INDIAN STATISTICAL INSTITUTE

ANNUAL REPORT : 1954-55

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CALCUTTA-35

INDIAN STATISTICAL INSTITUTE

Annual Report : April 1954—March 1955

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TWENTYTHIRD ANNUAL REPORT : April 1954-March 1955

PART 1. INTRODUCTION

1. On 17 December 1931 it was decided at a public meeting to start statistical society in India and a committee was appointed to draw up the constitution. On the recommendation of this committee the Indian Statistical Institute was registered in April 1932 as a non-profit scientific society under Act XXI of 1860. In 1932–33 there was only one part-time worker and the total current expenditure was Rs. 238. Since then the activities of the Institute have increased in many directions. It still functions as a learned society with *Sankhyā* : the Indian Journal of Statistics as its official organ; and has society-type branches at Aligarh, Bangalore, Bombay, Madras and Poona. In addition the Institute has many other activities for which operating offices are maintained at Baranagar (Calcutta–35) and 9B Esplanade in Calcutta, and at Bombay, Bangaloro, Delhi and Giridih (Bihar). The number of workers increased to nearly 1200 in December 1955; and the expenditure to about thirtyeight lakhs of rupees in 1954-55.

2. *Constitution and Administration :* The Institute consists of Ordinary, Life and Honorary Members; Associate Fellows, Fellows and Honorary Fellows. The supreme control including the power of making rules is vested in the members in General Meeting assembled. The President and Office-bearers are elected annually. The management is vested in the Council, the Governing Body of the Research and Training School, and other Committees elected from time to time. Work assigned by the Government of India is done in accordance with conditions settled by mutual agreement and in consultation with Government.

3. The late Sir R. N. Mookerjee was the first President (1932–1936); and Shri Chintaman D. Deshmukh has been elected President every year since 1945. A new post of Chairman was recently created and Sir D. N. Mitra was elected Chairman in 1955. Dr. S. C. Law has been holding the office of Treasurer since 1936. Professor P. C. Mahalanobis has been serving as Secretary since the inception of the Institute and also as the Director of the Institute in charge of the executive work since the creation of this post in 1948; he has been also the Editor of *Sankhyā* from the beginning.

4. The work of the Institute is at present organized in several departments :

(1) *Research and Training School* (RTS) : for research in theoretical and applied statistics with sections for professional training at post-graduate level for candidates who have already taken their masters' degree and other technical courses at various levels. A grant of about Rs. 6 lakhs was received from the Government of India in 1954-55 for this purpose. Recently two new units have been established for biometric and psychometric researches.

(2) *Projects :* for statistical enquiries and investigations which are undertaken on the basis of *ad hoc* contract grants. The biggest project at present is the technical work of the National Sample Survey (sample design, processing and analysis of field data) which is being done by the Institute in cooperation with Government agencies.

(3) *Examinations :* Since 1938 the Institute has been conducting open examinations in several parts for the award of Statistician's Diploma and Computer's Certificates. The Institute has also arrangements for the award of Associate Fellowship and Fellowship of the Institute on the basis of professional qualifications.

(4) *Precision Computation and Mechanics :* This section is in charge of both development and construction of electronic (analogue and digital) computers, desk and other types of calculating machines, precision measuring instruments and associated equipment. It has an electronic laboratory and a well-equipped workshop.

(5) *Statistical Quality Control* (SQC) *and Management Research :* Three whole-time SQC Units are maintained at Bangalore, Bombay and Calcutta, which work under the guidance of a Policy Advisory Committee of which Shri C. D. Deshmukh (Minister of Finance) is the Chairman and many leading industrialists are members.

(6) *Operational Research relating to Planning :* An Operational Research Unit (ORU) started work on a small scale at the end of 1953. In November 1954, Prime Minister Nehru inaugurated studies relating to planning which led to the preparation of the Draft Plan-frame of 17 March 1955. Since then Government have decided that the ORU should be expanded to work on problems of national planning in close collaboration with the Planning Commission, the Ministry of Finance and the Central Statistical Organization.

(7) *General Services :* The Institute maintains common services in the form of a large Machine Tabulation Section and a specialized Library with a Photographic Section. There is also an Estate Office which has constructed departmentally with great economy all the buildings of the Institute and which looks after water, drainage and electric supply and repairs and maintenance of grounds and buildings.

(8) *Social Services :* The Institute maintains various social services for its workers, students and guests such as medical welfare units at Calcutta and Giridih; hostels, guest houses for visitors, canteen, night school, transport service and workers' club for sports, recreation, and cultural activities.

(9) *The International Statistical Education Centre :* This is an associated institution which was established in 1950 under the sponsorship of the UNESCO and the Government of India and which works under the joint control of the International Statistical Institute and the Indian Statistical Institute. 246 trainees from 16 Asian countries have come to the ISEC in Calcutta between 1950 and 1955.

(10) *Eka Press :* Another associated unit is the Eka Press under the control of the Statistical Publishing Society which was established on the initiative of the Institute as a non-profit society registered under Act XXI of 1860 to undertake the publication of *Sankhyā :* the Indian Journal of Statistics as the official organ of the Institute. The Eka Press is well-equipped for scientific and technical work of high quality, and is managed in close association with the Institute.

5. A brief history of the Institute is given in Part 3 of this report.

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PART 2. THE YEAR UNDER REVIEW : 1954-55

1. GENERAL ADMINISTRATION

1. *Membership :* The number of ordinary members of the Institute increased to 179 at the end of the year when 31 enrolled as new members. The number of sessional and student members were 17 and 5 respectively. There were 3 general meetings, inclusive of the Annual General Meeting (Proceedings in Appendix C).

2. *Council :* The Council had 8 meetings during the year. (Names of the members of the Council are given in Appendix I).

3. *Governing Body :* The Governing Body of the Research and Training School met on 28 October 1954 at Calcutta with Dr. S. K. Banerjee in the Chair. The Finance Committee of the Governing Body also met on 27 October 1954 at Calcutta. (Names of the members of the Governing Body and the Finance Committee are given in Appendix II.)

4. *Honorary Members :* The Council recommended for election as Honorary Members the names of Dr. P. N. Banerjea, D.Sc., Dr. Nikhil Ranjan Sen, D.Sc., Ph.D., and Professor P. C. Mahalanobis, F.R.S., the three signatories of the notice convening a meeting on 17 December 1931 in Calcutta at which the decision was taken to establish the Indian Statistical Institute.

5. *Administration :* As in previous years the Institute continued its policy of decentralized administration through a number of working committees. The Administration Committee had 28 meetings to discuss questions of policy and important administrative matters. The Technical Committee met 16 times to discuss matters relating to the technical section. The House Committee and several other committees continued to function and met as necessary.

6. *Headquarters :* The premises at 202 Barrackpore Trunk Road, with an area of about 8.5 acres which is adjoining the Institute building, were requisitioned by the Government of India and possession of the premises was handed over to the Institute on 15 May 1954. After some repairs, additions and alterations, a total floor space of about 14,000 sq. ft. was available in the different buildings of the premises for office use. Asbestos sheds were also erected in the compound and additional accommodation of about 10,000 sq. ft. was made available for the purpose of Workshop, Smithy, Carpentry and Stores.

This year the Institute had to accommodate a large number of foreign scientists and experts for which a portion of the main office at 203 B. T. Road was converted into guest rooms.

The Institute also acquired in August 1954 about 1.29 acres of land to the west of the Institute premises through the Land Acquisition Department, Government of West Bengal, after four years' processing. The installation of an electrical sub-station at the premises of the Institute for high tension electric supply at 6,000 volts A.C. was completed during the year and the sub-station started functioning from 1 September 1954. Electrical installations at 202, 203 and 204 Barrackpore Trunk Road are now fed from the new transformer.

7. *Calcutta City Office :* The Computers' training classes continued to be held at the office at 9B Esplanade. Meetings of the Council and other important meetings were also held there during the year. It was found a convenient place for holding the Statistical Quality Control Conferences in January 1955.

8. *Giridih Office :* Development work on the land progressed satisfactorily. About 6.18 acres of land was reclaimed and a 2,000 feet long roadway was constructed. A cemented threshing yard and a store adjoining it was completed and additional construction work was taken in hand. Consolidation of cultivable plots was also started to facilitate field experimentation. Besides cultivation of *aus* and *aman* paddy by the Japanese and local methods a part of the reclaimed land was brought under wheat, gram, maize, sugarcane, potato and some other minor vegetables on an experimental basis. The trainees of the International Statistical Education Centre (ISEC) and the Research and Training School (RTS) received training in crop-cutting experiments and eye-estimation during their visit to Giridih in November, 1954.

9. *Delhi Office :* The office at Delhi continued to function at 8 King George Avenue as a vital link and co-ordinating office between the Institute and the Central Statistical Organization, the Planning Commission, the Department of Economic Affairs and other departments of the Ministry of Finance, and other Ministries. The office accommodation at Delhi is still inadequate and the Government of India has been approached for land and buildings.

10. *Bombay Office* : The Bombay Office did important administrative work in connection with the statistical and field work of the Eighth Round of the NSS in Bombay city.

11. *Field Branch:* The Field Branch of the Institute with a staff of 158 functioned with its headquarters at the Esplanade Office for part of the year and at 206 Barrackpore Trunk Road during the rest of the year. The main activities of the Field Branch were first, collection of NSS data in West Bengal and then attending to a number of special surveys. Some of the special surveys undertaken by the Field staff were a demographic survey associated with the Fourth Round of the NSS, jute and *aus* surveys, *amn* surveys, pilot surveay a of unemployment, peak period study during harvest season, etc. Besides the routine field work for collecting data, the Field Branch was also responsible for the preparation of many sampling frames and sketch maps of villages.

12. *Distribution of workers at different centres :* The following table shows the distribution of workers at Baranagar, Calcutta, Giridih, Delhi, Bombay and Bangalore as on 31 March 1955. Figures are also given for the Field Branch maintained under the direct control of the Institute for sample surveys and special enquiries.

centre	*workers*				*total*	
	1954	1955	1954	1955	1954	1955
Calcutta : Headquarters	455	548	101	161	556	709
Calcutta : City	10	26	6	8	16	34
Giridih	52	70	17	16	69	86
Delhi	8	6	2	3	10	9
Bombay SQC	4	7	1	3	5	10
Bangalore SQC	—	8	—	1	—	9
Statistical	529	665	127	192	656	857
Field Branch	131	120	40	38	171	158
Total :	660	785	167	230	827	1015

13. *Changes in staff :* Shri Debabrata Basu returned in July 1954 after working one year on a Fulbright fellowship in the Institute of Statistics, University of California, Berkeley, California.

Dr. T. P. Choudhury was on study leave for two years at the London School of Economics, and came back in August 1954 after securing the Ph.D. degree of the University of London.

Dr. C. R. Rao who had been away for about one year as Visiting Research Professor of Mathematical Statistics at the University of Illinois, Urbana, U.S.A., resumed charge of the Research and Training School in November 1954.

Dr. Edwin A. Harper of the Ewing Christian College, Allahabad, joined the Institute on deputation in November 1954 to organize the Psychometric Unit.

Shri Amaresh Chandra Roy and Shri Mohi Mohan Mukherjee joined the Electronic Laboratory in December 1954 and January 1955 respectively.

Shri P. K. Sen joined the Institute as Special Officer (Administration) in December 1954.

The following new research scholars joined during the year : Messrs Ravi Kumar, S. D. Chatterjee, R. P. Pakshirajan, B. Das Gupta and Mrs. Sumitra Nandi.

Shri S. B. Sen, Head, Project Division, was granted leave for one year from May 1954 with lien over his present post to take up an assignment under UNTAA programme in the Philippines in May, 1954.

Dr. R. Vaidyanathaswamy retired from the service of the Institute with effect from 31 December 1954.

Prof. K. N. Chakravarti retired from the post of Registrar with effect from 5 January 1955.

Shri Dipankar Sarkar left in December 1954 to take up an appointment in the Indian Defence Accounts Service.

14. *Cost Accounting Section :* This section, as in previous years, was mainly concerned with evaluating output of work into equivalent standard hours for all primary workers of the Institute, and with assessing man-months spent in various jobs.

The system of incentive bonus was revised in July 1954 and a system of awarding prizes for efficient performance was introduced. A Standards Board for fixing reasonable levels of performance was set up in July 1954 with 7 senior workers as members. Twentyone meetings were held by this Board during the year in which 95 different operational items were examined and corresponding reasonable levels of performance fixed.

The Accounts Section is exploring the possibilities of mechanizing the accounts and a measure of success has been attained in mechanization of the monthly pay-rolls of the Institute which cover more than 50% of our total expenditure.

15. *Sankhyā : The Indian Journal of Statistics:* The publication of *Sankhyā* has been expedited to a great extent and during the year under review the following seven parts of the Journal have been published :- part 4 of volume 13, 4 parts of volume 14 and parts 1 and 2 of volume 15.

16. *Newsletter :* The Indian Statistical Institute Newsletter volume 2, parts 1-4 were published to keep workers and general public informed about the activities of the Institute.

2. Social and Welfare Section

1. *Health Home :* Preliminary work has been started for the construction of a health home for the workers at Giridih on the piece of land kindly handed over to the Institute by Mrs. Nirmal Kumari Mahalanobis. A sum of Rs. 3,950/- handed over by the delegation of Soviet scientists to Professor P. C. Mahalanobis was earmarked by the Director for medical welfare of the workers. It will be utilized for this purpose along with the funds allotted by the Institute.

2. *Medical Welfare Unit :* During the year the Unit was housed in an independent building consisting of the Medical Officer's room, a well-equipped dispensary, a reception room for patients, an examination room, an isolation room and two single-seated sick rooms. Sanitary privies and bathrooms with hot and cold water were also provided.

The attendance at the Medical Unit was 7,449 as against 5,581 in the previous year. The Medical Officer attended 940 calls at workers' residences against 715 in 1953-54. Medical consultations, minor surgical treatment and injections etc. totalled 688 as against 518 in the previous year; 7,214 prescriptions were served against 5,063 in the preceding year. Medicines worth Rs. 7,882/- were dispensed during the year, as against Rs. 5,260/- last year.

The usual six-monthly inoculations against typhoid and cholera and yearly vaccination against small-pox were carried out covering the entire Institute staff at Baranagar and Calcutta. The Baranagar Municipality supplied free vaccination lymph to the Institute and sent some of their vaccinators on request. The benefit of the anti-malarial measures which was so far confined to the Institute workers only has since been extended to the entire field staff. The Medical Unit was also charged with the responsibility of looking after the sanitation of the Institute campus jointly with the Estate Office.

The Medical Unit undertook a preliminary statistical study on health measurements of Institute workers and has lately taken up an intensive health survey on a more ambitious scale of all the Institute workers and members of their families.

The work of the Branch Medical Unit at Giridih also increased during the year under report. The total number of calls attended by the Branch Medical Officer, rose to 239 and the total number of prescriptions served by the Branch Unit to 1,492, value of medicines dispensed being Rs. 1,930/-.

Our thanks are due to Dr. Satyasakha Maitra, the Honorary Medical Adviser of the Institute for the expert advice and help given by him. Dr. L. M. Banerjee and Dr. Amiya Bose also rendered valuable help as consultants in several cases.

3. *Canteen :* The canteen which is under the management of the House Committee served tiffin and other food items to nearly 700 persons on each working day, and served meals to the members of the Mess and Student Hostel. Besides routine catering the Canteen took charge of the arrangements for several tea parties and luncheons.

4. *Workers' Club :* During the year 1954-55 the I.S.I. Club registered a steady progress in all spheres of its activities. The membership which was less than 250 at the beginning of the year increased to nearly 450 at its close.

