statistical Institute,

We have examined the Receipts and Payments Accounts in respect of Current Expenditure, Capital Accounts and the Subsidiary Fund Accounts of the Indian Statistical Institute for the year ended 31 March, 1960, with the books and records maintained by the Institute and, subject to the following remarks, have found them to be in accordance therewith.

1. No confirmations were available in respect of advances standing in the names of Contractors and Suppliers as at 31st March, 1960.
2. No Council resolutions were available for each different item of Capital Expenditure incurred during the year, totalling Rs. 130,857.74 nP., as appearing in the Receipts and Expenditure on Capital Accounts (Item 2) although an annual expenditure of Rs. 8 lacs was approved of at the Council Meeting held on 24th October, 1958.
3. The balances with the United Bank of India Ltd., Baranagore Branch, and State Bank of India, as at 31st March, 1960, were verified by us with the Reconciliation Statements drawn up and certified by Messrs. P.C. Nandi & Co., Chartered Accountants, the Internal Auditors of the Institute.

Calcutta,  
17th October, 1960.

Sd/- LOVELOCK LEWES  
Chartered Accountants

- (1) Regarding point 1—see statement 'A' appended.
- (2) Regarding point 2—vide Council resolution No. 5.2 dated 29 October 1960 in statement 'B' appended.

**TWENTYEIGHTH ANNUAL REPORT : 1959-60**

**STATEMENT A**

List of names of contractors and suppliers from whom no confirmations were available as at 31st March 1960 :

Mr. Sreedhar Sreemani .. .. .	Rs. 500.00
" Biswanath Karmakar .. .. .	Rs. 4,000.00
" Alizan Mistry .. .. .	Rs. 1,209.49
" Nizamuddin Mistry .. .. .	Rs. 328.55
" Panchu Gopal Das .. .. .	Rs. 50.00
" Panchu Gopal Maity .. .. .	Rs. 1,274.76
	<hr/>
	Rs. 7,362.80

sd. M. K. Roy  
for M/s. Lovelock & Lewes,  
Chartered Accountants,  
Calcutta.

The above confirmations have been since produced.

sd. M. K. Roy  
for M/s. Lovelock & Lewes,  
Chartered Accountants,  
Calcutta.  
29-10-60

**STATEMENT B**

Extract from proceedings of the joint meeting of the Governing Body of the Research and Training School and of the Council of the Indian Statistical Institute : 29 October 1960.

*President* : Sir D. N. Mitra, Chairman (in the chair).

*Members of the Governing Body and of the Council* : Professor K. B. Madhava, Dr. C. R. Rao, Sri Vishnu Sahay, Dr. N. S. R. Sastry and Sri N. C. Chakravarti, Joint Secretary.

*Members of the Council* : Sri S. Basu, Sm. C. Bose, Sri M. Ganguli, Shri D. B. Lahiri, Sri S. K. Mitra, Sri M. Mukherjee, Sri Satish Chandra Sen, Sri S. C. Sen, Sri Sadasiv Sengupta.

*Members of the Governing Body* : Mr. George Barrell, Dr. B. N. Prasad, Sri S. K. Sen, Finance & Audit Adviser, was present by special invitation.

5. *Auditor's report and Audited Statement of Accounts for 1959-60* : The Auditor's report along with audited statement of accounts (copies appended as annexures 1, 2, 2.1 to 2.7, 3) circulated earlier with an explanatory memorandum were considered. Sri N. C. Chakravarti stated that the joint meeting of the Finance Committees had recommended the adoption of the auditor's report and audited statement of accounts as circulated.

5 Resolved that—

(a) the auditor's report and the audited statement of accounts be approved for submission to the Annual General Meeting;

(b) approval be given to the capital expenditure incurred as per details in item 2 of the expenditure side of the Capital Account certified by the auditor in terms of the requirements mentioned in the audit report;

(c) the supplementary note of the auditors giving a list of contractors and suppliers from whom confirmation about outstanding advance had not been received together with their subsequent note that these confirmations since obtained had been produced to them should be appended to the audit report.

Sd/- N. CHAKRAVARTI  
Joint Secretary

Sd/- D. N. MITRA  
Chairman

# INDIAN STATISTICAL INSTITUTE

## Indian Statistical Institute : Receipts and Payments Accounts

<i>To Receipts</i>		Rs.	nP.	Rs.	nP.
1.	Opening balance :				
	(i) Cash in hand and at Banks with Central Office ..	35,308.84			
	(ii) With branches and sub-offices .. ..	38,617.89			
	(iii) Unadjusted suspense of 1958-59 .. ..	95,575.59			
	(iv) Loans unrecovered from staff for educational and house building purposes etc. as per last account ..	31,372.10		2,00,874.42	
2.	Membership subscriptions .. ..			3,147.81	
3.	Machines fees for training courses in Calcutta and Delhi ..			19,300.00	
4.	Tuition fees for language course .. ..			545.00	
5.	Examination fees and other receipts .. ..			26,734.17	
6.	Receipts from produce at Giridih Experimental Farm ..			4,639.83	
7.	SQC receipts from non-Government sources :				
	(i) Membership fees .. ..	53,500.00			
	(ii) Service charges and training fees, etc. .. ..	1,08,384.41		1,59,884.41	
8.	Recoveries for work done by Workshop .. ..			41,445.21	
9.	Block grant from the Government of India for :				
	(i) Research & Training School and Society type activities Sector .. ..	9,38,400.00			
	(ii) International Statistical Education Centre .. ..	92,800.00			
	(iii) Statistical Quality Control Sector .. ..	2,09,100.00			
	(iv) Computing Machines & Electronic Laboratory Sector ..	3,12,100.00			
	(v) Economic Wing, Sector .. ..	2,80,600.00			
	(vi) Utilization of Soviet (UNTAA) equipment Sector ..	2,18,216.00			
	(vii) Operational Research Unit for Planning Sector ..	3,42,780.00			
	(viii) Industrial Management Research Unit for Planning Sector .. ..	16,000.00			
	(ix) Pilot Project for Surveys in Regional Planning (Mysore) .. ..	90,780.00		24,07,736.00	
10.	Contract payment by Government of India for :				
	A. National Sample Surveys & Integrated activities Sector :				
	(i) Paid directly to the Institute .. ..			47,20,500.00	
	(ii) Paid through Army Statistical Organization (as per contra : item No. 8c) .. ..			65,000.00	
	B. Urban Frame Collection Survey : On account payment received from the Government of India .. ..			20,000.00	
11.	Amount received as sale proceeds of Institute's own publication .. ..			8,131.00	
12.	Sub-total of items 2-11 (for current Project & Sectors) ..			76,63,943.23	

TWENTYEIGHTH ANNUAL REPORT : 1959-60

(current expenditure) for the year ending 31 March 1960

		By Payments			
		Rs.	nP.	Rs.	nP.
1.	(i) Salary, dearness allowances, honorarium .. .. .	44,65,276.	34		
	(ii) Employer's contribution for workers' Provident Fund (outstanding liabilities per contra) .. .. .	2,46,940.	18		
	(iii) Overtime allowance .. .. .	2,06,535.	33	49,18,751.	83
2.	Contribution to Leave Salary Fund .. .. .			21,400.	00
3.	Contribution to Gratuity Fund .. .. .			1,48,164.	00
4.	Travelling expenses .. .. .			1,92,443.	58
5.	(i) Visiting Professors & Scientists for R.T.S. Sector .. .. .	50,000.	00		
	(ii) Visiting Professors, fellows, foreign experts and scientists etc. for other Sector .. .. .	38,009.	83	86,009.	83
6.	(i) Scholarships, stipends etc., to trainees of the R. & T. School .. .. .	1,75,000.	00		
	(ii) Fellowship allowances and other assistance to ISEC non-Colombo Plan trainees .. .. .	12,227.	24	1,87,227.	24
7.	Prizes to workers for initiative, etc. .. .. .			3,140.	40
8.	Machine Tabulation expenses :				
	(a) Hire and maintenance of tabulating equipment, key punches and verifiers including freight, transport and other charges .. .. .	8,17,586.	76		
	(b) Cost of cards, cabinets, etc. .. .. .	2,72,783.	53		
	(c) Payments to Army Statistical Organisation (directed by the Government of India as per contra : Item no. 10A.ii) .. .. .	65,000.	00	11,55,368.	29
9.	Printing and publication (including paper for printing) .. .. .			1,39,089.	79
10.	Society-type activities .. .. .			24,339.	43
11.	Examination expenses .. .. .			23,735.	74
12.	Books and Journals (including cost of binding, etc.) .. .. .			11,13,817.	66
13.	Remittance to Translation Unit set up in Japan .. .. .			30,000.	00
14.	Workshop charges, photo and microfilm expenses .. .. .			22,564.	35
15.	Laboratory and Workshop stores, tools and minor accessories, etc. .. .. .			75,279.	10
16.	Materials and labour charges for experimental farming at Giridih .. .. .			3,381.	07
17.	Repairs, maintenance and replacement of machineries, equipment, accessories, furniture and fittings, etc. .. .. .			55,797.	70
18.	Stationeries and consumable stores .. .. .			1,06,385.	15
19.	Audit fee and expenses :				
	P. C. Nandi & Co.—Audit fee for 1958-59 .. .. .	4,500.	00		
	P. C. Nandi & Co.—Internal audit fee for 1959-60 .. .. .	8,900.	00		
	Lovelock & Lewis—Audit fee for 1959-60 .. .. .	13,660.	00	25,050.	00
20.	Electricity, telephone, postage including M.O. commission, postal freight, etc. .. .. .			1,69,017.	91
21.	Other miscellaneous expenses viz., advertisement, law, Bank charges and interest, conveyance, hot weather contingencies, etc. .. .. .			84,204.	29
22.	Rent, rates and taxes (including those of field, camp and out-station premises and Rs. 54,057 transferred to capital expenditure account being the rent of Institute's own premises)			1,93,788.	70
23.	Repairs and maintenance of land and buildings including petty construction .. .. .			82,587.	89
24.	Transport .. .. .			50,643.	44
25.	Workers' Welfare and Amenities .. .. .			1,23,188.	82
26.	Development at Director's discretion .. .. .			14,027.	71
27.	Transport, freight, installation and storage, etc. of Soviet (UNTAA) equipment .. .. .			11,405.	57
28.	Sub-total of items 1-27 (for current Projects & Sectors) .. .. .			80,60,819.	48