The Sports and Games section of the Club arranged inter-section Football, Volleyball, Badminton tournaments, Chess, Cards (Auction Bridge) and Table Tennis Competitions at

different periods of the year. The Third Annual Sports was held in February 1955 in presence of a large number of spe tators.

The Social and Cultural Section exhibited 6 films borrowed from the "Centre Cultural Français" in August 1954. A relief fund was organized in aid of flood-stricken people in North Bengal and a little over two hundred rupees was contributed to the R.W.A.C and People's Relief Committee. On the Anniversary Day of the Institute the second number of "Lekhan", the annual literary organ of the Club, was published.

The Third Annual Social gathering and prize-giving ceremony of the Club was held in April when along with the variety performances the members of the Club staged "Kalindi", by Tarasankar Bandopadhyaya.

A steamer trip to Diamond Harbour was arranged in early January 1955 in which more than one hundred members participated.

5. *Salbani Club :* At Giridih the Salbani Club arranged regular indoor and outdoor tournaments. It celebrated the Republic Day, Independence Day and Bengali New Year's Day and the Foundation Day Reunion of the Institute. The Club organized several excursions and picnics. It also donated Rs. 128/- to the Prime Minister's Relief Fund.

3. External Activities

1. Professor and Mrs. P. C. Mahalanobis went abroad on 1 April 1955. Professor Mahalanobis was elected Chairman of the United Nations Statistical Commission and presided over its eighth session in Geneva in April. He attended a meeting of a working group of Technical Committee 69 of the International Standards Organization at Brussels at the end of April.

2. Shri Samar K. Mitra accompanied by his wife joined Professor and Mrs. Mahalanobis at Geneva. The party halted for a few days in Paris and England where Professor Mahalanobis and Shri Mitra had scientific discussions relating to statistics and planning and inspected a number of electronic computers. Professor and Mrs. Mahalanobis accompanied by Shri Mitra went to the USA in the middle of May 1954.

3. In New York, Professor Mahalanobis discussed with the United Nations Technical Assistance Administration the question of technical aid and equipment for the Institute and also attended by invitation some meetings in connection with the Bi-centennial Anniversary of the Columbia University. He also had scientific discussions and attended conferences in Washington, D.C., Urbana (Illinois), San Francisco, Stanford and Berkeley (California). Shri Mitra visited important centres of work on electronic computers. The party returned to London in June and halted there for some time.

4. In the meantime, Professor Mahalanobis received an invitation from the USSR Academy of Sciences to go to Moscow with a delegation of Indian scientists to discuss the question of securing equipment and technical aid for the Institute from the USSR. Professor and Mrs. Mahalanobis accompanied by Shri and Shrimati S. K. Mitra and Dr. S. Ghosal halted at Prague (Czechoslovakia) for 3 days and reached Moscow at the end of June. Professor Mahalanobis spoke at an International Conference on Mathematics and Statistics which was being held at that time in Prague. The party halted for about 5 weeks in the

USSR, mostly in Moscow with visits to Leningrad and Erevan (Armenia). In the USSR, the Indian scientists had many discussions on the production of electronic computers and precision instruments and on various phases of planning. The party left the USSR in early August. Professor and Mrs. Mahalanobis made short halts in London and Geneva and returned to India in the middle of August 1954.

5. Dr. C. R. Rao worked for one academic year (October 1953—June 1954) as Visiting Professor in the University of Illinois, Urbana. He gave lectures and attended conferences in the University of North Carolina at Chapel Hill, the University of California at Berkeley, the University of Chicago in Chicago and the Columbia University in New York; and also attended a number of scientific meetings in the USA. On his way back he attended the International Mathematical Conference held at Amsterdam in September 1954. He also visited some of the important centres of statistical work in Europe.

6. Shri D. B. Lahiri and Shri Ajit Das Gupta attended as members of the Indian delegation the World Population Conference in Rome in September 1954. They both presented papers and participated in the discussions. They also visited Geneva, Paris and London where they had scientific and technical discussions.

Dr. C. R. Rao, Dr. P. B. Patnaik, Dr. R. Vaidyanathaswamy, Dr. G. Kallianpur and some of the other members of the staff served as members of the Board of Studies and/or Board of Examiners of different universities.

Messrs Des Raj, J. Roy, I. Chakravarti and R. G. Laha attended in Indian Science Congress Session at Baroda in January 1955.

Dr. C. R. Rao and Shri A. Matthai attended the Conference on Statistical Quality Control in January 1955 and participated in the discussions.

Shri Ajit Das Gupta participated as a member of the Statistical Sub-committee of the Family Planning Research Programme Committee of the Planning Commission.

Many senior workers took part in the State Statistician's Conference, Calcutta n February 1955.

4. Research and Training School

1. The main activities of the Research and Training School (RTS) fall under the three heads— (i) Research, (ii) Consultations and (iii) Training. Research has been conducted at various levels: (a) theoretical research on the foundations of probability and the logic of statistical inference, (b) applied research involving the development of statistical tools for application to specific problems and (c) research in fields of application in which the approach is statistical.

2. The different courses of training that have been imparted during the year have been—

(a) Two-year professional statistician's training,
(b) Training at the International Statistical Education Centre,
(c) Individual training for officers on deputation for short periods,
(d) Training for computers.

For purposes of professional training, the RTS made due use of the facilities available in other Divisions and Units of the Institute. The RTS also received active cooperation from the Central Statistical Organization, New Delhi, for training in official work in Statistics.

3. Consultation is open to all scientific workers in the country. Advice has been given to various enquiries on the planning of investigations and analysis and interpretation of data.

4.1. Theoretical and Applied Research

1. *Research Seminars :* Besides a number of research seminars regularly conducted by the Research and Training School for exchange of ideas among the staff, some seminars of major importance were held during the year. The first was a series of talks in November 1954 on the recent advances in the Theory of Probability and Statistics in the USSR by Yu. V. Linnik of the University of Leningrad. The talks were followed by a fruitful discussion where the similarity of certain problems solved in the USSR and India was revealed.

2. The second was a series of discussions in December 1954 held by Sir R. A. Fisher on the logic of Statistical Inference. He traced the history of the logical development of statistical concept. Setting aside the approach of Bayes as one belonging to deductive logic Sir Ronald proposed a number of criteria for inductive inference. Likelihood and Fiducial Probability proved a satisfactory approach to many problems in scientific investigations. The theories developed by J. Neyman and the late Abraham Wald can be more aptly described as acceptance procedures and do not relate to inductive inference.

3. The third was a series of talks by Prof. P. C. Mahalanobis on some problems related to planning. He discussed the Plan-frame of the second five year plan and gave an account of the theoretical model and statistical calculations on which it was based.

4. *Theoretical Research:* An account of the research work carried out during the year is given below under different heads. The figures within the brackets refer to the list of papers given in Appendix VI(A). Some of these are published papers, some to be published and the others are only preliminary reports.

(i) *Sample Surveys:* (13, 14, 15, 16) : Criteria, based on the regression of the variate under consideration and the auxiliary variates, have been obtained for which PPS (probability proportional to size) sampling is more precise than sampling with equal probabilities.

The problem of integrating different types of enquiries when the sample units for individual types are selected with assigned sets of probabilities has been considered. The problem is of importance in the National Sample Survey where the population is made the basis for selection for the household enquiry and area for the land utilization survey. The object is to devise a suitable selection procedure so that the sample villages for the two types of enquiry are identical or near to each other. It is shown that the 'serpentine' method is optimum in a certain sense.

Use is made of linear programming for the determination of optimum probabilities (based on auxiliary information) of selection of units in the sample when the selection is made without replacement.

(ii) *Estimation:* (1, 2, 4, 23, 24, 25, 37, 38, 42, 44): The general theory of estimation by minimum chi-square and maximum likelihood has been worked out. It was shown that estimates are continuous functionals and Frechet derivable under some conditions. All the asymptotic properties of consistency in probability and normality and efficiency are consequences of the above analytical properties of the estimates. The procedure of obtaining the absolute minimum chi-square or maximum likelihood estimates from the derived equations is shown to be valid with probability unity.

Examples have been constructed to show (i) that even in the case of independent observations from a continuous distribution the maximum likelihood estimate is not consistent although a consistent estimate exists and (ii) an estimate though asymptotically much less efficient than another may yet have greater concentration (in some sense) than the latter.

A method of estimating the correlation coefficient from a two-way contingency table with more than two classes for each qualitative category has been found. Using the extreme observations of a bivariate sample an estimate of the correlation coefficient has been constructed analogous to the range estimate of the standard deviation.

(iii) *Probability and Measure Theory:* (5, 6, 21, 22, 34, 39, 40): Given any continuous random variable X and an arbitrary discrete stochastic process Y_n, $n = 1, 2, \ldots$, it was shown that a sequence of functions $G_n(x)$ can be constructed such that distribution of (G_n) is the same as that of $[Y_n]$.

Problems of convergence to normality of a type of random variables which are such that blocks of them sufficiently far apart are independent, have been studied. Getting rid of the conditions on conditional moments, a theorem on normal convergence has been proved under Lindeberg type conditions.

Using Tauberian theorems of Feller's theory of recurrent events it was shown that in a two-dimensional random walk the asymptotic distribution of $S_n = x_1 + \ldots + x_n$ (in the usual notation) does not belong to the domain of attraction of any stable law.

Some results have been obtained on the structure of measurable sets in function spaces and on measure-preserving transformations generated by stationary stochastic processes.

(iv) *Distributions and Tests:* (3, 7, 25, 26, 27, 28, 29, 30, 31, 35, 36, 41): Several well-known results in distribution theory have been deduced from the converse of the proposition that if T is a sufficient statistic for a parameter θ then any statistic stochastically independent of T is independent of θ.

A test for the extreme observations in a second sample from a population from which a first sample is available has been developed primarily with the intention of setting confidence limits to the extreme observations in the second sample.

Several theorems characterizing the normal and gamma type distributions based on the independence of some statistics have been proved. A significant result is enumeration of all distributions fo which the mean is distributed independently of a homogeneous quadratic statistics.

The necessary and sufficient conditions under which two general quadratic statistics of n observations from a normal distribution are independently distributed have been found.

A non-parametric test for two samples based on empirical distribution functions has been constructed.

An estimation of the factor loadings by the method of maximum likelihood and the consequent test of the goodness of fit of a specified number of factors have been investigated and a computational procedure suitable for electronic computers has been devised.

(v) *Multivariate analysis*: (43, 45, 47): Computational techniques for analysis of dispersion of multiply classified data with unequal numbers have been worked out. Some general results useful for computations arising out of least square theory involving singular matrices and the concept of pseudo inverses have been found. This together with the general theory of least squares developed by the workers of the Institute provides a complete treatment of the theory and method of least squares.

Multivariate tests in problems involving quick decisions have been worked out.

(vi) *Quality Control:* (32, 33, 46): A general solution for optimum (minimum sample number) gauge setting has been derived and on the basis of this acceptance sampling plans suitable for gauging inspection, based on the AQL, AQL-LTPD and other concepts have been constructed. Extensive sampling inspection tables for these plans have been provided. These tables have uses in biological and other non-industrial fields also. A technique has been evolved for controlling simultaneously the mean and variability using the count of items transgressing the two specification limits, when inspection is done by gauging.

(vii) *Miscellaneous:* (8, 9, 10, 11, 12, 17, 18, 19, 20, 48, 49): There were a number of other contributions relating to econometrics, biometry, psychometry and time series.

5. *Applied Research:* Work in applied research was mainly undertaken by the Biometric and Psychometric Units whose activities are given separately elsewhere and also by members of the staff attending to scientific enquiries.

6. *Scientific Enquiries:* The Research and Training School attended to a number of scientific enquiries from research workers in various fields, government departments and business firms. Some of the major problems handled are described below.

(i) The effect of Ergometrine and other medicines to control haemorrhage in child birth. (Arati Roy, *Calcutta Medical College*).

(ii) Discrimination of beetles by the configuration of spots on the body. (Dr. A. P. Kapoor, *Zoological Survey of India*). The two species of beetles E_{12} *stigma* and *E Implicata* are not easily distinguishable morphologically. It was desired to find a method of discrimination based on the configuration of spots on the body and neck so as to minimize the errors of classification. The existing technique for the construction of a discriminant function is applicable when quantitative measurements are involved. These methods were modified for the case of qualitative characters such as the configuration of spots and applied to the above problem.

(iii) A study of children born to parents affected by atomic radiation. (Dr. William, J. Schull, *Heredity Clinic, Institute of Human Biology, University of Michigan*). The data consisted of a four-way classification with mothers and fathers each classified into 4 categories of injury due to atomic radiation, two cities and two sexes. Four measurements were taken on each child. Besides involving multiple measurements and multiple

classifications there was an additional complication due to cell number being unequal. Special computational techniques have been worked out for use in this problem.

(iv) Analysis of Vanaspati samples—experimental error: from Government of India, Ministry of Food and Agriculture through the Central Statistical Organization.

4.2. Training Courses

1. *Statisticians' Training Course:* This course is intended to provide training at an advanced level for the making of professional statisticians. Candidates who possess master's or equivalent degree in statistics, mathematics, or an allied subject are admitted to the course. This course is being converted with effect from July 1955 into a three-year professional-cum-theoretical course.

2. Seventeen students (list in Appendix VII) satisfactorily completed the two years' training in June 1954. Most of them were absorbed in commercial or industrial organizations or in government, while four of them joined the Institute as research workers or technicians.

3. All the 13 students who attended the first year class, were promoted to the second year. Three other students who had previous qualifications in statistics were directly admitted to the second year after a qualifying examination. The number of fresh men admitted to the first year class was sixteen. The list of trainees who attended the two classes are given in Appendix VII.

Besides attending lectures and laboratory work on the different subjects in the curriculum and undergoing training in applied work in different sections of the Institute, trainees of the second year spent a few days at Giridih actively participating in crop-cutting and other agricultural experiments conducted there. The trainees of the second year were also given opportunities to attend the Conference on Statistical Quality Control, the State Statistician's Conference held at Calcutta and the various seminars and technical discussions held at the Institute during the year. The trainees also spoke on various topics prepared by them at a series of seminars specially held for them.

4. On the basis of their performance in class and periodic tests held, six students of the first year class and six students of the second year class were awarded scholarships worth Rs. 30/- or Rs. 50/- per month.

5. With the inauguration of the studies relating to planning for national development the necessity of increasing the efficiency of the staff was felt, especially in the Computing Section. With this aim in view, evening classes were opened at the end of 1954 in the Institute premises at Baranagar to give, free of all charges, facilities of training to computers and other workers to acquire technical skill, accuracy and speed. Under the auspices of the House Committee, the night school continued to give coaching to Institute workers who wish to appear for the School Final Examination of the Secondary School Board. A large number of workers are taking advantage of the training facilities provided by the Institute.

6. *Training in the International Statistical Education Centre:* A major portion of the training at the ISEC was undertaken by the staff of the RTS. Some of the ISEC students were given facilities to attend lectures on special topics given at the RTS. The trainees of

the Centre also attended the seminars and discussions. Details of the Centre's activities are given elsewhere.

7. *Computer's Training Course:* There were two sessions, one from July to December 1954 and another from January to June 1955, for giving courses of training to computers. During each session, junior courses corresponding to Part IA and Part IB and senior courses corresponding to Part IC of the syllabus for the Computer's Certificate Examination were held. The number of students admitted to the junior courses was 67 and to the senior courses 31. Classes were held both at the Esplanade and the Baranagar Offices. Junior classes were held in the mornings and evenings while the senior classes only in evening.