**INDIAN STATISTICAL INSTITUTE**

**Indian Statistical Institute : Receipts and Payments Accounts**

<i>To Receipts</i>		Re.	nP.	Re.	nP.
13.	Amount received (\$ 32,000.00) during the year out of the Ford Foundation grant of \$ 72,300.00 .. .. .			1,50,840.00	
14.	Funds received from the Government of India, Ministry of Finance in reimbursement of disbursements to the trainees of the ISEC (under the Technical Co-operation Scheme, Colombo Plan) .. .. .			79,836.48	
15.	Sub-total of items 13-14 .. .. .			2,30,476.48	
16.	Arrear dues from the "Director of Health Services, Government of India" for conducting certain studies in 1958-59 ..			45,000.00	
17.	Army Statistical Organization (direct payment made by Government of India for arrear work of previous years as per contra : item no. 32).. .. .			38,000.00	
18.	Other miscellaneous service charges .. .. .			1,400.00	
19.	Miscellaneous receipts : viz., sale proceeds of waste paper, cards etc. .. .. .			2,727.60	
20.	Sundry deposits payable (at the close of the year) ..			30,412.51	
21.	Outstanding liabilities for payment of employer's share of contribution to : ..				
	(i) I.S.I. General Provident Fund for 1959-60 .. .. .	2,48,940.16			
	(ii) Leave Salary Fund .. .. .	21,400.00			
	(iii) Gratuity Fund .. .. .	1,48,164.00		4,18,504.16	
22.	Outstanding liabilities for goods and services, etc. ..			57,791.00	
23.	Temporary loan taken from funded accounts during the year .. .. .			3,00,000.00	
24.	Sub-total of items 16-23 .. .. .			9,00,835.36	
25.	Grand Total of items 1, 12, 15 & 24 .. .. .			88,96,129.49	

\*Temporary loans as at 31-3-59 from funded accounts not incorporated

In terms of our report of even date.

Calcutta,  
17th October, 1960

Sd/- LOVELOCK LEWIS  
Chartered Accountants

**TWENTYEIGHTH ANNUAL REPORT : 1959-60**

**(current expenditure) for the year ending 31 March 1960**

		<i>By Payments</i>	
		Rs.	nP.
		Rs.	nP.
29.	(a) Expenditure incurred against Ford Foundation grant for staff training abroad etc. . . . .	44,837.68	
	(b) Deposit A/c. with American Express Co. Inc. out of the Ford Foundation grant for \$ 32,000.00 received during the year . . . . .	1,05,802.32	1,50,640.00
30.	Disbursement of fellowship allowance to ISEO trainees under Colombo Plan . . . . .		98,358.34
31.	Sub total of items 29-30 . . . . .		2,48,998.34
32.	Army Statistical Organisation (direct payment made by Govt. of India for arrears work as per contra; item no. 17)		38,000.00
33.	Unspent balance of the 25th Anniversary Celebrations account upto 1957-58 deducted by Government of India from current year's grant . . . . .		67,736.00
34.	Outstanding liabilities (incorporation of balance as per last account):		
	(i) for employer's share of contribution to ISI General Provident Fund . . . . .	2,54,171.14	
	(ii) for goods and services . . . . .	17,975.06	2,72,146.20
35.	Deposit (incorporation of balance as per last account) . . . . .		32,441.95
36.	Loans to staff for educational and house building purposes etc. (balance at the close of the year) . . . . .		40,336.61
37.	Security deposits receivable (at the close of the year) . . . . .		3,938.94
38.	Advances to contractors and suppliers against work done or goods supplied or ordered and T.A. advances to staff awaiting bills and adjustments. (balance at the close of the year)		76,387.13
39.	Closing balance:		
	(i) Cash in hand and at Banks with Central Office . . . . .	30,002.39	
	(ii) With branches and sub-offices (including Rs. 5,010.09 lying with Nath Bank Ltd. in liquidation) . . . . .	36,422.45	66,424.84
40.	Sub-total of items 32-39 . . . . .		6,87,311.67
41.	Grand Total of items 28, 31, & 40 . . . . .		88,96,129.49
above:	(i) Leave salary fund	Rs. 2,45,000.00	
	(ii) Gratuity fund	Rs. 3,18,000.00	
		<u>Rs. 5,63,000.00</u>	



## INDIAN STATISTICAL INSTITUTE

Indian Statistical Institute : Receipts & Payments Account for the year ending 31 March 1960

### SCHOLARSHIPS, STIPENDS, VISITING PROFESSORS AND FELLOWS FUND

<i>To Receipts</i>		Rs.	n.P.	Rs.	n.P.
1. Opening balance :					
Cash in hand and at Banks .. .. .				3,183.74	
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 and Training School and Society Type Activities Sector transferred from General Account .. .. .					
				50,000.00	
				2,28,183.74	

<i>By Payments</i>		Rs.	n.P.	Rs.	n.P.
1. Scholarships and stipends awarded during the year :					
(i) Scholarship etc. for Research Workers .. .. .		47,390.25			
(ii) Stipends to students and trainees .. .. .		1,19,162.72		1,66,552.07	
2. Expenses for visiting professors and fellows from U.S.A., U.K., France, Poland, Yugoslavia, Japan and several other countries					
				29,912.51	
3. Temporary advances to meet Institute's general expenditure during the year .. .. .					
				31,000.00	
4. Closing balance :					
Cash in hand and at Banks .. .. .				718.28	
				2,28,183.74	

In terms of our report of even date.

Calcutta,  
17th October, 1960

Sd/- LOVELOCK LEWIS  
Chartered Accountants

TWENTYEIGHTH ANNUAL REPORT : 1959-60

Indian Statistical Institute : Receipts & Payments Account for the year ending 31 March 1960

DEVELOPMENT FUND No. I.

(created out of savings from Director's salary etc.)

		<i>To Receipts</i>	
		Ra.	nP.
1.	Opening balance :		
	(i) Cash in hand and at Banks .. .. .	1,736.65	
	(ii) Advances recoverable from Capital Expenditure Account as per last account .. .. .	97,000.00	98,736.65
2.	Advances outstanding with Statistical Publishing Society as per last account .. .. .		20,785.29
		Ra.	<u>1,19,621.94</u>

		<i>By Payments</i>	
		Ra.	nP.
1.	Temporary advances made to Statistical Publishing Society as per last account .. .. .	20,785.29	
	<i>Less</i> —amount realized during the year .. .. .	10,392.29	10,393.00
2.	Closing balance :		
	(i) Cash in hand and at Banks .. .. .	731.16	
	(ii) Temporary advances made to Capital Expenditure account as per last account .. .. .	97,000.00	
	<i>Less</i> —amount realized during the year .. .. .	15,802.22	81,397.78
	(iii) Temporary advances to meet Institute's current year's general expenditure .. .. .	27,000.00	1,09,128.94
		Ra.	<u>1,19,621.94</u>

In terms of our report of even date.

Calcutta,  
17th October, 1960

Sd/- LOVELOCK LEWIS  
Chartered Accountants

INDIAN STATISTICAL INSTITUTE

Indian Statistical Institute : Receipts & Payments Account for the year ending 31 March 1966

DEVELOPMENT FUND No. II

(created out of contributions received from Government of India)

<i>To Receipts</i>		Re.	n.P.	Re.	n.P.
1. Opening balance :					
(i) Cash in hand and at Banks	.. .. .	1,206.	63		
(ii) G.P. Notes at cost (face value Rs. 50,000)	.. .. .	45,533.	75		
(iii) Advances recoverable from Capital Expenditure Account as per last account	.. .. .	7,07,000.	00	7,53,740.	38
2. Interest received on investments in G.P. Notes					
	.. .. .			1,498.	00
				Ra. 7,56,238.	38

<i>By Payments</i>		Re.	n.P.	Re.	n.P.
1. Closing balance :					
(i) Cash in hand and at Banks	.. .. .			2,702.	63
(ii) Temporary advances made to Capital Expenditure Account as per last account	.. .. .			7,07,000.	00
(iii) G.P. Notes at cost (face value—Rs. 50,000)	.. .. .			45,533.	75
				Ra. 7,55,238.	38

In terms of our report of even date.