Special courses similar to the junior courses were also given at the Baranagar office for the training of computers working in the Institute. Seventytwo workers have participated in this training.

8. *Officers on deputation:* Eight persons deputed by government departments or educational institutions went through individual courses of specialization in different fields of interest. Some of them were also able to participate in the seminars held by Sir R. A. Fisher. Names of the officers on deputation are given in Appendix VIII.

4.3. Biometric Unit

1. A new unit for carrying out applied researches on biometry was started in April 1954 under the leadership of Dr. M. Masuyama, and with the assistance of Shri Subodh Kumar Roy and Shri A. Narayanan. Professor Masuyama returned to Japan in August. Prof. J. B. S. Haldane and Mrs. Haldane (Miss Helen Spurway) arrived in July 1954 and worked in the Unit for about two and a half months. A well-equipped laboratory has now been set up and it possesses among other things: gas plant, autoclave, colorimeter, incubator, thermostatic bath, centrifuge, distilled water plant, air conditioner, microscope, etc. The Unit has been making attempts to collect and maintain pure cultures of fungi and bacteria from the city and from abroad. The Unit is greatly indebted to the following Institutes and Laboratories for helping with pure cultures of fungi and bacteria: Bose Research Institute; School of Tropical Medicine, Calcutta; Botany Department, Calcutta University; Botany Department, Presidency College and National Institute of Agricultural Sciences, Tokyo, Japan.

3. In connection with certain investigations of antibiotics and fungicides, a large number of angiospermic plants were collected from various parts of the city and suburbs and some plants which were not available locally were purchased from Sikkim. Under the guidance of Dr. Masuyama, S. K. Roy made screening tests of about fifty angiospermic plants in search of antibiotics and fungicides.

4. Professor and Mrs. Haldane studied the breathing behaviour of fish 'Koi', *anabas testudineus*. In a brief study of the ascents for air of this fish they found that by altering the amounts of oxygen available in the air and water they could alter the mean value of the interval between two ascents (more than ten-fold), but its coefficient of variation remained at about 25 per cent. When however the fish was put in a situation to which neither they nor their ancestors had been exposed, for example, in water containing oxygen but with pure nitrogen above it, this relative regularity was lost and coefficient of variation rose to over 200 per cent.

5. S. K. Roy measured the chloride concentration of about one hundred urine samples during monsoon and sixty-three during winter. The distribution of samples during the monsoon is found to be nearly rectangular rather than normal. A. Narayanan has studied the problem efficient utilization of protein in pulses by processing them with micro-organisms. In this connection the optimum temperature, pH and ratio of starch to pulses are being investigated individually and in factorial design. Several other problems such as the study of antibiotics, physiological measurement of fatigue, and earth-worm casting in different localities are currently under investigation.

4.4. Psychometric Unit

The Psychometric Unit was opened in November 1954 with Dr. Edwin A. Harper, Jr. (whose services have been temporarily lent to the Institute by the Synodical Board of the United Church of Northern India) in charge of the Unit. Group and individual tests of aptitude and ability, as well as of knowledge and training are constructed and tried out. Research work is done on efficient methods for item writing, item analysis, test analysis, factor analysis, and other psychometric statistics. Services are offered to competent psychologists in all parts of India, for punched card machine analysis of large sample data.

2. Besides attending to a number of requests for information on test construction and statistical analysis, vocational guidance, speech correction, etc., the Unit gave advice on the following projects:—(1) correlation of Cattell's 'Culture-Free Test' with Punjab Matriculation examination results (Rev. C. W. Riddle, Punjab and Dr. Raleigh Drake, Kent State University, USA). (2) Item analysis and selection of items for a mechanical assembly test (Shri C. N. Ganguly).

3. The Unit was also either partially or wholly responsible for the completion of the following items of work—

(i) Rogerian 'Non-directive counselling' is described in terms understandable to the Christian minister and layman.

(ii) A workbook in Hindi, with instructions, places to record data, and questions, covering the Intermediate and part of the Degree course in psychology 'practical'.

(iii) U.S. birth statistics are analysed, and their implications for future school and college enrolments discussed. Confusions in projections arise from the multiplicity of data available: one must take into account the source of the data, how it was gathered, the exact definition of the territory and/or group covered, the time of year, etc. Various methods of projecting enrolments are also discussed.

(iv) Nearly seventy-five psychometric research projects, now in progress in India, were listed and described.

(v) Data on 177 students who had taken Cattle's'Culture-Free Test' of Intelligence, and the Punjab (I) High School Final Examination were analysed. Correlations ranged from +.47 to +.70 for various age groups.

(vi) Effect of long time interval on Dr. Philpott's oscillation ratio: Work curves were taken from 10 male and 10 female subjects (20 sittings each) on two types of work. It was found that the wave length present in the morning work curve is longer than its corresponding evening work curve.

(vii) Records of 50 persons on a 50-word Word Association Test were analysed with reference to type of response elicited, reaction time, reproduction time, popular responses, etc. Subjects were persons who came to the Institute of Psychological Research and Service (Patna) for guidance.

(viii) A Word Association Test in Hindi was constructed and the records of 25 persons on that test were analysed, with reference to type of reactions elicited, reaction time and reproduction time, and percentage of the responses given in English.

4.5. International Statistical Education Centre

1. The International Statistical Education Centre (ISEC), Calcutta, was opened in October 1950 under the auspices of the UNESCO and the Government of India. The Centre was a cooperative enterprise of the International Statistical Institute and the Indian Statistical Institute. The objective of the Centre was to provide courses of training in theoretical and applied statistics at various levels to prospective statisticians from countries of the Middle, South and Far East. From the inception of the Centre to January 1954, the Centre had conducted six terms of training each of six months' duration, with provision for trainees who completed one term to continue for another term for training at a more advanced level. During these six terms, training was imparted to 143 participants, involving 186 student terms, and representing 15 Asian countries.

2. The year under review covered the seventh and eighth terms. The seventh term was a six-month term. As regards the eighth term it was decided to have a longer term extending over one academic year.

3. The maintenance of the ISEC continued to be shared by the International Statistical Institute and the Indian Statistical Institute. At a meeting of the Statistical Education Committee of the International Statistical Institute, the following proposals, among other things, were accepted:—(i) the course at the Centre should be extended to cover one academic year (approximately mid-July to mid-April) which could in practice be regarded as forming two terms of 4 to 4½ months each, (ii) the composition of the Joint Board of Directors should be as follows:—International Statistical Institute— 3 members, Indian Statistical Institute—3 members and Government of India—1 member, (iii) while there were reasons to expect continuing support of the Centre by the Government of India, availability of funds from other sources should be explored.

4. The Government of India sanctioned a grant of Rs. 1,20,200/- to the Indian Statistical Institute and $9,000 to the International Institute for the continuance of the Centre during the two-year period 1952-54. With the termination of the period of this grant, the Government agreed in principle that the Centre should be continued and the sanction of a grant for the period 1954-56 was received subsequently.

5. The seventh term opened on 11 January 1954 and closed on 30th June 1954. The number of trainees who attended was 24 from 7 countries as follows:—

Burma-2, Indonesia-3, Nepal-1, Pakistan-1, Philippines-3, Viet Nam-2 and India-12.

6. The eighth term opened on the 16th August 1954 and closed on the 15th April 1955.

The number of trainees admitted to the eighth term was 27, distributed among 7 countries as follows:—

Burma-1, Ceylon-1, Indonesia-3, Iran-2, Pakistan-3 and the Philippines-2, India-15.

7. The trainees were drawn from among officers in Government departments, commercial organizations, or scientific or teaching institutions. A list of trainees who attended is given in Appendix IX.

8. Training during the two terms comprised lectures, laboratory work, assisted reading, seminar discussions, in-service training [both at the Indian Statistical Institute and at the Central Statistical Organization (CSO), New Delhi] and sampling investigations carried out by the trainees themselves. About 550 hours were devoted for lectures on different subjects in the curriculum, 850 hours for practical and other work, besides periods of a few weeks spent for in-service training at the Central Statistical Organization, New Delhi and for conducting a survey of housing condition in Calcutta during the seventh term and crop-cutting experiments at Giridih during the eighth term.

9. Among the teachers from the Indian Statistical Institute who contributed to the training were: P. C. Mahalanobis, S. Bhattacharyya, I. M. Chakravarti, P. K. Chatterjee, H. K. Chaturvedi, T. P. Choudhury, A. Dasgupta, Des Raj, N. C. Dutt, A. Ganguly, A. K. Dasgupta, N. C. Ghosh, J. Roy, R. G. Laha, A. Matthai, K. G. C. Nair, E. M. Paul, B. Panesar, S. J. Poti, S. Raja Rao, Ravi Kumar, A. Rudra, R. P. Saha, B. N. Sarkar, D. Sarkar, C. S. Ramakrishnan.

10. A number of visiting professors arranged for by the International Statistical Institute or deputed by the UN, the FAO and other specialized agencies of the UN have been associated with the instruction at the Centre. The visiting professors during the two terms were:— Dr. Q. M. Hussain (Pakistan), Prof. R. M. Goodwin (UK), Prof. J. B. S. Haldane (UK), Dr. A. E. Harper (Jr.) (USA), Dr. P. V. Sukhatme (FAO), Dr. S. S. Swaroop (WHO), Mr. T. U. Viswanathan (UN), Dr. N. Keyfitz (UN), Mr. M. Lieberman (UN), Dr. M. Masuyama (Japan), Mr. A. S. Windett (UN).

11. The trainees of the Centre also attended lectures and seminars given by a large number of other visiting scientists at the Institute including Sir R. A. Fisher (UK), Dr. Shewhart (USA), Dr. Linnik (USSR).

12. A large number of statisticians (whose names are not mentioned here) from different ministries and departments of the Government of India delivered lectures during the in-service training organized by the CSO, New Delhi.

13. The Government of India have been granting a number of fellowships to the trainees of the Centre out of contributions to the Technical Co-operation Scheme (Colombo Plan). During the first six terms, a total of 75 Fellowships were awarded. In the seventh term and in the eighth term 21 trainees received such Fellowships.

14. The ISEC Students' Association arranged a number of excursions to places in and around Calcutta, besides visiting Santiniketan, Banaras and Agra. The Association published a Souvenir volume for the seventh term and another for the eighth term.

4.6 Professional Examinations

1. *The Statistician's Diploma Examination* was held in August 1954 at the following centres:—Calcutta, Delhi, Madras, Poona and Lucknow. In all, 86 candidates registered themselves for the examination in one or more papers, of whom 61 appeared and thirtyone passed.

2. *The Computer's Certificate Examination* Part I was held in July 1954 at Calcutta and Poona. No candidate registered for Part 2. Out of 80 candidates who registered for different sections of the examinations 74 appeared and 28 passed.

3. Two examinations for *Statistical Field Surveys Certificate*, junior and senior were held during the year—in July 1954 and in February 1955. The July examination was held at Calcutta. Nine candidates had registered, 7 appeared and 5 passed. The February examination was held at the three centres—Calcutta, Delhi and Giridih. Fifty candidates had registered 43 appeared and 23 passed in one or more sections of the examination.

The names of successful candidates in the different examination are given in Appendix X.

5. Project Work

5.1. National Sample Survey and Associated Projects

1. The Institute has been in charge of the statistical work relating to the country-wide, continuing National Sample Survey (NSS) since its commencement in 1950-51 while the field branch has been under the direct control of the Ministry of Finance (except for a special survey unit under the Institute). By the beginning of the year under review seven rounds of the survey had been completed. On the basis of analysis of the data collected during different rounds, various reports were prepared; and one report, National Sample Survey Report Number 6: Survey of Faridabad Township (March-April 1954) was published.

2. As in previous years, the NSS Statistical Section was engaged in the design of surveys (including preparation of forms and schedules and instructions for field workers), and the scrutiny, processing, tabulation and analysis of the data collected by the field branch.

3. A NSS Programme Committee was set up by Professor P. C. Mahalanobis (Hony. Statistical Adviser to the Cabinet) in December 1954, with Sarbasri B. Ramamurti, M. Mukherji (*CSO*), H. C. Ghosh, V. R. Rao, D. Y. Lole (*NSS Field Directorate*), P. Pant (*Planning Commission*), J. M. Sengupta, D. B. Lahiri, N. C. Ghosh and A. Das Gupta (*Indian Statistical Institute*) as members. It met on two occasions. The Committee also convened meetings of statistical workers from different parts of the country to consider the NSS programme. The Committee was entrusted with the recommendation of priorities in both field and statistical work for the consideration of the Government of India.

4. *Eighth Round of the NSS :* The Eighth Round made a distinct departure from the past in more than one respect. In addition to the usual questions on household consumption and production the Eighth Round included, at the desire of the Ministry of Food

and Agriculture, an extensive survey of agricultural holdings broadly on the basis of the Food and Agricultural Organization (FAO) Census. To fulfil the purpose in view the size of the sample was increased nearly three-fold by the addition of sample villages for which information was collected by the different State Governments.

5. A conference of State and Central Statisticians was held in Calcutta in March 1954 to prepare concrete proposals which were finalized in consultation with State Governments by the end of June 1954. A Training Conference of the Supervising Officers who would take charge of the survey in the different States and also of the Supervising Officers of the NSS (responsible for the Central sample) was held in the first week of July 1954.

6. Out of total of about 4,500 sample villages, the States took charge of about two-thirds and the Central sample had one-third of rural sample together with about 500 units in urban areas. . The period of field investigation extended over about 9 months (roughly July 1954-March 1955). The State of Jammu and Kashmir was included in the survey for the first time since the inception of the NSS.

7. The sample villages of the Central sample were allocated to the various States on a joint consideration of the relative rural agricultural population (excluding agricultural labour) and the area under cereal crops. The extended samples in the States were constituted by a multiple (generally twice) of the number of the Central sample units in each State, with a view to obtain reasonably dependable State estimates.

8. The number of sample villages allocated to a State was further distributed to "natural divisions' in the sense of the Census of India 1951 in proportion to respective agricultural population (excluding agricultural labour). Natural divisions were further stratified, each stratum being a set of *tehsils* or *taluks* which are more or less homogeneous with respect to net crop area per head of agricultural population (excluding agricultural labour). The limits within which this measure of homogeneity would lie was so obtained as to give more or less equal volume of agricultural population in each stratum. Four sample villages within each stratum were chosen with probability proportional to total population and with replacement. The sample units for both Central sample and extended sample were chosen on the same principle from these strata.

9. On the basis of information regarding means of livelihood classes and holding size, the households constituting a sample village were stratified into three types. A sample of households was selected separately from each of these three types. The size of sample for each type was determined on the considerations that the sample would be self-weighting separately for each type and that adequate representation of each type was ensured. The sampling fractions in each household type was maintained at such a level so as to give, on an average, from 20 to 24 sample households per village taking all the three types together.

10. In addition to agricultural holdings, this round covered questions regarding trend of self-management, household indebtedness, and farming practices. Besides these new subjects, the usual enquiries regarding consumer expenditure and household productive enterprises were continued in the Central sample.

11. *Sample Survey of Manufacturing Industries:* The survey with the year 1953 as the reference period, was started in March 1954 and was completed by November 1954. The NSS had thus collected up to now data under this survey for the years 1951 to 1953 in

addition to the data collected by the Directorate of Industrial Statistics and tabulated by the Institute, for reference years 1949 and 1950.

12. *Survey of Savers' Preference in Delhi State:* At the request of the Ministry of Finance a pecial enquiry was conducted to study the preferences of purchasers of National Savings Certificates in Delhi State. The planning of the survey as well as the field work was completed in about three weeks in August 1954; preliminary tabulation was completed by the end of the first week of September 1954; and a report was submitted to Government in December 1954.

13. *Employment & Unemployment surveys—Baranagar Pilot Inquiry:* The Government of India had desired that the NSS should undertake a detailed survey of employment and unemployment, over he country as early as possible. In order to collect basic information for the preparation of an efficient sample design for this purpose, pilot enquiry was made in December 1954 at Baranagar in the immediate vicinity of the Institute headquarters.

14. *Chittaranjan Enquiry:* A special enquiry covering about 700 households and private enterprises was started in January 1955 in Chittaranjan which was a very small village before a large Government locomotive factory (employing about 6,000 operatives) was established there in 1950 leading to the growth of a completely new industrial town. The object of the enquiry was to study the characteristics of the economic development of such towns.

15. *Preparatory work for the Ninth Round of the NSS:* Towards the end of the year under review a good deal of attention was given to the planning and designing of a country-wide survey on employment and unemployment which would be the major objective of the Ninth Round of the National Sample Survey.

16. *Experimental Surveys for Estimation of Crop in West Bengal (Autumn and Winter Seasons):* Two sample surveys, on an experimental basis for the estimation of acreage and out-turn of jute and paddy crops in autumn and winter were carried out with a two-stage sampling design having 6000 village unions as first-stage units and 10 clusters of fields in each unit as the second-stage units. For the yield surveys, a similar design was adopted, but with two more stages of sampling, the ultimate unit being circular cuts of 100 sq. ft. The results obtained from these experimental surveys are being utilized in evolving a multi-stage sampling technique for crop estimation on an all-India scale.

17. *Central & State Statisticians' Conference on Employment & Unemployment Enquiries:* In order to bring about co-ordination and comparability in surveys of employment and unemployment to be conducted by the various Central and State agencies, the Central Statistical Organization of the Government of India has prepared a Manual on the subject which was discussed in an *ad hoc* session of the Conference of the Central and State Statisticians held in the Institute in Calcutta from 17 to 19 February 1955.

A Working Party consisting of the representatives of the Central Statistical Organization, the Planning Commission, the Field Directorate of the NSS, the Ministry of Labour and the Indian Statistical Institute was set up by the Central Statistical Organization for drafting the 'Manual'.

The Indian Statistical Institute prepared a draft questionnaire on employment and unemployment to serve as the basis for discussion by the Working Party. The Conference

mentioned above was attended by the statistical representatives of almost all important States besides the members of the Working Party and some senior workers of the Indian Statistical Institute.

18. *Internal Planning and Reorganization:* The statistical work of the NSS was reviewed against the exsting resources of the Institute, and it was found that a great deal of expansion was needed particularly in tabulating machine equipment, and in trained personnel for a critical appraisal of the results. Considerable expansion was made in machine equipment and also in personnel as the result of this review.

5.2. Other Projects and Applied Studies

1. *Family Budget Enquiry in Rural Area, Giridih:* This survey which started in June 1953 was continued during 1954, and syatematic information was collected on production and receipts, daily purchases and consumption and other disposals in the household during the day from 60 families in the sample in 4 zones (in about 10 villages). Besides the daily schedules, a fortnightly schedule was introduced to ascertain and record the actual weights of a few selected items of consumption just before cooking. In addition, weekly and monthly accounts of consumption were collected on every sixth day, in order to study the recall period. This was so conducted that in every week 4 schedules from 4 different households could be collected and a complete cycle of 60 families could be finished within 15 weeks.

2. *Varietal & Manurial trials:* In the agricultural farm at Giridih a number of varietal experiments and manurial trials were conducted to study the effect of manure and methods of cultivation. The experiments were made on winter paddy to test the difference in yield in plots cultivated by the local methods as well as the Japanese method. The data is being analysed, and it seems that it will be necessary to carry out a series of such experiments before any conclusions can be drawn.

3. *Crop-cutting experiments, Giridih:* Crop-cutting experiments on jute and paddy were conducted in the Institute farm plots as in the previous year.

4. *Progressive harvesting experiments:* Experiments on progressive harvesting have been conducted in several paddy plots on the agricultural lands at Giridih. The plots chosen for the purpose constituted a compact area with paddy crop ready for harvest at the same time. A large number of sample cuts were taken every day, commencing from about 30 days before the normal harvesting period, when the paddy grains were not sufficiently mature and contained a good deal of moisture and upto the period of normal harvesting when the grains were fully mature. The main objects of these experiments were (1) to find out a optimum date for harvesting when the crops attain just that amount of maturity which when harvested cause no loss in the final yield; and (2) to examine the trend in the effective yield rate, so that estimation of final yield, if necessary, could be adjusted even when harvested at a premature stage.

5. *Studies on Sampling Methods in Population Census based on 1941 Census enumeration slips of Hazaribagh, Bihar:* Experimental studies on the methods of sampling in population census were continued during the year under review. By extracting 400 systematic samples of individual census slips from a set containing 7,00,000 slips, the efficiency of systematic sampling in building up some of the population tables was investigated. The effi-

ciency of the village as the sampling unit in respect of two important aspects of the population viz. the distribution by (1) age, sex, civil condition and (2) sex, means of livelihood, dependency status, is being investigated. The tabulation work has been completed and the draft report has been prepared.

6. *Fertility study: NSS Second Round (April-June 1951):* To isolate and study the vital factors that condition population dynamics in India, details of about 20 thousand rural couples (sample villages 1106, sample households 11,000), obtained from NSS Second Round data (April-June 1951) were tabulated. The ages at marriage of husbands and wives, average number of children born per couple, sex-ratio, infant mortality, and average intervals of successive births were studied in two independent and inter-penetrating sub-samples in the differentials: marriage cohort, marriage duration, religion, caste group, occupation group, land possessed, for each population zone and also for all population zones combined. A report based on the above data: "The use of sample surveys in Demographic studies in India" was presented by Professor P. C. Mahalanobis and Shri Ajit Das Gupta at the World Population Conference, Rome, August-September 1954. The progressive intensity of sex-selective and dead-infant recall lapses and increase in the number of children per couple in recent marriage cohorts at different years after marriage stages are two of the main findings.

7. *West Bengal Special Demography Study, April-May 1954:* A Special Demography Study was conducted in 72 villages, 26 urban blocks, and 14 city blocks in West Bengal (Fourth Round NSS sample villages and urban blocks, but with fresh sampled households) to study a number of methodological problems such as the quality and improvement of age assessment, mobility and migration details, scatter of the bio-family, recall lapse, intensity in sickness and marriage reporting, basic attitude towards migration, education, family planning, etc. Data relating to 1300 households were collected; and the different levels of age accuracy were studied under sex, age, religion and group, mother tongue, education status and informant's ability and willingness.

8. *Study on Age Reporting:* On the basis of the available material including the Census and NSS, a study was made of age reporting with a view to investigate the effect of three forces: digit preference, estimation error, and age bias which lead to the heaping up in age returns. The analysis, confirmed by coefficients of concentration, suggested the 2-6 age-grouping as the most efficient.

9. *Demographic Study, NSS Fourth Round (April-September 1952):* Work was started on the analysis of the demographic material (by two independent, inter-penetrating half-samples) of the NSS Fourth Round (April-September, 1952). Sub-samples with the week as the period of reference were taken. In the rural sector the number of sample villages and sample households were about 950 and 8,600 respectively; in the urban sector, the number of urban blocks and sample households were about 400 and 3,900 respectively.

10. *Population projection:* The population of India was projected under different fertility and mortality assumptions in the light of demographic experiences here and abroad, for sex and four broad age groups, for each of the six population zones in India upto 1971, and for India as a whole upto 2,001. The results are given in a working paper prepared for the Planning Unit and listed in Appendix VI(B).

11. *Man Power Estimates:* On the basis of the projected population and the labour force estimates obtained from the NSS Fourth and Seventh Rounds, the man-power estimates

in India have been projected up to 1976 under age and sex breakdowns, under different assumptions regarding the future behaviour of the various demographic factors. A working paper on this is under preparation.

12. *Study of South Rhodesian Age Distribution:* In the 1951 Census of the South Rhodesian population age returns were recorded in specified years where possible; and in other cases information was collected as to whether the individual was born before the influenza epidemic of 1918, and for those born after 1918, whether they were below or above the age of puberty, among the females born before 1918 in the two groups: post menopause and pre menopause. There were in addition others who could not supply any such information. The problem was to estimate the population distribution in single years. The data were made available to the Institute by Dr. J. R. H. Shaul, Central African Statistical Office, Salisbury, S. Rhodesia. Estimates for single years were made and a technical note is under preparation.

13. In addition to the projects or studies mentioned above a number of special investigations such as family budget, nutrition and health studies, bullock utilization surveys, demographic studies on the later rounds of the NSS and other socio-economic investigations on NSS data.

6. Operational Research Relating to Planning (Planning Division)

1. With the inauguration at the Institute of studies relating to planning for national development by the Prime Minister on 3 November 1954, a rapid expansion has taken place in our activities. The Planning Commission had decided earlier that the Institute together with the Central Statistical Organization should start basic studies to explore possibilities of getting rid of unemployment in ten years and at the same time of increasing national income as much as possible. A Programme Committee was formed to decide the general lines of work and set up priorities and a Project Execution Committee was set up to ensure that work was being done in accordance with such priorities. Twelve research units were formed on an *ad hoc* basis to conduct research in various fields. Apart from the workers of the Institute a number of experts from abroad participated in the studies. With the formation of a separate Planning Division, the Institute entered a new and important field of study.

2. The Project Execution Committee consisted of Professor P.C. Mahalanobis (Chairman), J. M. Sen Gupta, C. R. Rao, Pitambar Pant (Private Secretary to the Chairman, Planning Commission), and M. Mukherjee (Central Statistical Organization), (Secretary). A large number of workers from different sections in the Institute participated in the studies (names given in Appendix B). Among foreign scholars who participated in the studies were Professor Ragnar Frisch (Norway), Professor Ch. Bettelheim (France), Dr. R. M. Goodwin (UK), Dr. Oskar Lange (Poland), and Academician D. D. Degtyar, Professor I.Y. Pisarev, Dr. M. I. Rubinstein and Professor P. M. Moskvin (USSR).

8. Shri C. D. Deshmukh (Finance Minister) came to Calcutta and had discussions on planning in the Institute on 14 December 1954. Prime Minister Nehru came to the Institute on 25 December 1954 and stayed here for nearly two hours and a half and had discussions on various aspects of planning. This was followed by the visit of many high officials of the Government of India among whom may be mentioned Shri S. N. Misra

(Deputy Minister of Planning), Shri Y. N. Sukthankar (Secretary, Planning Commission), Shri H. M. Patel (Secretary, Department of Economic Affairs, Ministry of Finance), Shri Tarlok Singh (Joint Secretary, Planning Commission), Shri J. J. Anjaria (Chief, Economic Division, Planning Commission), Shri I. G. Patel (Deputy Economic Adviser, Department of Economic Affairs).

4. On 8 November 1954 Professor P. C. Mahalanobis submitted to the Prime Minister a preliminary note on the basic approach of the 2nd Five Year Plan. In November and December, the Institute and the Central Statistical Organization (CSO) made a rapid study of available material and started preparing working papers. From January 1955 the Economic Division of the Planning Commission and the Department of Economic Affairs (Ministry of Finance) became actively associated with the Institute and the CSO in preparing working papers on planning. On the basis of the above studies and after full discussions with the foreign experts Professor P. C. Mahalanobis prepared a draft Plan-frame for the 2nd Five Year Plan which was submitted to the Prime Minister on 17 March 1955. A working paper giving technical details was prepared jointly by the Economic Division of the Planning Commission, the Department of Economic Affairs, the Institute and the CSO and was submitted at about the same time. These two papers were considered by the Panel of Economists of the Planning Commission on 8, 9 and 10 April 1955. A memorandum generally endorsing the approach of the Plan-frame was prepared by the Panel of Economists and submitted to the Planning Commission on 10 April 1955. The draft Plan-frame and associated papers were considered by the National Development Council (which consists of the Planning Commission, the Central Cabinet, and the Chief Ministers of all the States of India) in May 1955 and the approach and targets were approved generally to serve as the basis for the formulation of the 2nd Five Year Plan. This decision was endorsed by the All-India Congress Committee in September 1955.

5. Two main objectives of the Plan are an increase in national income of five per cent per year and the creation of new employment by way of gainful occupation or jobs for 11 million persons over the plan period. Unemployed man-power and unexploited resources can be brought together to increase both consumption and investment simultaneously. The Plan-frame adopted a dual policy of large investments in heavy industries and social services together with an expansion of small-scale and household industries to supply as much as possible of consumer goods required to meet the increase in demand brought about by planned investments. It was also laid down that there should not be any expansion of factories (which are capital-intensive and labour-light) to produce goods which could be produced by the smaller units (capital-light and labour-intensive).

6. The public sector would develop faster than the private sector in keeping with the declared objective of a socialistic pattern of society. It was further recognised that planning must be flexible and continuous; and the plan must be revised in the light of experience.

7. Besides the assessment and appropriate allocation of the available resources and the preparation of the frame for the Second Five Year Plan, the work on planning included a number of analytical studies on employment, national income, consumer demand, investment etc. Special mention may be made regarding the studies relating to inter-industry relations where a large number of research workers were engaged in constructing an elaborate transaction matrix for Indian economy. This group was also engaged

in the theoretical studies relating to linear programming leading to the optimum allocation of available resources and determination of consistent and feasible targets. In a short period of five months 35 working papers were prepared. A list has been given in Appendix VI.

7. Statistical Quality Control

1. In the Annual Report for 1953-54, mention was made of the establishment of a whole time SQC Unit in Bombay on the lines recommended by the Statistical Quality Control Committee of the Council of Scientific and Industrial Research (CSIR) and of the setting up of the SQC Policy Advisory Committee with Shri C. D. Deshmukh (Finance Minister) as Chairman, and Shri K. C. Neogy (Member, Planning Commission), Sir Shri Ram, Shri Kasturbhai Lalbhai, Dr. S. S. Bhatnagar, Dr. Lal C. Verman, Shri H. H. Keil, Shri M. G. Kotibhaskar, Shri S. C. Jain and Professor P. C. Mahalanobis as members and Shri Pitambar Pant as Secretary.

2. The Policy Advisory Committee at meetings held in August and in December 1954 accepted the recommendations of a sub-committee on the scale of payments to be made by industrial concerns for services rendered by the SQC Units and these scales were brought into operation in Bombay. In discussing budget matters, the Committee considered the special earmarked grant from the CSIR for carrying out, under the direction of the Board of Management of Quality Control in Bombay, work similar to that of the SQC Unit there and felt that it would be better to integrate these activities in a more rational way. They further expressed the view that for SQC work Government grants to the Institute (which were being received in part from the Ministry of Finance and in part from the CSIR) should come from the same source instead of being directed through separate channels.

3. *New SQC Units in Bangalore and Calcutta:* The Policy Advisory Committee had desired that three more SQC Units besides that at Bombay should be established, one at Bangalore, one in Calcutta and the third in the Defence Department. The Bangalore Unit was inaugurated on 1 September 1954 under the management of a Board of Directors with Shri R. Natarajan as the Administrative Officer. The Calcutta Unit was started in September 1954 under the guidance of Mr. G. Taguchi from Japan and with the assistance of two technicians. A more detailed report of the work of the SQC Units is given later.