Calcutta,  
17th October, 1966

Sd./ LOVELOCK LEWIS  
*Chartered Accountants*

TWENTYEIGHTH ANNUAL REPORT : 1959-60

Indian Statistical Institute : Receipts & Payments Account for the year ending 31 March 1960

LEAVE SALARY FUND

		<i>To Receipts</i>	
		Rs.	nP.
1. Opening balance :			
(i)	Cash in hand and at Banks .. .. .	1,110.61	
(ii) Advances recoverable as per last account from :			
(a)	Capital Expenditure Account .. .. .	6,10,000.00	
(b)	General Account .. .. .	2,45,000.00	8,56,110.61
			<u>Rs. 8,56,110.61</u>

		<i>By Payments</i>	
		Rs.	nP.
1. Leave salary paid including payments in lieu of leave .. .. .			
			17,133.39
2. Closing balance :			
(i)	Cash in hand and at Banks .. .. .	977.22	
(ii) Temporary advances made to—			
(a) Capital Expenditure Account :			
	as per last account .. .. .	6,10,000.00	
	Less realised during the year .. .. .	17,000.00	5,93,000.00
(b)	General Account as per last account .. .. .	2,45,000.00	8,38,977.22
			<u>Rs. 8,56,110.61</u>

No transfer to this fund has actually been made during the year under report though a contribution of Rs. 21,400.00 has been provided as liability in the General Account to be transferred in due course.

In terms of our report of even date.

Calcutta,  
17th October, 1960

Sd/- LOVELOCK LEWIS  
Chartered Accountants

# INDIAN STATISTICAL INSTITUTE

Indian Statistical Institute : Receipts & Payments Account for the year ending 31 March 1960

GRATUITY FUND			
<i>To Receipts</i>			
		Rs.	nP.
1. Opening balance :			
(i) Cash in hand and at Banks .. .. .		1,053.32	
(ii) Advances recoverable as per last account from :			
(a) Capital Expenditure Account .. .. .		4,90,000.00	
(b) General Account .. .. .		3,18,000.00	8,00,053.32
			Rs. 8,00,053.32
<i>By Payments</i>			
		Rs.	nP.
1. Gratuity payments .. .. .			
			10,285.88
2. Closing balance :			
(i) Cash in hand and at Banks .. .. .		767.94	
(ii) Temporary advances made to :			
(a) Capital Expenditure Account :			
as per last account .. .. .	4,90,000.00		
Less realised during the year	10,000.00	4,80,000.00	
(b) General Account as per last account .. .. .		3,18,000.00	7,98,767.94
			Rs. 8,00,053.32

No transfer to this fund has actually been made during the year under report though a contribution of Rs. 1,48,164 has been provided as liability in the General Account to be transferred in due course.

In terms of our report of even date.

Calcutta,  
17th October, 1960

Sd/- LOVELOCK LEWIS  
Chartered Accountants

TWENTYEIGHTH ANNUAL REPORT : 1959-60

Indian Statistical Institute : Receipts & Payments Account for the year ending 31 March 1960

SUPERVISION FEE FUND

To Receipts

	Rs.	nP.	Rs.	nP.
1. Opening balance :				
(i) Cash in hand and at Banks .. .. .	955.	02		
(ii) Advances recoverable from Capital Expenditure Account as per last account .. .. .	69,000.	00	69,055.	02
2. Advances recoverable as per last account from :				
(i) Small industries experimental unit run by the Institute	30,938.	84		
(ii) Small industries experimental units in villages ..	3,192.	90	34,131.	74
3. Cost of land at Baranagar and Giridih as per last account ..			1,12,218.	11
			Rs.	2,16,304.87

By Payments

	Rs.	nP.	Rs.	nP.
1. Temporary advances to small industries experimental unit run by the Institute as per last account .. .. .	30,938.	84		
Add—during the year .. .. .	1,977.	83		
	32,916.	67		
Add—advances as per last account to carry out experiments in village units .. .. .	3,192.	90	36,109.	57
2. Land at Baranagar and Giridih as per last account .. ..			1,12,218.	11
3. Closing balance :				
(i) Cash in hand and at Banks .. .. .	977.	19		
(ii) Temporary advances made to—				
(a) Capital Expenditure Account				
as per last account .. .. .	69,000.	00		
Less—amount realized during the year .. .. .	69,000.	00		
Nil				
(b) General Expenditure Account during the year ..	67,000.	00	67,977.	19
			Rs.	2,16,304.87

In terms of our report of even date.

Calcutta,  
17th October, 1960

Sd/- LOVLOCK LINES  
Chartered Accountants

**INDIAN STATISTICAL INSTITUTE**

Indian Statistical Institute : Receipts and Payments

I. S. I. GENERAL

	<i>To Receipts</i>		Rs.	nP.
1. Opening balance :				
(i) Cash in hand and at Banks .. .. .			2,78,858.36	
(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 .. .. .			2,13,573.00	
2. Advances outstanding with Institute's Capital Expenditure Account as per last account .. .. .			3,00,000.00	
3. Employer's contribution due to the Fund on account of 1958-59 received from Institute during the year .. .. .			2,54,171.14	
4. Workers' Own Subscription to the Fund during the year .. .. .			2,48,940.16	
5. Workers' Voluntary Subscription to the Fund during the year .. .. .			25,436.91	
6. Interest received during the year against loan given to members .. .. .			14,684.44	
7. Interest on Investments :				
(i) G. P. Notes .. .. .			55,130.75	
(ii) National Savings Certificates .. .. .			5,000.00	
(iii) For loans to the Institute .. .. .			18,000.00	
(iv) For Institute's liabilities on account of Employer's Contribution for 1958-59 repaid during the year .. .. .			6,354.27	
			26,84,455.82	

In terms of our report of even date

Calcutta,  
17th October, 1960

Sd/- LOVELOCK LEWIS  
Chartered Accountants

**TWENTYEIGHTH ANNUAL REPORT : 1959-60**

Accounts for the year ended 31 March 1960

**PROVIDENT FUND**

		<i>By Payments</i>		
		Rs.	nP.	Rs. nP.
1.	Repayment of Workers' Own Contribution (on leaving service) ..			61,008.16
2.	Payment of Institute's contribution to workers (on leaving service) .. .. .			59,821.17
3.	Payment of Interest to workers on closing of accounts as in Item nos. (1) & (2) .. .. .			9,084.93
4.	Repayment of Workers' Voluntary Subscription .. .. .			2,820.13
5.	Payment of Interest to workers against voluntary subscription ..			189.06
6.	Loans to Members :			
	Outstanding from previous year .. .. .	2,13,573.00		
	Since added during the year .. .. .	4,65,876.00		
		<u>6,79,449.00</u>		
	Less : Amount realised during the year .. .. .	4,01,278.00		2,78,171.00
7.	Temporary advances to Institute's Capital Expenditure Account as per last account .. .. .	3,00,000.00		
	Less : Amount realised during the year .. .. .	<u>3,00,000.00</u>		Nil
8.	Temporary advances to meet Institute's general expenditure during the year .. .. .			1,75,000.00
9.	Closing balances :			
	(i) Cash in hand and at Banks .. .. .			5,89,197.08
	(ii) G.P. Notes at cost as per last account .. .. .	12,06,296.79		
	Since added during the year (Total Face value —Rs. 16,70,000/-) .. .. .	2,23,062.50		14,29,359.29
	(iii) National Savings Certificates as per last account ..	60,000.00		
	Less : Encashment of Certificates during the year ..	10,000.00		
		<u>50,000.00</u>		
	Added during the year .. .. .	50,000.00		1,00,000.00
				<u>Rs. 26,84,445.82</u>

*Note:* An amount equivalent to worker's own subscription (item 4 on receipt side) was due to this fund as employer's contribution. This however could not be paid and the transfer to the fund of an amount of Rs. 1.75 lakhs (item 8 on payment side) out of the amount noted in item 4 of receipt side had to be deferred for non-receipt during the year of about Rs. 5.00 lakhs of the contract amount for the NBS project payable by Government.