4. *Visit of W. A. Shewhart:* At the invitation of the Indian Statistical Institute, Dr. W. A. Shewhart ("the father of SQC") came to India for the second time at the end of October 1954 for a visit of 3 months. During his first visit he had made extensive tours, addressed meetings and had discussions on SQC all over the country which had aroused great interest and had made India SQC conscious. Besides lectures and discussions in Calcutta, Dr. W. A. Shewhart visited Ahmedabad (where he had discussions with the SQC workers in the Ahmedabad Textile Industries Research Association), Bombay and Bangalore (where he worked with the whole time SQC Units), Coimbatore, Delhi and some other places. His second visit gave great encouragement to all SQC workers in India and stimulated their interest in the subject.

5. *Visit of other SQC experts:* As already mentioned, Mr. G. Taguchi, a SQC expert and specialist in design of experiments in industrial research, came from Japan in September 1954 to work in the Institute for one year. Mr. T. Hanada, another SQC expert from Japan, was appointed in December 1954 to work with the Calcutta SQC Unit for a year. Mr. D. J.

Desmond, a well-known SQC consultant of UK came to the Institute in December 1954 for four months with an assignment from the British Government under the Colombo Plan. Besides the work in Calcutta, all the foreign experts visited other centres of SQC work in India and in this way their experience was made available to a large number of SQC workers in India.

6. *Statistical Quality Control Conference, January 1955:* The presence of the foreign experts was very opportune and the Indian Statistical Institute proposed the holding of a conference of SQC. The idea was approved of by the Policy Advisory Committee and the Conference was held in Calcutta under the auspices of the Indian Statistical Institute in January 1955. This Conference was the second of its kind to be held in India, the first having been held in January 1948 on the occasion of the first visit of Dr. Walter A. Shewhart. In 1948 the emphasis was on the propagation of SQC ideas, in the present conference greater stress was laid on technical problems and training in SQC. The Conference was, therefore, restricted to persons who had knowledge or experience of SQC work and could take part on the technical discussions or who could explain the views of industrialists and managements.

7. The five main topics dealt with in the Conference and on which reports by Committees were submitted were (1) SQC in relation to Standards, (2) Installation of SQC in factories (3) Case studies, (4) Training and Research and (5) Promotional and organizational matters.

8. The procedures to be adopted during the Conference were in the hands of a Steering Committee consisting of the following members: P. C. Mahalanobis, Lal C. Verman, R. Natarajan, M. G. Kotibhaskar, N. S. R. Sastry, S. P. Vaswani, B. K. Raja Rao, D. J. Desmond, G. Taguchi, N. T. Mathew, T. Hanada, A. K. Gupta, Srinagabhushana, P. B. Patnaik, S. K. Ekambaram, K. B. Madhava, S. C. Sen and Pitambar Pant.

9. The Conference was inaugurated on 16 January 1955 by Shri G. D. Birla at the premises of the Indian Statistical Institute. The other sessions and committee meetings were held at 9B Esplanade East in the City Office of the Indian Statistical Institute.

10. Over 80 persons from industry and SQC Units or statistical institutions participated as members and about 25 persons attended as associates. A number of working papers on each of the five topics mentioned above were submitted and discussed at the Conference. Among the main recommendations were (1) the formation of a National Society for Quality Control and (2) the institution of a SQC journal on an all-India basis. Concrete schemes for training and research in SQC as well as for the maintenance and promotion of SQC have also been evolved. The Conference concluded its session on 22 January 1955 with a farewell tea in honour of Dr. W. A. Shewhart and his wife in the premises of the Institute at Baranagar.

11. *Whole-time SQC Units: Bombay:* The Bombay Unit, which was started under Dr. (Miss) S. P. Vaswani in December 1953, got into stride during the year under review. She was assisted by a team of 3 young statisticians and received help from the Board of Management for Quality Control which also had a small staff working in collaboration with the Unit staff. Temporary accommodation was kindly provided by the Reserve Bank of India in one of their offices, and but for this the Unit could not have functioned properly. The activities of the Unit fell mainly into three categories: (1) training for SQC, (2) installation and maintenance of SQC in factories, and (3) promotion of SQC.

12. A four-month training course was conducted during the period, September—December 1954, and was attended by 31 trainees nominated by 22 factories. The training consisted of both theoretical instruction in lectures and practical demonstration in factories, principally with the trainees' own data. Training, intended primarily for foremen and operatives, was also organized in some factories and proved to be quite popular.

13. The installation of SQC in factories was effected under a scheme of membership for service as approved by the Policy Advisory Committee. Members were enrolled on payment of an annual subscription and monthly service charges depended on the extent of service asked for during the month. By the end of the year 9 factories had enrolled for service, 6 of these being textile mills, and the other 3 engineering concerns.

14. Some of the mills had their own SQC staff and others were considering engagement of such staff. At present routine visits to the mills for maintaining the control arrangements call for a considerable volume of detailed work. As regards promotional work, apart from lectures to various institutions and societies for exposition of the principles and advantages of SQC, preliminary surveys had been conducted in over 20 factories.

15. *Bangalore:* The Bangalore Unit, inaugurated on 1 September 1954 with the approval of the Policy Advisory Committee, owes its origin primarily to the enthusiasm of a small group of engineers, administrators and educationists who had been working quietly in this area for some time and had constituted themselves into a Quality Control Association. During the year under review the Unit was managed by a Board of Directors with Shri. R. Natarajan as Administrative Officer, Professor S. K. Ekambaram, Professor Srinagabhushana and Shri H. S. Narayana Rao as technical directors and Shri R. Ramaswamy as treasurer. The Unit had four technical assistants:— two statisticians, one engineer and one textile technologist. The assistants, placed in various factories in and around Bangalore, studied processes and production methods not only from the SQC point of view but also from the technological point of view. They received every help from the factory authorities and the experience so obtained was a greater gain perhaps for the Unit than the benefits possibly derived by the factories at this early stage. The lack of a wholetime officer with adequate experience in SQC was admittedly a handicap. The Unit, however, was partly compensated for this difficulty by the effective cooperation of an enlightened management with whom it was fortunate enough to work. The scheme of membership for service was initiated in Bangalore under the same terms as in Bombay. The Board of Directors proceeded cautiously to make sure of their ground and enrolled only two members during the year under review. In both these factories, management had organized its own SQC section which worked in close cooperation with the Unit.

16. The Unit had made its contribution to promotion of SQC by organizing a three-day course of lectures on top management to explain the philosophy and benefits of SQC. The lectures, arranged at the premises of one of the biggest factories in the country, were attended by over 24 members representing several industries. Another important development in the same context was the formation of an advisory panel to assist the SQC Unit in formulating its policies and shaping its activities. The panel consisting of, as it does, of top executives in South India, is expected to form an effective liaison with local industry.

17. *Calcutta:* The foreign experts on SQC, who have already been mentioned had the Calcutta Unit as their base. The Unit was started in the middle of September 1954 with

the arrival of Taguchi and the recruitment, shortly after, of two technical assistants, both statisticians, Hanada joined in the middle of January 1954 and the third assistant, a chemical engineer, was recruited about the same time. In the first few weeks, the assistants received instruction from Taguchi on methods developed by him in Japan. In November 1954 one of the assistants accompanied W. A. Shewhart on his tour of South India and Bombay, and thus had the opportunity of acquiring a wider perspective. The Unit was kept very busy throughout the month of January in connexion with the organization and management of the SQC Conference. Immediately after the Conference it was occupied in initiating its scheme of SQC service to industry, which involved the preparation and issue of a brochure, as well as a number of introductory visits to various factories followed by reports on preliminary survey of conditions therein. In all these preparatory activities P. B. Patnaik of the Research and Training Section of the Institute was of immense help. Amongst the factories visited by one or other of the experts in the preparatory stage were the Jay Engineering Works, the Sindri Fertilisers, National Rubber Company, the Indian Malleable Casting, the J. K. Group of Industries, Britannia Biscuit Co., Guest Keen Williams and the Indian Aluminium Company ; some of these were soon to become members for service.

8. Service Units

8.1. The Machine Tabulation Unit

1. The Machine Tabulation Unit was responsible for (i) preparation, (ii) processing, and (iii) storing punched cards relating to different statistical projects. Punching Units were located at three offices in Calcutta and at Giridih while there were two machine units, the Central one at Calcutta and another at Giridih.

2. During the period under review, schedules pertaining to over thirty projects were handled by the Punching Unit. The material of the 2nd, 5th, 6th and 7th Rounds of the NSS, and the Manufacturing Industries constituted the bulk representing 76% of the total volume of work which in terms of card passage amounted to nearly 2825 thousands. The total strength of punchers and verifiers stood at 85. They were located at Baranagar (40), 9B Esplanade (15), Giridih (15) and Albert Hall (15).

3. With the addition of a few new machines of the Powers-Samas type which involved basically different punching techniques, an intensive punching training had to be organized; eight punchers completed the training successfully, and eight more are being trained.

4. During the period under review major changes took place in the machine unit. The size of the installation as a whole almost doubled in the course of this year with the addition of a number of latest machines of the IBM system and two tabulator units of the Powers-Samas type. The Machine-Unit had to be housed in three different locations at Baranagar, as no space could be made available adjacent to the original machine room to accommodate the new machines. There are at present four IBM, four BTM and two Powers-Samas tabulator units along with two Electronic Statistical Machines (type 101) and two Calculating Punches (Multipliers) of IBM and a number of other auxiliary machines.

5. The total volume of work involved 834 lakhs, 44 lakhs, 37 lakhs and 19 lakhs of card-passage through the sorters, tabulators, ESM and calculating punches respectively.

6. The rapid expansion of the Machine Unit created a number of problems of which the scarcity of trained operators was the foremost. About thirty operators had to be appointed. Some had previous training while others had to be trained after recruitment.

7. The Card Store of the Section now contains over 100 full cabinets (with 50 drawers each) and over 200 half-cabinets (with 25 drawers each). Over 150 lakhs of cards are stored in them for reference as and when required. This constitutes the cards of 2nd to 7th round NSS and related surveys. The cards pertaining to the Y-samples of 1941 Census and NSS 1st round, numbering about 100 lakhs, were sent to Giridih for storage. The current output of the Punching Units is over three lakhs of cards per month. The number of cards summary punched or reproduced per month in the Machine Unit is over two lakhs. Thus about six lakhs of cards are being added per month to the Cards Store.

8. For greater efficiency certain changes were made in the organization by attaching the Work-Audit Unit to the Punching Unit, and the Scrutiny and Card-Store Units to the Machine Unit.

9.2. Library

1. The Central Library was located at Baranagar with a service branch at Giridih as in previous years. A new service branch was opened at the City Office at 9B Esplanade, Calcutta for the convenience of the members and students.

2. *Books:* The Library acquired 1945 volumes of books against 1324 last year. Of these 331 were received as gifts and 53 in exchange.

3. *Periodicals:* The Library received 1126 periodicals and annuals against 839 last year. Of these 215 periodicals were subscribed and 565 were received on exchange basis and 346 were received as gifts. The Library subscribed 36 new journals and made exchange arrangements with 3 new Indian and 20 foreign agencies (Foreign Agencies— Poland-1, USSR-2, France-6, Canada-3, Japan-1, Switzerland-1, East Germany-1, Pakistan-2, Spain-1, New Zealand-1, Chile-1). Besides these the Library received 12 new periodicals from different foreign embassies in India.

4. *Special gifts:* The Joint Committee on Slavic Studies (American Council of Learned Societies and the Social Science Research Council) offered a concession of $125 in the subscription of the Current Digest of the Soviet Press which was thankfully received.

The Scripps Foundation designated the Library as one of the 50 libraries selected from all over the world which will receive without charge the reports published in their series Studies in Population Distribution.

About a hundred books were received as gifts from visiting scientists of the Soviet Scientific Delegation, Professors Ragnar Frisch (Norway), R. M. Goodwin (UK), Oskar Lange (Poland) and M. Masuyama (Japan).

5. *J. C. Sinha collection :* The Library purchased a very valuable collection of economic literature belonging to the late Dr. J. C. Sinha consisting of more than 1300 volumes of books, rare reports and several runs of important periodicals. (The figures for the current year's acquisitions cited above do not include this collection as these publications have not yet been processed and integrated into the Library stock.)

6. *Bibliographical Services:* Three bibliographies were compiled during the period, viz:

1) a bibliography on linear programming and input-output relations;

2) a bibliography on Statistical Quality Control; and

3) a bibliography on Indian economics (1947-55).

The Library continued to issue the weekly lists of selected periodicals received in the Library, the monthly bulletin of new acquisitions, the quarterly index to current periodicals and a newsletter.

7. *Service and Circulation:* The number of library members increased from 599 to 724. The total number of books and journals and other material issued was 23,033 of which 5,405 were issued from the Lending Section and 17,628 from the Reference Section. Unfulfilled requests registered a slight fall and came to slightly above 6 per cent from above 7 per cent in the previous year.

8. *Circulating Library:* There was new acquisition of 239 Bengali, 130 English, and 38 Hindi books bringing the total to 5,632 volumes. Stocks were regularly rotated between the branches of the Library. The numbers of books issued from Baranagar, Calcutta and Giridih were 16,480, 1,582 and 3,072 respectively with a total of 21,134 against 19,374 last year.

9. *Records Unit:* The Records Section continued to function at 206 Barrackpore Trunk Road, Calcutta-35, where it has now been centralized by bringing together the scattered units. It is divided into two separate units for (a) Projects, for the maintenance of schedules, working papers, and reports relating to surveys and projects and (b) Maps, and is managed by one Supervisor, two Assistants and ten sorters. The Projects Unit arranged, classified and indexed 4387 files during the year bringing the total number of files thus arranged to 7425. The introduction of 'Kardex' system for the registration of files has much facilitated easy and quick reference. In the Map Unit, 83,138 Cadastral Survey maps and 2863 coloured ones have been processed and shelved. The first instalment of National Sample Survey records has been transferred from the Sectional Office to the Records Unit for systematic processing and preservation. With the same object the Field Branch also has transferred its old records to this Unit.

10. *Photographic Section:* The demand for the photo duplication service has been steadily increasing. The total number of exposures was 5671 consisting of 1440 microfilms, 4231 photostats, 2212 bromide enlargements. The Photographic Section also took 1570 still photographs of individuals, groups and important functions at the Institute, as well as 2000 ft. of motion picture half of which was in colour. Requests for documentary reproduction from other Institutions were also complied with by supplying microfilm, photostat and photoprints.

9. Precision Computation and Mechanics

9.1. Electronic Computers

1. In spite of great difficulties in securing raw materials and equipment steady progress has been made in the work on the construction of an Electronic Digital Computer started at the end of the last financial year (1953-54). The basic part of the machine, the magnetic drum memory with its associated electronic circuits, has been completed. These include counters, a television type raster for scanning data from the magnetic drum, logical gate circuits etc. The design and construction of the organs of the arithmetic unit, such as the logical adder has progressed satisfactorily and is nearing completion. Some teletype equipments obtained from the Disposals Directorate have been repaired and put to service.

2. Professor D. Y. Panov, Dr. V. A. Ditkin, Mr. V. A. Melnicov and Mr. A. N. Zimarev on deputation from the USSR Academy of Sciences came to help in the work of the Laboratory during the months November and December 1954; and had many discussions on the design of an electronic computer. These discussions laid the basis of further Soviet collaboration in technical matters.

3. Dr. Ditkin gave two lectures during his stay, in one of which he gave a review of the recent researches made in USSR in numerical methods; the other was on "Numerical Evaluation of Multiple Integrals".

4. Mr. D. W. Davies of the National Physical Laboratory, UK, visited the Laboratory at the end of December with the object of making a report to the UNTAA in connexion with the request for an aid from the Institute. Mr. Davies who is an expert on high-speed computers had also discussions on technical matters connected with the Laboratory.