N. C. CHAKRAWARTI  
Joint Secretary



# INDIAN STATISTICAL INSTITUTE

## Indian Statistical Institute : Receipts and Expenditure

<i>To Receipts</i>		Rs.   nP.
1.	Opening balance :	
	(i) Cash in hand and at Banks .. .. .	3,02,534.05
	(ii) Stock of building materials for work under progress and other constructions .. .. .	4,88,029.32
2.	On account payment, from Government of India in reimbursement of Capital expenditures incurred by the Institute ..	6,50,000.00
3.	Recovery of rent in respect of Institute's main buildings and structures in 203 B.T. Road and 153 Gopal Lal Tagore Road ..	54,057.00
4.	Recovery against Capital outlay from different sources ..	27,718.39

TWENTYEIGHTH ANNUAL REPORT : 1959-60

on Capital Accounts for the year ending 31 March 1960

<i>By Expenditure</i>			
		Rs.	nP.
1.	Expenditure on land and buildings purchased and/or acquired :		
1	Enhanced cost of 183 Gopal Lal Tagore Road .. ..	4,200	67
2	Cost of property at 205 B.T. Road .. ..	3,75,375	75
3	Cost of property at 160 Gopal Lal Tagore Road .. ..	1,27,854	00
		5,04,529	42
2.	Expenditure on buildings, equipment and other purposes :		
1	Development of land, fencing etc. at Giridih .. ..	1,088	73
2	Irrigation & water supply at Giridih .. ..	857	33
3	Construction of Institute main building at Baranagar (Fabrication of materials) .. ..	18,995	01
4	Construction of sheds and structures, etc. .. ..	1,057	38
5	Internal telephone system .. ..	1,090	87
6	Capitalised rentals of telephones under the O.Y.T. scheme (2 in number) .. ..	5,000	00
7	Electrical equipment and fittings .. ..	0,286	80
8	Calculating, punching and other tabulating equipment .. ..	38,525	62
9	Office machineries and equipment .. ..	8,282	90
10	Workshop, Photo and Optical equipment .. ..	877	25
11	Laboratory equipment .. ..	10,768	66
12	Furniture and fittings .. ..	33,450	30
		1,30,857	74
3.	Expenditure on account of repairs, maintenance and constructions of properties of Government of India :		
	Repairs, renovations and new constructions, etc. at 202 B.T. Road .. ..		7,977
4.	Recoverable Capital expenditure: R.T.S. Students' hostel at 206 B.T. Road .. ..		2,347
5.	Repayment of loans taken from different funds of the Institute ..		4,11,602
6.	Closing stock of building materials for work under progress and other constructions .. ..		4,45,024
	Total Expenditure .. ..	15,02,338	76

Out of the temporary loans amounting to Rs. 22,73,000/- taken from the funded accounts upto 31-3-59, an amount of Rs. 4,11,602.22 nP. having been repaid during the year under report (vide item no. 5 in the expenditure side above) the present position of outstanding loans at the close of 31-3-60 comes as under :

(i) Leave salary fund .. ..	Rs.	5,93,000	00
(ii) Gratuity fund .. ..		4,80,000	00
(iii) Development fund I (created out of Director's salary etc.) .. ..		81,397	78
(iv) Development fund II (created out of Government grant) .. ..		7,07,000	00
	Rs.	18,61,397	78

In terms of our report of even date.

Calcutta,  
17th October, 1960

Sd/. LOVELOCK LEWES  
Chartered Accountants

## PART 3 : APPENDICES

### Appendix 1 : Twentyeighth Anniversary Celebrations

The twentyeighth anniversary celebrations of the Indian Statistical Institute commenced at 4.15 p.m. on 19 December 1969 with the singing of a Vedic hymn in the mango-grove at 203 Barrackpore Trunk Road.

#### WELCOME SPEECH OF CHAIRMAN

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

The thought that is uppermost in our minds is the Statistical Institute Bill. It has passed the two Houses of Parliament and is due for the President's assent this very day, which is the date of the twentyeighth anniversary of our existence. To celebrate this happy occasion, we decided to have a ceremony in which all those who take part have been connected with this Institute at some time or other.

I should like to emphasize on this occasion that though the Bill says that we are an organization of national importance, we claim to be something more. As a matter of fact, Professor Fisher, speaking in 1951, described that during the 20 years of its existence the Indian Statistical Institute had developed several facets of national and to some extent of international importance. So far as the Institute's international importance is concerned, we have visible evidence of it in the galaxy of foreign talents adorning the platform. We welcome them and will ask them to testify to our international character. We have Mr. T. Okuno from the National Institute of Agricultural Sciences, Japan; Dr. M. Kalecki, Vice-Chairman, Planning Commission, Poland; Dr. Solomon Adler, lecturer in economics, University of Cambridge; Dr. James Reed from the Wayne State University, U.S.A. and Dr. Frank Yates whom we have ceased to consider as a foreigner, because this is his sixth visit to India. I welcome them all and I welcome you gentlemen, as being interested in the Institute, right from its start. I would now ask Professor Mahalanobis to introduce to you the distinguished foreign guests present here tonight.

#### INTRODUCTION OF FOREIGN GUESTS

Professor Mahalanobis then introduced the foreign guests present, including Madam Kalecki and Mrs. James Reed to all of whom he extended a warm welcome. The following guests then addressed the meeting at the request of Professor Mahalanobis.

Dr. M. Kalecki said :

I am very glad to have an opportunity to be present on the anniversary of your Institute and I wish you much success in your research for the development of your country.

Dr. Solomon Adler said :

I am proud to meet you on this occasion. As you all know, the Indian Statistical Institute has an international reputation. In Cambridge, I learnt a lot about the work of the Institute. It was no occasion for surprise to me when I discovered in Peking that the work of the Institute is also very well-known in the People's Republic of China. May the work of the Indian Statistical Institute grow from strength to strength in the future (applause).

## TWENTYEIGHTH ANNUAL REPORT : 1959-60

Mr. T. Okuno said :

I consider it as a great privilege to be present on this important occasion. I bring to you the greetings and felicitations from the fellow workers in the field of statistics in Japan. We, in Japan, have always admired the great achievements of this Institute. May I congratulate the Director and the staff for putting this Institute prominently on the World Map by their hard and progressive research work. During my short stay I have been able to see for myself the various functions of this Institute, and I am grateful for the hospitality extended to me by its authorities. I wish this Institute continued success and progress and I look forward to a fruitful association between Indian and Japanese statisticians through this Institute. Before sitting down I should say in Japanese 'emisei' (congratulations).

Mr. Morton Nadler, Institute of Computing Machines, Prague, who had been working in the Institute as a foreign expert for nearly one year, said :

It has been a very great privilege to have been in this Institute, to meet your workers who have an international stature and because of this international stature this Institute has attracted so many of the world's great scientists in very many fields. This anniversary is the occasion for looking back at the successes of the institution and it is also the occasion for looking forward, and I should like to say that my own special interest—the data-processing machine—must have a great place in India in the future. I cannot imagine any country as large as India not having its own data-processing industry. I expect that in the development of this industry in India, the Institute will certainly play a leading role.

Dr. Frank Yates, Rothamsted Experimental Station, U.K., said :

I need hardly say, what a great pleasure it is to be with you once again. I am very pleased with Professor Mahalanobis that he feels as I feel myself, that I am not a foreigner. In fact, I have expressed exactly this feeling in the address I have just been giving on the progress of agricultural research in this country which I should say, is really remarkable in the short space of 7 years since I first came in contact with it during a meeting of the International Statistical Institute and the United Nations Sub-Commission on statistical sampling.

The situation in some of the subjects, particularly in plant nutrition, has been, I think, completely transformed. During this short period since my first visit to this Institute in 1951, it has made extremely rapid progress and recorded great achievements. Only those who have had experience of developing research rapidly to meet the urgent demand for results know how difficult it is to achieve a sound and fruitful development and that I feel is what this Institute has been doing. If one looks now at the achievement of the NSS and the contributions the Institute has made to theoretical statistics, particular mention should be made of Professor Rao who has produced a standard text-book on multivariate analysis. He is a leading authority on large-scale sample surveys and it is pleasing to see that the National Sample Survey is now being used to estimate agricultural production and I expect that in a very short time considerably more sense will be brought into the figures that have been previously collected.

It is particularly a pleasure to be here today when the Indian Statistical Institute Bill has been enacted. I realize that this Institute has now come of age. I wish it every success in the future—a success, which I am sure, it will have. And finally I should like to say how much I have always admired and continue to admire the founder, guide and builder of this Institute, your Professor Mahalanobis. I not only admire him but I also count him as one of my greatest friends.

Dr. James Reed, Department of Reading and Study Skills, Wayne State University, USA, said :

It is a very great pleasure to be here on the occasion of the twenty-eighth anniversary of this Institute and on behalf of myself and the American Statistical Association I wish to offer my congratulations to Professor Mahalanobis and to the administration of the Institute. I think that the technical competence of the Institute needs no emphasizing but one of the memories which I shall preserve I shall relate to you in the form of an unconscious comment of one of the staff members here. He was going to Delhi on business and since it was the occasion of a personal event in his family, which was the birthday of his child, he was asked why he did not go to Delhi and return for the event and then back to Delhi. He said, "Because it would cost too much. Of course, I am not paying my own expenses but one should

## INDIAN STATISTICAL INSTITUTE

not spend so much money even when it is paid by some one else". And I think one of the strengths of this Institute is in the unconscious personal awareness of the responsibility that each member has. It is indeed a privilege to have been here.

Dr. James H. Davidson, General Electric Company, USA, said :

As a representative of the private sector of American Industry, I should like to say that it has been my great privilege to have known Professor Mahalanobis since one of his earliest visits to the United States some twelve years ago and I consider it a great privilege to be associated with him and to have been friendly with him since then. I think it is quite obvious to you that not only India but the statistical profession as a whole is very proud of this Institute and of Professor Mahalanobis and it is hoped that with the passing of the Bill the Institute will become an even more important part of Indian life and a factor in the growth of Indian industry. I consider it a great pleasure and privilege to be associated with the Institute and to have this opportunity to work here among you.

Mr. Morris J. Solomon, Operations Research Analyst, Atlas Powder Co., USA, said :

I have been a worker in the sampling field for a number of years and I have always looked upon the Indian Statistical Institute as an important centre of the development of sampling theory. So it is a great pleasure that I have an opportunity to work in the Institute and on this happy occasion I should like to express my good wishes for the future of the Institute.

Professor P. C. Mahalanobis then presented the trainees of the International Statistical Education Centre from the following countries before the distinguished gathering : Burma, Ceylon, India, Indonesia, Japan, Laos, Malaya, New Zealand, Philippines, and Thailand.

### REVIEW BY PROFESSOR P. C. MAHALANOBIS

I should first like to refer to some of the messages which we have received. Our President, Sri Chintamon Deshmukh has sent a telegram saying he is very sorry he could not be here today. We have also received messages from the USSR. Dr. Pamela Robinson, who was with us last year has sent a cable from London, Dr. Rudolph from Germany and Professor Bettelheim from France. The Central Statistical Organization also wish to be remembered on this occasion as we work in very close association with that body.

I shall now come to what is usually called the annual review. In a way, the year under review has been the most eventful and critical year in the history of the Institute. We must all feel humbly grateful to the Parliament and the Central Government, led by the Prime Minister for conferment of a new status on us and we must redouble our efforts to deserve the status. I had the privilege of being present at the time the Bill was debated in the Lok Sabha and the Rajya Sabha and I know of the goodwill which was voiced in both Houses, and of course, we are all conscious that we have to work and earn the right to deserve this new recognition as an Institution of national importance by the Parliamentary Act. It happens to be after the life-span of just one generation—since its foundation—a period of time covering, about 27 or 28 years, that the Institute is having statutory recognition; and also passing through or perhaps, I should say, passed through its most critical year.

My mind goes back to two of my young colleagues, who are no longer with us, without whose assistance we could not have laid the foundations of the Institute. One, Subhendu Sekhhar Bose, was a brilliant student of physics who was doing research work in physics. Then he joined me in statistical work. The other, Sudhir Kumar Banerjee, was only a matriculate. The Institute does represent cooperative effort of this type. We have had brilliant

scientists and also workers who have helped in the management and have even contributed to research. There were many others, but I am mentioning only these two as typical examples. Some of my friends present here today will remember the days before the Institute was formally established when we used to work in what came to be known as the Statistical Laboratory.

I should like on this occasion also to mention two other persons who have never been connected with us in a formal way, but who have been sources of deep inspiration to us. One was Brojendra Nath Seal. He took a great interest in statistics and he insisted, when I was a young professor of physics, that this was the subject I should pursue. I came almost as a kind of command from him. The other person was Rabindranath Tagore. On one occasion, when there was a possibility of my going out of Calcutta on transfer, he strongly urged that I should resign from Government service so that I could continue my statistics studies. My mind goes back to those two great names of modern India.

Coming to the first ten years, I should like to mention three names only. Our first President, Sir Rajendra Nath Mukherjee was a leading industrialist of our country. At that time he was leaving most of the organizations he was connected with, but he accepted our request to be its first President and for five years he continued to take a keen personal interest in the Institute. Another name from a different country, Great Britain, is that of Sir James Grigg who, as Finance Member of India, rendered invaluable help to us. I should like also to mention the name of Mr. H. S. Surhawardy, who is now in Pakistan and who, when he was a Minister here in undivided Bengal, gave us very strong support.

Coming to more recent times, may I refer to an extract from a statement, distributed to you at this meeting, made by Sir Ronald Fisher in December 1951. During the twenty years of its existence, Sir Ronald observed in the course of his statement, the Indian Statistical Institute had developed several facets of national, and even to some extent, of international importance, such as (i) a learned society, (ii) a professional organization, (iii) a non-profit distributing corporation for carrying out projects of fact-finding and analysis, (iv) a teaching centre for pure and applied statistics and (v) a publishing house analogous with the University Press of many Western Universities. So far as national planning was concerned, Sir Ronald observed that the Institute had been progressively shaping its organization towards the fulfilment of the task of bridging the gulf which separates purely academic studies from effective execution and that, in particular, it had taken the lead in the development of techniques of the sample surveys while at the same time it had harboured a series of brilliant mathematicians of world reputation in mathematical statistics whose work had constantly been linked with work on the projects. It was this organic unity of theory and practice, Sir Ronald pointed out, that had given the Institute its unique status. Such an Institution would be wasted if planning consisted of a dull conformity to a blue print of ready-made and foreign conception. It could only be used if planning recognized the aptitude of this spontaneous growth as a national resource. Sir Ronald has been here, I believe on seven occasions, since 1938, and it is remarkable how he so clearly foresaw the future. That, of course, is his characteristic, as my statistical colleague, R. A. Fisher, will confirm. Even here, his intuitive grasp was something really amazing. Not only did he foresee the future of the Institute, but he also saw it developing on the lines of, as he called it, a higher technological institute.

I should like also to refer to the message from our President which has been circulated at this meeting. In the course of his message Sri C. D. Deshmukh mentioned that in recog-

## INDIAN STATISTICAL INSTITUTE

nition of the high reputation of the Institute in India and abroad the Government of India had decided that the Institute would be developed as the focal centre for professional training and research on the same lines as a higher technological institute. A notable feature of the Institute, Sri Deshmukh pointed out, was the integrated training facilities for both theoretical studies and practical project work, an example of the latter being the NSS, perhaps the biggest and most comprehensive survey of its kind undertaken in any country of the world. Sri Deshmukh stressed that with the increasing tasks that were entrusted to it, it had become the more necessary for the Institute to maintain and improve the quality of its work.

And, finally, I should like to refer to the extracts from the statement by the Prime Minister made at the time of introduction of the Indian Statistical Institute Bill. Referring to the vital importance of the Institute which was respected greatly the world over not only for its normal work but also for original work which had benefited and profited the science of statistics, the Prime Minister said : "We want science to grow, and I think it is quite essential that we should accept this broad approach to this question, that scientific work should have a certain latitude. Therefore, we have decided that in this particular matter, this should continue to be an autonomous organization". It was for this reason, the Prime Minister pointed out, that in the appeal presented to Parliament, the Government had accepted the basis for the Indian Statistical Institute to function as an autonomous organization. And that was why, though various checks and counter checks were provided, they had definitely and deliberately not put in Government Directors, for that would change the whole nature of the organization. "Thus, we have tried to combine two major things in this, one flexibility and the other non-interference with its work. It can do its work properly and, at the same time, all kinds of subsequent checks will be there to find out whether it had done its work properly, with the ultimate authority to take over completely or for a period". Apart from this statement we have had the privilege of having him here on many occasions and he has always been a source of inspiration to this Institute.

I have mentioned only a few names, but, of course, there are hundreds of others, who have helped in building this organization. We have also had friends outside India, whom we never knew before, but whose appreciation has been of great help to us.

I shall come back to my present theme. The most eventful year in the history of the Institute, I mean the calendar year, is 1950. January and February were full of troubled forebodings. We did not know the future clearly. I referred to that last year, and stated that we decided that we had now reached a critical stage in the history of the Institute when we should have to reorganize ourselves and completely change the structure of our organization. This requires to be done only rarely. The Council decided in February to serve notice on all members of the staff to terminate their services on 31 March 1950. Again, in March, it was decided to offer re-appointment to our workers for one year. This, surely can be called a great crisis. It came as a shock which I think, has been all to the good. Sometimes, such shocks are necessary and prove to be salutary as it has, I believe, in our case.

Then of course came the passing of the Bill. This meant recognition on the part of Government that this was an Institute, which had already been functioning and had reached a stage which made it necessary to take some definite step regarding its future. We are grateful to our Parliament and the Central Government led by the Prime Minister in giving us this new status. The future now opens out in a new way.

## TWENTYEIGHTH ANNUAL REPORT : 1959-60

In the extracts which I have quoted from the Prime Minister's statement, you will find, he has stressed that this is a non-governmental, non-profit distributing and a scientific society. These are the three outstanding characteristics. To understand the purpose of the Institute it is necessary to realize its triple aspect. It is non-governmental, and the Prime Minister has continually stressed that it will continue to remain non-governmental and it is not going to be converted into a government agency. That, I think, is of great importance. Further, it is a non-profit distributing society enterprise, and we have succeeded in restoring from this year the contract basis for the National Sample Survey and certain other projects. This also is important. In our country, unfortunately, a certain type of bureaucratic administration leads to a great deal of inefficiency. We were becoming, I am sorry to say, rather bureaucratic and rigid and that was due to the fact that we had complete assurance of getting grants from the Government whether we worked hard or not, in other words, we were rapidly becoming like a government agency. But the passing of the ISI Bill during this year has changed this situation. It is now recognized as a non-governmental agency but enjoying a definite relationship with the government.