5. An order for a small electronic computer HEC-2M, has been placed with the British Tabulating Machines Co. Ltd., London. Two of our engineers, Shri Mohi Mohan Mukherjee and Shri Amaresh Chandra Roy, have been sent to UK to assist in the construction and to become familar with the maintenance of this machine. The machine is expected to arrive by the end of 1955.

6. A number of teletypewriter units, a few thousand radio tubes, some electronic instruments and meters were purchased from the Disposals Directorate at a nominal price and strengthened the poor raw material position of the Laboratory to a very great extent.

9.2. Workshop

1. The maintenance of desk calculators of different types has continued as usual. More than 730 calculators were repaired during the year.

2. The prototype model of the desk calculator designed in the Workshop was completed in November 1954. The performance was satisfactory inspite of poor machinin facilities obtainable in the Workshop. More than one hundred and ten press tools of high precision types have been completed and thousands of parts have already been produced with these press tools for the manufacture of two hundred desk calculators of a slightly improved design than the prototype.

3. During the year, two lathes and two power presses were obtained from the German Reparations Directorate. Most of these have been repaired and put into service. A small radial drill press, a 5 K.W. electric furnace, a low cost surface grinder and a twist drill grinding machine were added during the year.

4. Professor D.Y. Panov and his delegation of Soviet Experts visited the Workshop and examined the work that was being done here. Mr. D. W. Davies, who was deputed by the UNTAA visited the workshop and spent a few days examining in details the press tools which have been made in the workshop and examined the performance of the desk calculator. His comments in the report he submitted to the UNTAA have been very encouraging for the Workshop staff. Mr. J. C. Corry of the UNTAB also visited the workshop and studied its activities.

10. Visiting Professors and Experts

1. The Institute was fortunate in having been able to invite during the year many distinguished scientists from abroad. Scientists from the UK, USA, USSR, Japan, France, Norway, Poland and several other countries came and worked for varying periods of time in the Institute. Their visits have not only stimulated teaching, research and project activities in the Institute but have led to a better mutual understanding of the statistical activities in different countries. A list of visiting teachers and consultants is given below.

(1) Dr. M. Masuyama (*Tokyo University, Japan*) had come to the Institute for the third time in October 1953 and continued his work in the Institute for a part of the year under review. He gave lectures on mathematical and applied statistics and helped in organizing the Biometric Unit before his departure from India in August 1954.

(2) Professor A. Kawaguchi (*Hokkaido University, Japan*) came in April 1954 for about 4 months and had seminars on (i) On the theory of aerial spaces, (ii) On the development of idea of space and (iii) Introduction to integral geometry.

(3) Professor J. B. S. Haldane (*University College, London*) was in the Institute from July to September 1954 and gave lectures and had seminars on (i) Genetical theory of population, (ii) Quantitative study of animal behaviour. He also undertook some biometric researches.

(4) Mrs. J. B. S. Haldane (Miss Helen Spurway, *University College, London*) worked in the Biometric Unit for about 3 months, July–September, 1954, and had scientific discussions.

(5) Dr. R. M. Goodwin (*University of Cambridge, England*) accompanied by Mrs. Goodwin, was at the Institute from September 1954 to February 1955 and gave lectures on (i) Static and dynamic linear general equilibrium models, and (ii) Input and output model and its application to planning. He participated in the compilation of an input-output table for India and in the discussions on planning.

(6) Dr. G. Taguchi (*Chief Statistician, Electric Communication Laboratory, Japan*) expert in SQC and application of statistics in industry worked in the Institute from September 1954 to August 1955. He gave lectures and consultation service and made extensive tours in connexion with his work.

(7) Dr. Q. M. Hussain (*Institute of Statistics, University of Dacca, Pakistan*) came to teach at the ISEC in September 1954 and lectured on 'Correlation and Regression Analysis'.

(8) Dr. Walter A. Shewhart (*The Bell Laboratories, U.S.A.*) accompanied by his wife, who had visited the Institute in 1947-48 again spent about 3 months in India from October 1954 to January 1955. He gave lectures on Statistical Quality Control, presided over the SQC Conference in Calcutta in January 1955, and made extensive tours and had many scientific and technical discussions.

(9) Professor Charles Bettelheim (*Ecole Pratique des Hautes Etudes, Sorbonne; France*) accompanied by his wife, who had come as Visiting Professor in 1953-54 again worked in the Institute from October 1954 to January 1955. He gave lectures on planned economy and participated in discussions on the same subject.

(10) PROFESSOR RAGNAR FRISCH (*University of Oslo, Norway*, and *Editor*, Econometrika), accompanied by his wife, stayed in the Institute (with UNTAA assignment) from November 1954 to March 1955 and worked on the use of linear and non-linear programming in economic planning.

(11) PROFESSOR YU. V. LINNIK (*University of Leningrad, USSR*) gave a series of lectures in November 1954 on recent developments in the USSR in the theory of limit theorems for independent variables, Markov's chains and non-parametric statistics.

(12–14) PROFESSOR D. Y. PANOV (retired Director, *Institute of Precision Mechanics and Computing Machinery, Moscow, USSR*) accompanied by MR. V. A. MELNICOV and MR. A. ZIMAREV, electronic engineers of USSR, stayed in the Institute in November and December 1954 and had technical discussions about the design of electronic computers.

(15) DR. V. A. DITKIN (*Deputy Director, Institute of Precision Mechanics and Computing Machinery, Moscow, USSR*) was in the Institute in November and December 1954, and gave lectures on (i) The construction of approximate formulae for computing multiple integrals, and on (ii) Some approximate methods carried out at the Academy of Sciences of the USSR.

(16) ACADEMICIAN D. D. DEGTYAR (*USSR Gosplan*) stayed in the Institute from December 1954 to April 1955 and gave lectures on Soviet planning and participated in discussions on planning.

(17) PROFESSOR I. Y. PISAREV (*Head of Statistics Section, Institute of Economics, USSR Academy of Sciences, Moscow*) worked in the Institute from November 1954 to April 1955. He gave lectures and had discussions on statistics in relation to planning in USSR.

(18) DR. M. I. RUBINSTEIN (*Professor, Institute of Economics, USSR Academy of Sciences, Moscow*) accompanied by his wife, worked in the Institute from November 1954 to April 1955. He gave lectures on electrification in USSR and participated in discussions on planning.

(19) PROFESSOR P. M. MOSKVIN (*State Institute of Economics, Moscow*) gave lectures and had discussions on national income statistics in USSR.

(20) SIR RONALD A. FISHER (*Balfour Professor of Genetics, University of Cambridge*) came for the fourth time in December 1954 and had seminars on "The logic of statistical inference" and had scientific discussions.

(21) MR. D. J. DESMOND (*Birmingham, U.K.*) an expert in SQC and production engineering worked in the Institute under a Colombo Plan assignment from U.K. from December 1954 to March 1955. He gave lectures and consultation service and made extensive tours in connexion with his work.

(22) DR. OSKAR LANGE (*Director, Institute of Planning and Statistics, Warsaw, Poland*) accompanied by his wife, worked in the Institute from January to April 1955 and gave lectures on (i) fundamentals of national economic planning, (ii) statistical estimation of parameters in Markov's process, (iii) analysis of variance, Loxis theory and regression analysis; their interrelations, (iv) fundamental principles of planning. He also participated in discussions on planning.

(23) MRS. JOAN ROBINSON (*University of Cambridge, England*) delivered a series of lectures in March 1955 on (i) the principles of planning, (ii) the need for planning, (iii) avoiding inflation and (iv) the capital labour ratio.

2. *Lectures and seminars by other experts from abroad.* In addition to visiting professors and experts who stayed in the Institute for several months or a year, a large number of experts from abroad made short halts and gave lectures or had scientific discussions. A list of such visiting experts is given below. Many of them came under the auspices of the United Nations (UN) or its Specialized Agencies like the Food and Agriculture Organization (FAO), International Labour Organization (ILO), World Health Organization (WHO) etc.; in these cases the agency concerned is mentioned within brackets..

(1) MR. J. P. ECIMOVIC of Yugoslavia (UN, September 1954) came with his wife and gave lectures on "Agricultural Surveys".

(2) MISS HELEN N. TURNER, Commonwealth Scientific and Industrial Organization, Australia (September 1954) : "The design of sheep-breeding experiments in Australia".

(3) SHRI T. V. VISWANATHAN (UN, October 1954) gave a series of lectures on (i) Foreign Trade Statistics, (ii) Set-up of UN Statistical Office.

(4) DR. M. P. SCHUTZENBERGER of Paris (UN, October 1954) gave several lectures on Information Theory and had discussions on mathematical statistics.

(5) MR. AMAL GHATAK (ILO, December 1954) : ILO and its organization.

(6) DR. S. SWAROOP (WHO, November 1954) gave lectures on (i) Health Statistics, (ii) On WHO, and (iii) Statistical Set-up of the WHO.

(7) MR. BIMAL GHOSH (ILO, December 1954) gave lectures on under-developed countries and technical assistance.

(8) PROFESSOR J. L. LUSH, State Agricultural College, Iowa (FAO, December 1954) gave a lecture on "Statistics in research in animal production".

(9) ACADEMICIAN K. V. OSTROVITYANOVO, Vice-President, USSR Academy of Sciences, accompanied by his wife, made a short halt in the Institute in January 1955 and gave a lecture on "Scientific Foundations of Planning in the USSR."

3. *Lectures by Indian experts.* The Institute was also fortunate in having a number of distinguished Indian experts as guest lecturers during the year under review. A list is given below with dates and subjects of the lectures.

(1) PROFESSOR K. NAGABHUSANAM, Andhra University, Waltair (April 1954): (i) Single linear equation models, (ii) Problems of identification and (iii) Estimation of Economic parameters.

(2) SHRI C. R. B. MENON, Director General of Commercial Intelligence and Statistics, Government of India, Calcutta (May 1954): Statistics of Trade and Industry.

(3) DR. K. S. BANDYOPADHYAYA, State Statistical Bureau, Government of West Bengal, Calcutta (September 1954) : six lectures on 'Construction of cost of living index numbers'.

(4) DR. K. R. NAIR, Forest Research Institute, Dehra Dun, (September 1954): Recent advances in incomplete block designs.

(5–6) DR. I. G. PATEL AND DR. A. MITRA, Ministry of Finance, Government of India, October 1954 : Financial aspects of the Five-year Plan.

(7) PROFESSOR K. B. MADHAVA, Madras (December 1954): Vital Statistics.

(8) PROFESSOR U. S. NAIR, Trivandrum (December 1954): Census Statistics.

(9) Dr. P. V. Krishna Iyer, Ministry of Defence, Government of India (December 1954): Non-parametric Inference.

(10) Dr. S. N. Bagchi, Institute of Mathematics, Berlin (February 1955): The algebra of physically observable functions.

(11) Professor H. Ghosh, Chief Director, NSS, (May 1955): Organization of Sample Surveys.

11. The Branches

11.1. Bombay Branch

1. The associate membership of the Branch during the year increased to 60; three new ordinary members were also enrolled. A meeting of the Local Council and of the general body of members was held on 11 March 1955.

2. *Sample Survey:* The Branch carried out the field work relating to the eighth round of the National Sample Survey in Bombay city on behalf of the parent Institute. The Branch also carried out a sample survey of small-scale industrial establishments in the city during the period. The field staff employed for the survey consisted of 1 Inspector and 3 Investigators. Information relating to investments in machinery, labour, raw material used and value of output were collected in respect of 579 industrial establishments during the first quarter, 584 during the second and third quarters and during the fourth quarter.

3. *Quality Control:* The staff of the Board of Management for Quality Control worked in close cooperation with the SQC Unit of the Indian Statistical Institute during the period under review, and assisted the SQC Unit in the training programme and also in Quality Control work in the following factories: Western India Mills, Shree Niwas Mills, Shri Ram Mills, Hind Mills, Kamini Metals and Alloys Ltd., National Machinery Manufacturers Ltd., Thana, Hind Cycles.

The Quality Control Study Group held two meetings during the period under review. Shri Subbarao of Tata Oil Mills Ltd., and Shri Sahasranaman of Western India Mills spoke on some of the successful applications of SQC methods they have made.

4. *Institute Examinations:* The Statistician's Diploma Examination held in August 1954 was conducted in Bombay by the Branch: fifteen candidates appeared from this centre.

5. *Other Activities:* Prof. J. B. S. Haldane and Mrs. Haldane, visited the Branch in October 1954. Prof. Haldane delivered a lecture on "Fluctuations in the population of animals and birds" under the auspices of the Branch.

Some members of the Soviet Delegation of Scientists visited the Branch in January 1955. Dr. M. Rubinstein read a paper on "The place of statistics in planning in the USSR."

Sir Ronald A. Fisher, and Dr. R. M. Goodwin, visited the Branch in January 1955 and March 1955 respectively.

Prof. P. C. Mahalanobis delivered a lecture on National Planning on 26 March 1955 under the auspices of the Branch.

11.2. Mysore State Branch

1. This Branch was inaugurated by Padma-Bhushan Professor M. S. Thacker, Director, Indian Institute of Sciences, Bangalore, on 1 September 1954. The function was presided over by Shri A. G. Ramachandra Rao, Minister for Law & Education, Government of Mysore and was attended by leading industrialists, officers of Government and other prominent members. The Executive Committee met three times during the year.

2. *Membership:* As on 31 March 1955 there were 16 ordinary members, 3 Sessional members and 2 Life members, bringing the total membership to 21.

3. *Statistical Survey:* At the suggestion of the President, Shri R. Natarajan, the preliminary work was undertaken to conduct a survey on "The spread of labour and their mode of transport in the industries in Bangalore". A suitable pro-forma has been prepared by a sub-committee consisting of Shri R. Gururaja Rao (Convener), Shri M. C. Satyanarayan and Shri S. K. Iyengar and further action is being taken.

4. *Quality Control Unit, Southern Regional Centre, Bangalore:* The formation of the Branch of the ISI has been very fruitful in as much as it has been possible to establish a Quality Control Unit for the Southern Region, financed by the ISI through this Branch. Along with the Branch, the Quality Control Unit was also inaugurated on 1 September 1954.

The Unit functions through a Directorate composed of Shri R. Natarajan (Administrative Officer), Prof. S. K. Ekambaram, Prof. Srinagabhushana and Shri H. S. Narayana Rao (Technical Directors) and Shri R. Ramaswami (Hon. Treasurer). The Unit has on its staff the following four Technical Assistants : (1) Shri M. V. Venkataraman, B.Sc. (Hons. Statistics), (2) Shri C. Ananthapadmanabha Setty, B.E. (Mech.), (3) Shri G. V. Srikrishna Desikan, B.Sc., B.Sc. (Tex. Tech.), (4) Shri S. M. Sundara Raju, B. Sc. (Hons. Statistics).

The Unit is available for service to the industries for the promotion and installation of the Quality Control in the factories, surveys, research, problems etc.

5. *Visit of Foreign Experts:* Dr. W. A. Shewhart visited Bangalore in November 1954 and besides visiting various factories in Coimbatore and Mysore State and holding discussions, gave a lecture at the S. K. S. J. Technological Institute, Bangalore.

Mr. D. J. Desmond Bangalore in February 1955. He visited several factories and had visited discussions on SQC. He gave very useful suggestions on the future programme of work and addressed a public meeting on "SQC application in British Industry".

6. *Advisory Panel:* To assist the SQC Unit in formulating its policies an Advisory Panel consisting of top executives and managers of industries in South India and Directors of Industries and Commerce, Southern States, has been constituted. So far 29 members have agreed to join the Panel, representing various industries and various places in South India. The Panel met on 17 November 1954 for the first time and discussed some important matters. The second meeting was held on 7 and 8 May 1955.

SQC Conference in Calcutta: From Mysore State, the following attended the Statistical Quality Conference Calcutta in January and participated in the discussions: (1) Shri R. Natarajan, (2) Prof. S. K. Ekambaram, (3) Prof. Srinagabhushana, (4) Shri H. S. Narayana Rao, (5) Shri H. K. Karve (6) Shri J. Krishnaswamy (7) Shri S. K. Iyengar (8) Shri S. N. Aiyer .

Working papers had also been submitted by all the members of the Unit.

7. *Lectures:* A very successful 3-day Course of Lectures on "Quality Control for Top Executives" was given by Prof S. K. Ekambaram at Hindustan Aircraft Ltd., on 18, 19 and 20 November 1954. Members from several industries from Bangalore, Hyderabad etc. attended the Course which was much appreciated.

8. *General:* The Branch gratefully offers its thanks to the authorities of the S. K. S. J. Technological Institute, for kindly providing accommodation and other facilities for the Branch Office and Quality Control Unit, Southern Regional Centre, Bangalore.

INDIAN STATISTICAL INSTITUTE

PART 3. BRIEF HISTORY AND ACTIVITIES OF THE INSTITUTE

3.1. ORIGIN AND GROWTH

1. The origin of the Indian Statistical Institute can be traced to the early statistical work of P. C. Mahalanobis on biometry, meteorology, and anthropometry which began about the end of the first world war. A few part-time assistants and a group of young research workers had formed the nucleus of the Statistical Laboratory which was located in the Presidency College, Calcutta. Extensive investigations were made by this group on rainfall and floods in North Bengal, Orissa, and West Bengal leading to effective measures for flood control and supplying the basic calculations for two great river valley schemes in later years, namely, the Damodar Valley and the Hirakud projects. Official recognition of the Statistical Laboratory in a continuing form came in July 1931 with an annual grant of Rs. 2,500 from the Imperial (now Indian) Council of Agricultural Research for statistical investigations relating to agriculture. Training on an individual basis started at the same time.

2. At a meeting convened by P. N. Banerjea (at that time the Minto Professor of Economics), N. R. Sen (Ghosh Professor of Applied Mathematics in the Calcutta University) and P. C. Mahalanobis (Professor of Physics, Presidency College, Calcutta) and held in Calcutta on 17 December 1931 with Sir R. N. Mookerjee in the chair a resolution was unanimously adopted to establish the Indian Statistical Institute which was formally registered under the Societies Registration Act in April 1932. Since then the Institute has been functioning in law as a non-profit 'learned society'. The Statistical Laboratory was the active nucleus of the Institute and the work of both the Institute and the Laboratory used to be done from the very beginning in the form of a single integrated operating unit. With the accumulation of research material for publication, *Sankhyā: the Indian Journal of Statistics* was started in 1933 and has since then been functioning as the medium of advanced statistical publications in India. Society type branches were established quite early in Mysore, Poona, Bombay, Madras, Lahore, Banaras, Lucknow and Delhi.

3. In the early years the Institute and the Laboratory took up many small enquiries on behalf of Government departments and private concerns. Large scale surveys started in 1937 with the institution of a Government scheme for improving the forecast of the area under jute in Bengal and since then the Institute has been carrying out on an increasing scale enquiries and surveys on behalf of Government. The larger part of the income has always been derived as contract grants for projects and enquiries. The first general grant for research and training of Rs. 5000 per year from the Government of India began in 1935.

4. Many ventures in research and project work met with success, earning recognition for the Institute both within and outside India. The Institute also enlisted the support of statisticians from abroad, such as Professor R. A. Fisher who came to India to preside over the first Indian Statistical Conferences in January 1938 and Professor Harold Hotelling who came as a visiting professor in 1939–1940. Since then (with an unavoidable break during the war) the Institute has maintained the practice of inviting distinguished foreign scientists to work as visiting professors in the Institute.

5. The war period brought in many environmental changes. A large part of the Institute and Laboratory was removed, as evacuation measures, to Baranagar and Giridih

where operating centres were opened in 1942. With increasing need of statistics by Government the project side of the Institute also developed rapidly. The sample survey in Bengal was extended to cover both the area sown and the total yield of jute, rice and other important agricultural crops throughout the year. Full-scale sample surveys of agricultural crops began in Bihar in 1943. The tabulation, on the basis of a two per cent sample, of the 1941 Population Census started in 1944-45; and various socio-economic surveys were also undertaken.

6. The post-war years have been a period of rapid expansion and new developments. The question of stabilization of the Institute had been under consideration by the Government of India since 1938 but had reached a deadlock owing to basic differences of opinion between the Institute and the Department of Education. At a critical period in its history Shri Chintaman Deshmukh agreed to become the President of the Institute in 1945 and since then has been quietly helping in solving its many difficulties. Mainly through his efforts the Research and Training School was stabilized with an initial recurring grant of Rs. 4.5 lakhs from the Government of India from 1949-50; the administrative sponsorship was transferred from the Ministry of Education to the Ministry of Finance in 1950; and a Governing Body was established in 1952 to look after its affairs subject to general coordination of the work of the Institute as a whole by the Council.

7. The International Statistical Education Centre (ISEC) was started in October 1950 under the joint management of the International Statistical Institute and the Indian Statistical Institute under the sponsorship of the United Nations Educational and Scientific Organization and with the cooperation of the United Nations and associated international agencies. Since then the ISEC has been providing training for students for Asian countries with the full support of the Government of India. During the last five years (1950-1955) 167 trainees from 15 Asian countries and 79 from India have attended the ISEC in Calcutta.

8. On the project side the sample survey of crops in Bengal, which had been started by the Institute in 1937, was handed over as a going concern to the Government of West Bengal in 1951. However, a year earlier the Institute had taken up an even bigger project, namely, the design and analysis of data of the National Sample Survey which was started by the Government of India in 1950.

9. The computational work was steadily mechanized with punched card (both Hollerith and Powers-Samas) machines. The need of high speed computations led to the establishment of the Electronics Laboratory on an experimental scale in 1950. Gradually a good workshop was built up which took over the servicing and repair work of all desk calculators in the Institute. In 1953 a small electronic analogue computer of a novel design was constructed to solve linear equations in 10 variables; and early in 1954 work was started on the construction of a large capacity digital computing machine. In 1954 a desk calculating machine was designed and constructed; and arrangements were made in 1955 to produce a batch of such machines. It was also arranged to secure a large number of machine tools and other equipment from USSR through the United Nations to construct electronic and other types of computing machines and precision instruments and equipment.

10. The need of accommodation was growing with increasing commitments. A large part of the Institute had been located in Professor Mahalanobis's house at 204 Barrackpore Trunk Road since 1942. An adjoining plot of land of about 3 acres at 203 Barrackpore

Trunk Road was acquired in 1950 and a building was constructed in 1951 and was dedicated by Professor R. A. Fisher in the same year. In 1954 the Institute purchased a plot of 1.5 acres of land to the west of the Institute premises. In the same year the Government of India placed at the disposal of the Institute a larger plot of about 9 acres with some buildings at 202 Barrackpore Trunk Road immediately to the north of the main Institute building. An operating branch had been in existence at Giridih (in Bihar about 200 miles from Calcutta) since October 1941; and a 35 acre plot of land (partly agricultural) was acquired there in 1952. Since 1937 the Institute has also been using rented accommodation in Calcutta, Baranagar and Giridih. A number of rooms in the Presidency College, which the Institute had been occupying from the beginning, were vacated at the end of 1953 and a new city office was started at 9B Esplanade, Calcutta.

11. The post-war years were also a period of increasing recognition of the work of the Institute. Professor Mahalanobis was elected a Fellow of the Royal Society in 1945 and began serving as a member of the United Nations Statistical Commission in 1946 and served as Rapporteur and Vice-chairman on several occasions and was elected Chairman (1954-56). He served as the Chairman of the UN Subcommission on Statistical Sampling from 1945 to 1951, and also as member of various international committees and organizations. Other workers of the Institute began to have assignments in Europe and America and represented the Institute at international meetings and conferences. The Institute acted as the host society to the International Statistical Conferences in India in December 1951 and a part of the scientific session was held in the Institute premises in Calcutta.

12. The practice of inviting foreign scientists was revived in 1945. Sir R. A. Fisher came four times (in 1938, 1945, 1951 and 1954) and among other distinguished scientists from different countries who stayed in the Institute for some considerable time and actively participated in its work may be mentioned H. Hotelling (Columbia University, New York, 1939-40), W. A. Shewhart (Bell Laboratories, New York, 1947-48, 1954-55), Herman O. Wold (Uppsala, Sweden, 1948-49), Abraham Wald (Columbia University, New York, 1950), William Hurwitz (U.S. Bureau of Census, Washington, D. C. 1951), J. B. S. Haldane (London University, 1951, 1954), Frank Yates (Rothamsted Agricultural Station, U. K., 1951, 1953-54), Arthur Linder (Geneva University, 1951), M. Masuyama (Tokyo University, Japan, 1951, 1952, 1953-54), T. Kitagawa (Kyushu University, Japan, 1953), H. Theil (Netherlands, 1952-53), J. Durbin (London School of Economics, 1953-54), Charles Bettelheim (Paris, 1953-54, 1954-55, 1955), Richard Goodwin (Cambridge University, 1954-55), Ragnar Frisch (Oslo University, 1954-55), D. D. Degtyar (Gosplan), I. Y. Pisarev, M. I. Rubinstein, P. M. Moskvin, D. Y. Panov, V. A. Ditkin (USSR Academy of Sciences, 1954-55), Oskar Lange (Poland, 1955).

13. Since the appointment of Professor Mahalanobis as Honorary Statistical Adviser to the Cabinet, Government of India, the Institute has become more and more closely associated with the work of the Central Statistical Organization and other Government agencies in New Delhi. In accordance with a decision of the Government of India of 1952 the Institute is functioning as the focal centre for professional training and research and as a National Statistical and Computational Laboratory in India; and in 1953 operational research relating to planning was started in the Institute with the help of a special grant from Government.

14. Very significant developments took place in 1954. The Planning Commission, after a full discussion in September 1954, asked the Central Statistical Organization and the

Indian Statistical Institute jointly to undertake work on planning with a dual objective of solving the problem of unemployment in 10 years and at the same time to increase national income as much as possible. On 3 November 1954 Prime Minister Nehru inaugurated in the Indian Statistical Institute studies relating to planning for national development. This work was carried on with the active collaboration of the Central Statistical Organization, the Department of Economic Affairs (Ministry of Finance) and the Economic Division of the Planning Commission. A number of foreign experts came to the Institute in 1954-55 and actively participated in the studies and discussions on planning.

15. On the basis of the above work Professor Mahalanobis submitted to the Prime Minister on 17 March 1955 the 'Draft Plan-frame' which was accepted in May 1954 by the National Development Council (which consists of the Central Cabinet, the Planning Commission and the Chief Ministers of 28 States of India) as the basis for the formulation of the Second Five Year Plan (1956-61). The Institute thus became actively associated with the work of planning in India.

16. The Institute had started its work with one part-time worker in 1931-32. Its staff in November 1955 was nearly 1200. With expanding activities the Institute budget also has been steadily increasing. As already mentioned, the Statistical Laboratory had received its first recurring grant of Rs. 2,500 in 1931-32. The Institute began its activities with a current expenditure of Rs. 238 in 1931-32. The combined budget for the Laboratory and the Institute was less than Rs. 3000 in 1932-33, but gradually the current expenditure increased to Rs. 1.25 lakhs in 1941-42; Rs. 20.40 lakhs in 1951-52 and to Rs. 38 lakhs in 1954-55.

2. Theoretical Researches

The results of theoretical and applied researches have been given in over 550 original papers and reports. Some of the important lines of work are indicated below.

1. *Multivariate analysis :* In the theoretical field the first important work centered round problems of discriminatory analysis. The concept of a measure of divergence between two populations as an aid to classification was introduced by P. C. Mahalanobis from the Statistical Laboratory in 1925 and was later developed in a paper (1927). Further progress was made when a proper mathematical form was devised for classification of groups in terms of mean values only of the variates (1928). The classical and studentised D^2-statistics introduced for this purpose are now well known. Some of the distribution problems connected with them were solved by R. C. Bose and S. N. Roy between 1934 and 1939. Mathematical properties and practical applications have been investigated since 1939, and a fairly satisfactory approach to the entire problem of classification of groups is now available. The first major application is contained in the report 'Statistical Analysis of U.P. Anthropometric Survey' printed in *Sankhyā* (1949).

2. Classification and discrimination in terms of second order characteristics (variances and covariances) were taken up for systematic study by S. N. Roy from 1939-40, and considerable progress was made in the construction and use of suitable functions for measuring group divergences in respect of second order characteristics.

3. The problem of allocating an individual to its proper group was investigated by C. R. Rao when the alternative hypotheses are more than two (1948) and also when the alternatives are not completely specified as when the parameters need to be estimated from

samples (1953). More general problems of selections have also been developed by him (1951–53).

4. *Design of Experiments :* Considerable attention was also given to the theory of the Design of Experiments by R. C. Bose, K. R. Nair, K. Kishen, C. R. Rao and other Institute workers from 1938. Researches in the construction and analysis of balanced incomplete block designs were initiated in 1938. With the application of the theory of Galois fields by R. C. Bose it was possible to obtain all the known solutions previously given by Fisher and Yates together with a number of new solutions (1938). Further work led to a convenient representation of all practically useful balanced incomplete block designs.

5. The problem of confounding had been studied exhaustively at Rothamsted for the simpler designs of the 2^n and 3^n types, i.e., of n factors at 2 or 3 levels each respectively. The more general solution in the case of s^n design (where s is a prime number) was supplied by R. C. Bose and K. Kishen from the Indian Statistical Institute by using the properties of the s-sided hyper-Graeco-Latin squares (1938) and later with the help of finite projective geometry (1940). The problem of confounding of interactions in asymmetrical factorial experiment was studied in a series of papers by K. R. Nair and C. R. Rao from 1941. All possible confounded balanced designs in the case of symmetrical factorial design s^m in blocks of s^n plots have been constructed by R. C. Bose (1946). Using some number theory results, compact representations of finite geometrics have been obtained by C. R. Rao to enable the construction and analysis of confounded factorial designs by punched card methods (1951).

6. A proof was supplied by R. C. Bose for Euler's conjecture that completely orthogonalized sets of s-sided Latin Squares can be found so long as s was a prime number or power of a prime number (1938). Systematic methods of construction of such squares, which are of great importance in the practical designing of experiments, were investigated.

7. K. R. Nair and C. R. Rao developed two types of incomplete block designs (i) general class of partially balanced incomplete block designs (1940–41) which includes as special cases the balanced and quasi-factorial and (ii) the intra and inter-group balanced designs (1940–41) which are useful in many practical situations. A general method of approach for recovering the intra and inter-block information from the results of a general incomplete block design and the necessary tests of significance have been given (1948).

8. *Design of sample surveys :* Important contributions were made by Mahalanobis from 1938 on the mathematical foundations of large scale sample surveys. The economic aspects of conducting sample surveys were mathematically formulated and studied in detail. Also for the first time the concept of non-sampling errors were introduced and suitable statistical techniques in the form of independent inter-penetrating network of sample were devised to control such errors. The theory and application with special reference to surveys conducted in Bengal were published in the Philosophical Transactions of the Royal Society (1944). More recently D. B. Lahiri has been working on the theory of sample designs. He gave an extremely simple rule for the selection of sample units proportional to size (1951) and has developed ingenious methods of increasing the efficiency of the National Sample Survey. Methods of estimation in multiphase and multistage sampling have been investigated by Des Raj in the most difficult situation of varying probabilities of selection without replacement.