The Prime Minister referred to this contractual arrangement in the case of project work. This gives the Institute an incentive to do our work more efficiently, that is to say, we earn something with our own ingenuity and by working hard, which we can use to advance the cause of science and to provide amenities for the workers, and in having buildings of our own as we already have on this piece of land that was purchased out of the savings which the Institute succeeded in making in the days when the Institute was doing such sample survey work on a contract basis for the Government of Bengal, the Government of Bihar and other projects. I consider it very fortunate indeed that we succeeded this year in restoring the contract arrangement. This gives us a firm constitutional basis, a statutory basis to advance with our own efficiency through our own enterprise. But we do remain non-profit distributing of course. The Institute is in the public sector and we continue to remain in the public sector.

And here is another point that the Prime Minister has stressed namely, that there is a certain flexibility in this Bill, it is a very short Bill, which ensures autonomy as we continue to work under our own constitution and yet of course, we are recognised as an institution of national importance. If our management breaks down then the Government may take it over. This provides for, if I may say so, a floor to our efficiency. Our efficiency cannot go down below the level of Government administration—that is what I call the floor. But there is no ceiling, or rather, the ceiling will be what we make it.

The Bill also assures us independence in action. In an underdeveloped country like India, there is a big gap between formal rights and what we enjoy in actual practice. Like the recognised principle of political democracy that there will be no taxation without assent or vote, it is also necessary, there should be no governmental interference without responsibility. This has been assured by the Act if the Government wants to take over our work, they will also have to assume the responsibility of running it more efficiently. This, I think, is a guarantee of our independence in day-to-day management. At the same time, also, providing, as I have said, a floor. I think it is a good Bill and I am very glad it has been passed and I am very happy that the Prime Minister and many members of Parliament consider that it is a good Bill. As the Prime Minister mentioned, if it succeeds, it may provide a pattern for enterprises in the public sector. I should be very happy and I am sure



## INDIAN STATISTICAL INSTITUTE

my colleagues also would be, if in this field also, the Institute can function as a pioneering agency, as an experiment in decentralization, in evolving a pattern of administration appropriate to public enterprises.

The ISI Act also confers on the Institute the right to award degrees. We are happy to have this right. It will of course involve great responsibilities. We hope that this would enable us to organize the training and education of statisticians as a profession somewhat similar, if I may say so, to the medical or the engineering profession. That is, we are thinking of awarding degrees to be called B. Stat. which is not to be compared to B.A. or B.Sc. but rather to B.E. or M.B. We are looking forward to providing courses of full professional training hoping that we shall have integrated science teaching, not confined to just statistics, so that our trainees would work with their own hands and learn something of the methods of observations and measurement in the physico-chemical and the biological sciences and conduct experiments in agriculture. There will also be arrangements for teaching social sciences, demography and, of course, sample surveys and everything else in theoretical and applied statistics with mathematics to start with as the basic language of science and then the economics of planning.

People wonder why in a statistical institute we have Psychometric and Geological Studies Units. It is simply because statistics has its field of application as wide as the whole field of science. Therefore, it is proper and appropriate that we should have this broad spectrum of training so that people who graduated from here would find it possible and easy to work in the physicochemical, biological, engineering or the social sciences or in the field of economics of planning. This is what we are hoping to do. It is a challenge to evolve training courses which would be on a full professional line similar to, as I have stated, the engineering sciences or medical sciences. It is a great opportunity and a challenge.

I have mentioned the National Sample Survey which is a vast project. For the first time, we shall have the opportunity from this year of doing it on a contractual basis as an enterprise. If we work hard, if we can evolve methods by which we can do the work at a lower cost, then the savings accrue to us. As it is non-profit distributing, directly or indirectly, it must benefit the workers. If we have land or buildings, that will give us greater security. There may be direct benefits also. This also is an opportunity to show that a public enterprise in an underdeveloped country like India can be as efficient as or even more so than a private one. This is again a challenge. Since there is no conflict of interest between the workers and the management or owners, it should therefore be even more efficient, if I may say so, than enterprises in the private sector. This also is a challenge and an opportunity.

As regards the debate in the Parliament, what struck me most was that many members of Parliament whom I had never met and whom I did not know spoke in such a friendly way. There were others, of course, some of whom we know, who did not speak in exactly a friendly way, but that also is quite natural and proper. But just before the Bill was being put to the vote, one member whose name I do not know stood up and said, "Mr. Speaker Sir, may I point out that it is a very happy coincidence that we are passing this Bill in the Rajya Sabha on the 17th of December, the very day on which a resolution was adopted at a public meeting in the year 1931 to establish this Institute". It was a very graceful thing (*applause*) and I felt deeply touched.

Just after the Rajya Sabha session was over, a United Nations representative and a Joint Secretary from the Finance Ministry came to see me and said, "Now we shall hand

over the Electronic Computer and the machine tools which we have got here and there is a good deal more from the USSR received through the United Nations which we are now going to hand over to you unconditionally so that you may use them for productive purposes." So, I am looking forward to days of rapid development to be achieved not only by using the electronic computer but also by utilizing the equipment received from abroad to help India, a fact to which my friend Mr. Morton Nadler has just now referred. The way now seems clear.

I come now to the question of planning and the Central Statistical Organization. Certain developments have occurred there. I am also associated with that work, and there is a good deal of collaboration. But, I am hoping for still greater collaboration and even more active association at a technical level in the work relating to national planning.

Turning to our international activities, you see before you in the person of our friends from outside India a visual evidence of our international connexions. For many years it has been so. During the past year, a new possibility has occurred to which I may briefly refer. During informal discussions in the USSR and other countries of Europe, it was considered desirable that there should be arrangements for conferences or symposia on problems of economic development with the participation of both the "East" and the "West" as they are called, that is, the two great power blocks. The Indian Statistical Institute may be asked to function provisionally, as the Secretariat; we shall consider this to be a privilege. We are always eager and ready to be associated with all efforts to promote international activities.

I shall go back to a point I have already mentioned. From the point of view of implementation of planning, I attach the greatest importance to the decentralized administration of public enterprises. The Institute has the opportunity to experiment and show what can be done. It may have a very big impact if we succeed as the Prime Minister pointed out in the statement in the Parliament (printed copies of which have been distributed). If we succeed then this may set a pattern for other public enterprises; if it happens, this would be, in a sense, perhaps our biggest contribution.

Finally, one more point. The evaluation of efficiency. For the promotion of scientists or industrial workers, everything depends on appraisal. How we are to recognise talent, that is, ability above average capacity, and how we are to provide opportunity and recognition —this is a basic problem of human organization in every sphere. So, the greatest challenge to the Institute would be to develop its system of appraisal, which also means developing a framework of certain standards and an atmosphere, I do not quite know how to express it, of criticism, of evaluation of a scientific and other achievement. Personally I am somewhat ashamed to confess that this is where we are very weak in India. This is a mark of under-development. What we now need is development of standards of scientific criticism and scientific appraisal.

As a small contribution, we have decided in the Institute to start a new journal on somewhat novel lines. I should like to explain the idea briefly. I have discussed the idea with our President and also in our Board of Management and we are all agreed. Briefly, it is like this. When we judge whether someone is a good novelist, we do not demand that he must be in the same rank as the top, let us say, 10 or 20 or 50 of the best novelists in the whole world. We judge him on what he publishes. The same thing is true of short story writers, or poets. Everybody who writes poetry is not a very great poet and it would be a great pity if none could publish unless he happened to be, let us say, in Bengal like Rabindra-

## INDIAN STATISTICAL INSTITUTE

nath Tagore. In the case of a painter, surely you would not demand that to be allowed to exhibit the paintings he or she must belong to the top rank comprising, say, 100 or 200 painters. But somehow or other we, in India, have adopted the criteria of highly-developed countries in accepting papers for our journals in trying to achieve a very high level of publication. We have indeed succeeded in achieving it in *Sankhya*, which, we are glad, has earned fairly wide international recognition. But now we are thinking of starting another journal which would judge the matter offered for publication by only two criteria. First, there should be some element of newness in it. For example, a new bibliography would be acceptable, that is, it must not be a mere reproduction, a physical reproduction of something already available. Anything, which has an element of something new in it will be acceptable. Secondly, as far as we are able to ascertain it the contribution should be genuine, that is, the observations or facts recorded should not be put down from imagination—this would be quite adequate. On the basis of only these two criteria we intend to print whatever comes. Because then every young worker, every young scientist, will have a medium and will be able to publish articles on the basis of which he will be appraised. This will be a venture on somewhat new lines. We are rather enthusiastic about it. It seems to us this may help in laying the foundations of scientific appraisal and criticism in the whole country. I explained it to our President, and requested him to suggest a suitable name for the new journal. Sri Chintamon Deshmukh, I do not know if my colleagues know it, is a master of several languages including Sanskrit. He was very excited about the idea of this journal and said he would try to suggest a suitable name. Coming back from his house in Delhi, immediately I reached home he called me on the telephone and said he had got the name which was *Nikasha*, which means, the 'touch-stone' in Sanskrit. So, we hope, in the near future, we shall be able to start a new journal *Nikasha* and which, I hope, would be a kind of symbol of the future. It is by this touch-stone that we shall also be assessed and I do hope we shall succeed.

### CONCLUDING REMARKS BY CHAIRMAN

Sir D. N. Mitra, who presided, said in conclusion :

There is one provision of the Bill to which Professor Mahalanobis has not referred and that is a very important provision declaring that the Indian Statistical Institute is an institution of national importance. This, gentlemen, is only a recognition, for the Institute was not built by Parliament, it was built by us. The very first sentence of the History of the Institute, copies of which have been distributed to you, mentions that starting with a solitary computer working part-time and a total current expenditure of less than Rs. 250, when it was established in April 1931, the Institute had on its roll about 2000 regular workers backed by an annual budget allocation of Rs.84 lakhs at the end of March 1959. This Institute has been built up by that solitary computer plus 2000 regular workers working for the last 28 years; and on behalf of the Institute I extend my thanks to all the workers who have succeeded in building up this Institute of national importance.

Now, of the workers, the foremost has been Professor Mahalanobis and Mrs. Mahalanobis. I do not know whom to name first—Mrs. or the Professor? So far as the Professor is concerned, we have known each other for several decades and I have been associated with him from the very inception of the Institute. As regards his scholarship I cannot appraise it, but I can tell you this that during all these years, he has never spent a single day, even

when travelling far from this country when the Indian Statistical Institute has not been foremost in his thoughts.

We greatly miss Mrs. Mahalanobis on this happy occasion. Ever since we have been celebrating our anniversary, since the year 1951, she has not only been with us but she has always taken an active part in the celebrations. Unfortunately, her health prevented her from joining this year's celebrations. You will have heard of the hospitality extended by the Institute to the visiting scholars. Now, the whole credit for that belongs to Mrs. Mahalanobis and she also deserves some credit for seeing to it that Professor Mahalanobis is fit enough to carry on with his work.

There is just another thing, I should like to tell you. With the enactment of the Bill, it is now clearly established that the Institute is a learned body, akin to universities rather than to organizations which exist for making profit. As soon as this point is realized by all our workers most of the difficulty in regard to the relationship between workers and the management will be removed. If there is any difficulty left it can surely be solved, not in the spirit of negotiations between employers and employees, but in the spirit of democratic partnership in which all the workers share on the same basis—from the computer who started on a salary of Rs. 250 a year to Professor Mahalanobis.

Some of the important departments of the Institute were kept open for visitors till a late hour on the anniversary day. The meeting was followed by a programme of music and dance including a dance-drama, *Vasavadattā*, based on Rabindranath's poem, *Abhisara*.

#### ANNIVERSARY MEETING HELD AT GIRIDIH ON 25 DECEMBER 1959

##### PROFESSOR P. C. MAHALANOBIS' SPEECH

I am glad to be with the workers of the Indian Statistical Institute and the friends of the Institute in Giridih this afternoon on the occasion of the Anniversary Meeting and I offer them my greetings.

I am often asked why the Institute maintains an operating branch at Giridih. My mind goes back full one generation to the year 1929 when I with four young associates\* started statistical work in this very house, *Kamalabas*. We were then working on problems of rainfall and floods in Orissa which had been referred to me by the Government of Bihar and Orissa. At that time, Orissa was a part of the old province of Bihar and Orissa; but that had nothing to do with our coming here. This house belonged to my father-in-law, Heramba Chandra Misra. I and my associates wanted to do some intensive work on the flood problems of Orissa, and we decided to spend the Pujah vacation in Giridih; I and my wife stayed at *Kamalabas* and my young colleagues in my grandfather's house, *Jamkuli*. I recall that in the course of these studies, we explored possibilities of holding up the water of the Orissa rivers by building dams in the Mahanadi catchment, in order to control the floods in the Orissa delta and also to use the stored water for irrigation or, even more usefully, for hydro-electric power. These studies has supplied the basis for the future development of the big Hirakud project.

\* Nistaran Chakravarti (who later became the Director of the West Bengal State Statistical Bureau), Sudhir Kumar Banerjee (who passed away in 1952), Jalsdhar Sarma (who is still working in the Institute) and Surojendra Das Majumdar (who is still assisting the Institute in legal matters).

## INDIAN STATISTICAL INSTITUTE

It was a full generation ago\* that we started our statistical work in this house at Giridih in 1929. Two years later a resolution was adopted at a meeting held in Calcutta on 17 December 1931 to establish the Indian Statistical Institute. Soon after the Institute was established, from perhaps 1933 or 1934, I and some of the young workers began to come to Giridih every year during the Pujah vacation.

Some of my young colleagues have passed away before their time. I recall Subhendu Sekhar Bose and Sudhir Kumar Banerjee. Subhendu Bose was a brilliant student of physics who stood first in all the university examinations, and had been awarded a research scholarship in physics. He was working in a room adjoining my own room in the Presidency College where I was teaching physics at that time. He was my old student in physics; and I persuaded him to take up seriously the study of statistics. Sudhir Banerjee was only a matriculate. He was too poor to continue his studies in the university, and had started several years earlier to assist me in computation work. My mind goes back to these two young men, one a brilliant student of science and the other a matriculate computer, who each in his own way made contributions to the Institute the value of each which I alone can fully appreciate. The Institute has been built not merely by the scientific activities of brilliant students but also equally by the devoted service of its more humble workers.

From about 1935 or 1936, Raj Chandra Bose (1935) and Samarendra Nath Roy (1935) used to come to Giridih and did a great deal of work in statistics in this place. They have now settled in the USA where they are now professors. Even in the early days men from all over India had worked here and had shared heavy responsibilities and who are now working in other places; among them may be mentioned Prabhat Ranjan Roy (1931), Statistician, State Statistical Bureau, West Bengal; Santipriya Bose (1932), Deputy Director, Department of Agriculture, West Bengal; Sadasiv Sen Gupta (1953), Chief Statistical Officer, Eastern Railways (now retired); Dharendra Mohan Ganguli (1935), Deputy Director, State Statistical Bureau, West Bengal; Dr. K. R. Nair (1936), Joint Director, Central Statistical Organization, Cabinet Secretariat; G. M. Panchang (1937), Senior Statistician, Central Power and Irrigation Board, New Delhi; Shri V. G. Pondarkar (1938), now in the Reserve Bank of India; Kunway Kishen (1938), now Statistician; Satyabrata Sen (1938), Market Research Officer, Clarion Advt.; Atindranath Bose (1938), now Member of the Parliament; P. K. Bose (1939), Head of the Department of Statistics, Calcutta University; Mrs. C. Bose (1939), Deputy Director, State Statistical Bureau, Government of West Bengal; B. N. Datar (1940), Labour and Employment Adviser to the Government of India; K. D. Gupta (1940), Director of Statistics, Food Relief and Supplies Department, Government of West Bengal; G. D. Mathur (1940), Ministry of Commerce and Industry; N. T. Mathew (1940), Head of the Army Statistical Office, Government of India; Anil Bhattacharyya (1940), Head of the Department of Statistics, Presidency College; K. C. Cheriyan (1943), Reserve Bank of India.

Some of the valuable workers who joined at about the same time and are now a part of the inner core of old workers are—Mohanlal Ganguli (1939); J. M. Sen Gupta (1932); C. R. Rao (1941); Nimai Charan Ghosh (1940); S. Raja Rao (1938); D. B. Lahiri (1946); Mani Mukherjee (1943).

---

\* I have mentioned elsewhere that we had collected information, for Bengali students of the Calcutta University in early thirties, of the age of the father at the time of the birth of the first son, and this was about 27 or 28 years; we may therefore take 28 or 29 or 30 as the interval between two generations.

## TWENTYEIGHTH ANNUAL REPORT : 1959-60

From 1937 we started working on the sample survey of the jute crop in Bengal. The field work used to be usually complete by the end of September and it was our practice to come to Giridih to write the report during the Pujah vacation. I remember, for four or five years from 1938, we often used to work late in the evening and sometimes till midnight in this very house to complete the writing, typing and finally, the stencilling of the jute reports. In those days we always submitted our reports in good time. I used to stay at *Kamalabas* but my associates lived at *Jankulhi*, *West Point* and later in a number of rented houses.

In early November of 1941 we were getting ready to return to Calcutta. One of our oldest workers, who is well known in the Institute as Sankar (Jitenra Mohan Sen Gupta), came to me and said, "although we stay at Giridih only about six or eight weeks at the most, we pay the rent for the whole winter season. If we pay a little more we can keep the houses throughout the year; and this would be more convenient because we can leave behind some of the furniture, equipment, books, etc." This seemed to me to be a good idea, and in 1941 we decided to leave behind perhaps about 12 or 15 workers at Giridih. This was a most fortunate decision.

Soon after our return to Calcutta there was a great deterioration in the war situation; in December 1941 enemy troops entered Burma. There were grave apprehensions of their attacking Calcutta; and in fact Calcutta was bombed a little later. The Institute was then occupying some rooms in the Presidency College and also some rented houses in Calcutta. Government asked us to vacate the rooms in the Presidency College. Educational institutions were closed and were removed out of Calcutta. At a meeting of the Council of the Institute in January 1942 (which was held, I remember, at Baroda at the time of the Annual Session of the Indian Science Congress and of the Statistical Conference), it was decided unanimously that a good part of the Institute should be removed to Giridih.

M.Sc. classes in statistics had been started for the first time in India in July 1941 on the initiative of the Institute, and the whole of the M.Sc. department of statistics in the Calcutta University was located at that time in the Institute. In the first quarter of 1942 a big part of the Institute together with the M.Sc. department of the Calcutta University moved to Giridih. This is how the Institute first came to have a permanent centre in Giridih. C. R. Rao was a student of the M.Sc. class at that time. He and his fellow students completed their statistical studies at Giridih and he, as the present head of the Research and Training School, is now sending his students to Giridih every year.

In 1943 and 1944 the Institute, at the request of the Government of Bihar, organized sample surveys of crops in Bihar. This led to a great expansion of the activities at Giridih, and the number of workers at that time increased to something like three hundred. N. T. Mathew organized the work with great efficiency; he is now head of the Army Statistical Office in New Delhi and is also looking after work of the National Sample Survey in Delhi. Several other well known statisticians, for example, K. R. Nair (who is now Joint Director in the Central Statistical Organization in New Delhi), V. G. Pendarkar (who is now in the Reserve Bank) and many others had worked in Giridih. In this way Giridih had become an all-India centre of statistical work fifteen years ago.

In 1944 the Institute tried to acquire a fairly big plot of land through the land acquisition procedure but unfortunately there were many difficulties. I recall that it was through

## INDIAN STATISTICAL INSTITUTE

the good offices of the Prime Minister, Sri Jawaharlal Nehru, who wrote to the Chief Minister of Bihar, that we finally succeeded in acquiring the farm across the street.

From this time the Institute got a legal foot-hold in Giridih. The Calcutta workers, however, were in favour of transferring the work to Calcutta, and from 1946 and 1947 the Giridih staff began to get smaller and smaller. I took a different view. I had a feeling at that time that as the Institute claimed to be an all-India institution it would be proper to have its activities located not only in Calcutta but in other places outside Bengal. Giridih was a convenient centre in many ways; and we decided to continue the work at this place.

Looking back to the early days, I recall how intimately we used to work, having lively discussions in the early mornings or late evenings. *Kamalabas* was our centre for many years until *Mahua* was constructed. Some of my associates also used to live at *Kamalabas* or in the annexe. My father-in-law, Heramba Chandra Maitra and his wife Kusum Kumari, used to come to *Kamalabas* during the Puja vacation; and our workers had established very friendly relations with them. We used to live and work like a big family. This was of the greatest value. The friendly relations established at Giridih supplied cohesive forces which were of great help in the early years. I earnestly hope these traditions will be maintained in future.

As you are aware, an Act has been recently passed by the Central Government which was sponsored by the Prime Minister, Sri Jawaharlal Nehru, to recognize the Institute as an institution of national importance and also to give it the power to award degrees in statistics. The Central Act will not only place the Institute on a secure foundation but would also open new possibilities. Since 1952 or 1953 work in Giridih has been somewhat stabilized but progress has been slow because of the uncertainties of the future. I have already mentioned that I was always eager that the Institute should have a strong centre in Giridih which is the meeting place of three cultural streams. This is near the heart-land of ancient India. A hundred and forty miles away is Gaya where the Buddha attained enlightenment. Nalanda, the site of the great university, is only 90 or 100 miles away. A second stream is that of the Bengali culture which has taken root in this place. There is also the culture of the Santals who have been here for thousands of years, since long before the advent of the Indo-Europeans or the people of the Indus Valley civilization.

Giridih also has a considerable variety of economic activities. It is an important centre of coal mining and is the world centre of the mica industry. It is a trading centre of importance. The surrounding country is primarily agricultural with some forests. Giridih is also the gateway to the great place of pilgrimage of Jains, the Parasnath hill, which is only sixteen miles away.

Situated on a hillstream and in an undulating country in the midst of hills, it is a lovely and also a very healthy place. My own associations extend over two generations, since I was a young boy; as I have mentioned, also one full generation of statistical work has made Giridih very dear to me. But I believe it is not merely because of these associations but for entirely objective reasons it is very fortunate that the Institute has a branch in Giridih. It is an exciting place full of possibilities for social and economic studies. I am sorry and somewhat ashamed that we have not yet taken full advantage of the possibilities of research in this place and in the surrounding country.

I am sorry I could not come to Giridih for nearly three years. When I came here about two months ago in October, I heard there were rumours that Giridih work would be gradually reduced. Even at that time I told the Giridih workers that my own view was entirely different. Now that the Central Act has been passed for the Indian Statistical Institute, I have no hesitation in stating that it is our intention not only to maintain but to increase the activities at Giridih. So far the Giridih branch has been doing the National Sample Survey work as a kind of suboffice of Calcutta. I hope it will be possible to arrange for the primary data to be sent to Giridih directly from the field in future so that the work here can be programmed independently.

I should also like to refer to the courses of instruction which will be offered for the award of degrees in statistics. Sometimes a distinction is sought to be drawn between professional training and liberal education. I think it is possible to distinguish the two but not to separate them, like two sides of a piece of paper which can be distinguished but not separated. I believe it is desirable that everyone should earn his living. I hope social changes in India would create such conditions very soon that everyone would be obliged to earn his living; and living on unearned income (except for those who are physically not fit to work) would cease. The aim must be that our graduates would be able to earn their living in the statistical profession.

I believe it would be proper to look upon training in statistics as something like the training in the engineering or medical sciences. The use of statistics is universal in the physico-chemical, biological, and social sciences. The background of training for the statistical profession must cover all the sciences. An integrated approach is essential as it is out of question to cover the content of knowledge of each particular science subject. The teaching of science must be integrated. The students should acquire skill in scientific observation and measurement of natural or social events and also be able to understand how the different disciplines take care of different aspects of the problem.

I believe Giridih will offer special opportunities for a comprehensive and integrated approach to professional training and education. At Giridih one can come into contact with the realities of social and economic aspects of life in a way which is scarcely possible in a big city like Calcutta or Delhi. It is my hope that in future our trainees would come and spend a good part of their time at Giridih.

About ten or fifteen minutes before this meeting had started I planted a young mango tree in the grounds of this house, *Kamalabas*. A full generation ago we had begun our statistical work in this house. Today I have put down a young mango plant which would grow into a big tree along with a new generation. I look to the future with hope and confidence that old traditions will be maintained and the work will be extended and strengthened by the new generations who would come after us.

I am very glad that so many friends are with us today. I am particularly glad that twentyfour Government officers on deputation are also with us from different parts of India. Their presence here makes this Institute an all-India institution in reality and not merely as a matter of legal recognition by the Central Act. I shall conclude by offering our greetings again to our friends who are with us on this occasion.



## INDIAN STATISTICAL INSTITUTE

OBSERVATIONS MADE BY SIR RONALD A. FISHER, F.R.S., ON 28 DECEMBER 1951  
ON THE ROLE OF THE INDIAN STATISTICAL INSTITUTE IN NATIONAL DEVELOPMENT

During the twenty years of its existence the Indian Statistical Institute has developed several facets of national, and even to some extent, of international importance. It has in several aspects the character of

- (i) a Learned Society devoted to the increase of national knowledge in statistical science,
- (ii) a Professional Organization extending recognition to professional statisticians in various employments,
- (iii) a commercial non-profit distributing Corporation capable of carrying out on economic terms projects of fact-finding and analysis for State and Central Governments, and for commercial and industrial organizations,
- (iv) a Teaching Centre for pure and applied statistics at under-graduate and post-graduate level,
- (v) a Publishing House analogous with the University Press of many Western Universities.

It is, I believe, principally of the fourth of these aspects that National Planning should take account and make use, for with the great extension, in recent years, both of abstract or mathematical statistics, and of its applications in the economic, administrative and scientific life of modern nations, there has grown up as never before the need of centres for the concurrent study of mathematical statistics, and of its several specific applications. A similar need, which I believe to be rather closely analogous, has been felt in Western nations for Technological Institutes, in which the most advanced methods of applied physics may be studied concurrently with the facilities offered by modern engineering. This dual need has created great Institutes, of which many examples might be given, but of which the Massachusetts Institute of Technology is typical, which differ in structure and organization from the traditional University, being particularly charged with the task of bridging the gulf which separates purely academic studies from effective execution and in which consultant work for industry is a duty required of the professors.

The history of the Indian Statistical Institute shows it to have been progressively shaping its organization towards the fulfilment of such a task in relation to the constantly expanding applications of statistical methods. In particular, it has taken the lead in the original development of the techniques of Sample Surveys, the most potent fact-finding process available to modern administrations, while at the same time it has harboured a series of brilliant mathematicians of world reputation in mathematical statistics. What is most striking is that the mathematical work has been constantly linked with work on the projects, so that practitioners in the applied fields can learn insensibly the uses of mathematical analysis, and the mathematicians can receive the vivifying stimulus of seeing their devices applied in practice. It is the organic unity of theory and practice that has given the Institute its unique status at the present time.

In the course of National Planning such an Institution may be either used or wasted. It will be wasted if planning consists of a dull conformity to a blue print of ready-made and foreign conceptions. It can only be used if planning can recognise the aptitude of this spontaneous growth as a national resource peculiarly fitted to the current changes of the modern