9. *Theory of estimation :* The problem of unbiased estimation has been extensively studied starting with some inequalities for the attainable variance of an unbiased estimate

found by C. R. Rao (1945). It was also shown in 1945 that minimum variance estimates are explicit functions of sufficient statistics and a method was supplied for improving an estimate by finding its conditional expectation given the sufficient statistics. The above inequality was improved during 1946–1948 by A. Bhattacharya. Several results of a general nature in unbiased estimation have been found since 1948 by C. R. Rao, D. Basu and S. Mitra.

10. *Mathematical statistics:* Besides, in recent years, some multivariate tests were developed and their optimum properties investigated by C. R. Rao and J. Roy. A simple technique for finding powerful approximations to a complicated distribution has been found and applied to several multivariate tests based on the likelihood ratio criterion (1951).

11. There were a number of contributions by D. Basu and R. G. Laha on the characterization of the normal distribution from the point of view of stochastic independence of some statistics and of independence of conditional expectations. Two important cases considered are independence of two linear functions of identically distributed independent variables (1951) and of the average with any sample cumulant (1953).

12. One of the new lines of research started in the Institute is the study of limit theorem in probability. G. Kallianpur investigated the behaviour of successive sums of independent random variables and their equidistribution on the real line. A general theorem of the Lindeberg type has been proved for the convergence to normality of sums of 'm-dependent' random variables (1953).

3. Projects

1. *Statistical methods in anthropometry, meteorology and flood control:* The early work on anthropometric measurements (1921) by P. C. Mahalanobis led to the formulation of the generalized distance (D^2-statistics). His next two papers were on upper air correlation and the seat of activity in the upper air (1922) which led to detailed investigations on rainfall and floods in North Bengal (1926) and supplied the basis for effective measures for flood control. This was followed by extensive studies on rainfall and floods in the Orissa rivers (1930) which on one hand, led to flood control measures for the Brahmini river and, on the other hand, supplied the basic calculations for the Hirakud irrigation project. In the same connexion may be mentioned the studies on the Burdwan-Hooghly-Howrah Flushing and Irrigation Scheme (1936) which were connected with the later development of the big Damodar River Valley Project.

2. *Agricultural field trials:* In an early paper Mahalanobis (1925) had attempted to eliminate variations in yield arising from differences in soil fertility in a variety trial on rice. At this time he had no knowledge of R. A. Fisher's paper on field trials of 1923 or 1924. But his paper was seen by Fisher which put him in touch with Fisher's work on design of experiments, the far-reaching importance of which was immediately appreciated by Mahalanobis. In 1927 Mahalanobis met Fisher at Rothamsted and was eager to introduce the Fisherian technique on his return to India. This important line of work opened up with the sanctioning of an annual grant of Rs. 2,500 for this purpose by the I.C.A.R. in 1931. During the next 10 years the Statistical Laboratory and the Institute functioned as the focal centre of work in India on design of experiments. More than 60 papers were published by the Institute workers up to 1942 when the grant from the I.C.A.R. was dis-

continued. Mahalanobis and S. S. Bose and their younger colleagues participated in numerous discussions, meetings and conferences to promote the use of design of experiments. The Statistical Laboratory and the Institute also undertook the task of providing training in this subject to a large number of agricultural scientists from all over the country.

3. *Sample surveys :* A number of small sample enquiries had started in the middle thirties mainly relating to consumer preference for particular types of goods (1935) or such questions as the incidence of drinking tea in Calcutta. The subject opened up on a really grand scale with the initiation in 1937 of the five-year project for the improvement of the forecast (or rather, the estimate) of the area under jute in Bengal which is an important cash crop of the country. The sample survey of the jute crop in 1937 was a landmark in the history of the Institute. From this year sample surveys of agricultural crops and large-scale economic and social surveys of all kinds have for mad n very important field of activity of the Institute. A survey of family budget was conducted in 1938–39. Extensive work was started in 1939 on crop-cutting to estimate yield per acre. Between 1943 and 1945 two sample surveys were rapidly conducted on agricultural crops in Bihar with encouraging results. J. M. Sen Gupta supplied the leadership among younger workers on the statistical side from the very beginning; and Nihar Chandra Chakravarti was responsible for much of the developments on the field side.

4. Among other projects conducted by the Institute between 1944 and 1948, mention may be made of surveys on economic aspects of road development, rural indebtedness in Bengal, economic and social conditions of agricultural labour, middle class family budgets, sample surveys of traffic on Howrah bridge and survey of displaced persons in Delhi. Investigations on employment, cost and standard of living, and consumption patterns were also made. A sample survey on economic conditions in Rangoon was organized by the Institute in 1948–49 at the instance of the Government of Burma.

5. Besides conducting large-scale sample surveys, many methodological researches were undertaken on such subjects as the personal bias of the investigating staff, use of replicated sub-samples, use of inter-penetrating samples, configurational sampling, zonal and non-zonal randomisation, duplicated sample-units, sequential surveys, planning of sample surveys, experiments on crop estimating, control of observational and computational errors etc.

6. *Population data:* Another important project was started in 1945. Tabulation of the 1941 Census of Population had been kept in abeyance as a measure of war economy but there was continuing and pressing need of demographic information. At the suggestion of the Institute, the Government of India sanctioned a large-scale project to prepare age and occupational tables on the basis of the two per cent sample of the Census slips (which had been fortunately preserved under the instructions of the late M. M. Yeatts, Census Commissioner). The work was taken up by the Institute in 1945 and completed in 1950 under the guidance of D. B. Lahiri. Researches on population data were continued and gradually a demographic section was organized in which systematic studies are being made on growth of population in relation to social, economic and regional conditions under the guidance of D. B. Lahiri, Ajit Das Gupta and Jnanadan Poti.

7. *National Sample Survey:* In 1950 The Institute was called upon by the Government of India to take up the design and analysis of data of the National Sample Survey (the field branch of which has been all along working under the direct control of the Ministry

of Finance). The heavy task of first organization fell on J. M. Sen Gupta, D. B. Lahiri and Ramkrishna Mookerjee. In 1951 Satyabrata Sen took charge of the section. Nine rounds of the NSS have been conducted and extensive information has been made available on the economic conditions of the whole country. The NSS supplied much useful information to the Taxation Enquiry Commission and the Press Commission of the Government of India; and have undertaken special studies on unemployment for the Planning Commission and an extensive survey of agricultural holdings in the eighth round. A number of reports have been completed on household consumption, demographic conditions and unemployment; a technical paper on the sample design by D. B. Lahiri; and a valuable study of Faridabad (a new refugee town near Delhi) by Pitambar Pant. Other reports are under preparation.

8. *Biometric Unit:* A Biometric Unit was established under the guidance of M. Masuyama (Japan) and J. B. S. Haldane and Mrs. Haldane (UK) in 1954 and C. R. Rao and S. Roy are working on a number of problems.

9. *Psychometric Unit:* A Psychometric Unit was established under the charge of E. Harper in 1954 and is working on selection and aptitude tests and associated problems.

4. Statistical Quality Control and Industrial Management Research

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

2. In 1953 an Advisory Committee for SQC was set up with Shri C. D. Deshmukh (Minister of Finance) as Chairman and Pitambar Pant as Secretary; and gradually three whole-time SQC Units were established in Bombay, Bangalore and Calcutta. Dr. W. A. Shewhart visited India for the second time in 1954-55; and the second SQC conference was held in Calcutta in January 1955 which gave an impetus to the movement. Since 1954 a number of experts such as Mr. T. Hanada and Dr. G. Taguchi from Japan and Mr. D. J. Desmond from UK have come to help in this work.

5. Precision Computation and Mechanics

1. In 1950 a small unit for electronic computers was established under Samar Kumar Mitra. A small electronic analogue computer to solve linear equations in 10 variables was designed and constructed in 1953. A fairly well-equipped research workshop was also gradually built up where a hand-operated desk calculating machine was designed and constructed in 1954 and arrangements were made for the production of a batch of such machines.

2. Work was also proceeding on digital computers. In 1954–55 arrangements were made to secure a large number of machine tools and other equipment from USSR through the United Nations and a number of Soviet experts visited the Institute and some of the Institute workers also went to USSR. A built-up electronic computer was purchased in UK in 1955 and a larger electronic computer is expected to be received from USSR in 1956. The engineering and other staff is being steadily increased to enable this section to undertake developmental and small scale production work on analogue and digital computers to meet the special needs of the Institute, and also on other types of computers, precision instruments and gauges and associated equipment.

6. Operational Research relating to Planning

1. In 1953–54 an Operational Research Unit was established in the Institute to undertake, on a small scale, technical work relating to planning. In September 1954 the Institute was asked by the Planning Commission to undertake jointly with the Central Statistical Organization (Cabinet Secretariat) to study the possibility of solving the problem of unemployment in 10 years and at the same time to increase national income at a reasonably rapid rate. The Economic Division of the Planning Commission and the Department of Economic Affairs (Ministry of Finance) started actively to collaborate with the Institute and the CSO in this matter from December 1954. On the basis of such four-agency co-operative studies, P. C. Mahalanobis prepared the Draft Plan-frame of 17 March 1955 which was accepted as the basis for the formulation of the Second Five Year Plan. In September 1955 the Planning Commission decided that the Operational Research Unit in the Institute should be expanded and should work in close collaboration with the Planning Commission, the Department of Economic Affairs and the Central Statistical Organization with the guidance of a Joint Committee which would function directly under the Chairman of the Planning Commission, that is, Prime Minister Jawaharlal Nehru.

2. The ORU arranged to issue a large number of working papers on planning in 1954–55 and is engaged on various studies relating to planning under the guidance of both Indian and foreign experts.

7. Training and Examinations

1. Training of officers deputed by the Central and State Governments had started in 1932. In the earlier years training was provided more or less on an individual basis. Between 1932 and 1939, more than 150 individuals had been given such training, but the demand was gradually increasing and the Institute started organized courses of instruction from July 1939. Since then the training courses have gradually developed into a professional training school. The Institute at present provides a two-year training course for advanced students who have already taken the master's degree in mathematics or statistics. After a further period of professional and research work, the candidates proceed to the Associateship of the Institute (which is equivalent to a doctor's degree) on submitting a thesis or report on applied work.

2. A small batch of probationers or apprentices are taken periodically, who attach themselves to some major project work and thus get their grounding in statistical work. Facilities are provided to officers on deputation from Government departments or scientific

institutions for advanced and specialized studies. To junior workers of the Institute as well as to suitable candidates from other fields, special courses of instruction in computation are given. Between 1932 and 1954, more than 750 persons received training in one form or other at the Institute.

3. Since 1938, professional examinations have been conducted for the award of Certificates for Computers and Field Investigators and Diplomas of Statisticians. The diploma holders can qualify for the Associateship for the Institute after a prescribed period of applied work.

8. International Statistical Education Centre (ISEC)

1. A new type of institution was established in October 1950 in the form of the International Statistical Education Centre under the joint management of the International Statistical Institute and the Indian Statistical Institute and under the sponsorship of the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the Government of India. From 1950 to 1953 there were two terms of six months each every year which, however, was found too short and the term was increased to a full academic year of 9 or 10 months from 1954.

2. Between October 1950 and March 1955 the numer of trainees who attended the ISEC was 246 from 16 Asian countries, namely, Afghanistan, Burma, Cambodia, Ceylon, India, Indonesia, Iran, Iraq, Japan, Malaya, Nepal, Pakistan, Philippines, Syria, Thailand, Vietnam.

9. Social Services

1. In the Indian Statistical Institute continuing attention has been given to the welfare of workers. A Medical Unit was established in 1943 and has now branches in Calcutta and Giridih under the charge of Dr. R. Maitra and Dr. N. K. Das respectively. The workers receive free services at the dispensaries and the privilege of having visits by the Institute medical officers at subsidized rate of Rs. 1/8/- per visit both in Calcutta and Giridih. There is also a liberal provision of medical leave on three-quarters pay. Prescriptions and medicine are supplied on a cost basis.

2. The Institute has been providing a certain amount of residential accommodation on a rental basis in houses hired by the Institute in both Calcutta and Giridih since 1942 when this arrangement became necessary under war conditions. There are hostels for students, guest houses for visitors, a canteen which supplies daily food to about 700 persons at Baranagar, a night school for workers and their children, and a subsidized transport service in Calcutta and circulating libraries of general literature at all offices for the convenience of workers.

3. The Institute also supports Workers' Clubs in Calcutta and Giridih for sports, recreation and cultural activities. Shrimati Mahalanobis has been actively associated with the social services from the very beginning and she used to be ably assisted in this work by Sudhir Kumar Banerjee, the oldest worker of the Institute, until his untimely death in 1952.

Indian Statistical Institute : Receipts & Payments Account

To Receipts

		Rs.	as.	p.	Rs.	as.	p.
1.	Opening Balance : Cash in hand and at Banks ..	21,402	9	1			
	Unadjusted suspense of 1953-54 ..	58,880	12	2			
					80,283	5	3
2.	Membership subscription				2,801	9	0
3.	Training Fees				9,995	0	0
4.	Examination Fees & other receipts				9,668	8	0
5.	Block grants and Grants-in-aid from the Government of India, Ministry of Finance :						
	i) Research, Training & General purposes ..						
	ii) Multipurpose National Sample Survey ..				5,86,000	0	0
	iii) International Statistical Education Centre ..				21,46,000	0	0
	iv) Manufacturing Industries Survey				74,000	0	0
	v) Operational Research				25,000	0	0
	vi) Employment Survey (Planning Commission's restricted programme) for work of 1953-54 ..				1,60,000	0	0
	do do 1954-55 ..	32,325	3	0			
		9,884	13	0			
	vii) Sample Survey of Agricultural Holdings—				42,210	0	0
	Central Sector						
	States Sector	1,33,000	0	0			
		88,000	0	0			
	viii) Economic Wing				2,21,000	0	0
	ix) Statistical Quality Control—				10,000	0	0
	(a) For current expenditure						
	(b) For Foreign Scientists & experts	40,000	0	0			
	(c) For Conference	40,000	0	0			
		20,000	0	0			
					1,06,000	0	0
6.	Grant received from Council of Scientific & Industrial Research for the Statistical Quality Control Unit ..				20,000	0	0
7.	S.Q.C. Membership & Training Fees etc.				20,850	0	0
8.	Grant received from Director General of Health services for certain statistical work on Family Planning ..				16,000	0	0
9.	Funds received from Government of India, Ministry of Finance for disbursements to the trainees at ISEC selected as Fellows under the Technical Cooperation Scheme, Colombo Plan				32,006	2	8
10.	Receipts from other sources :						
	(a) Arrear dues from Metropolitan Insurance Co. Ltd...				402	14	0
	(b) Miscellaneous				3,559	2	6
11.	Deposit accounts				3,963	2	3
12.	Outstanding liabilities for						
	(a) Goods & services						
	(b) Bank overdraft (State Bank of India)	63,301	5	6			
	(c) Loan from Dev. fund	65,722	3	10			
	(d) Loan from funds as per general a/c. of 1953-54 (per contra)	20,000	0	0			
		1,75,000	0	0			
					3,24,023	9	4
				Rs.	38,94,363	5	0

6, Hastings Street, Calcutta,
The 6th August, 1955

(current expenditure) for the year ending 31 March 1955

	By Payments	Rs.	as.	p.	Rs.	as.	p.
1.	Salary, Dearness allowance, Honoraria etc. ..	17,84,853	2	10			
	Employer's contribution to worker's P.F.	68,101	4	0			
					18,32,954	6	10
2.	Travelling allowances				1,10,281	2	11
3.	Overtime allowance				7,473	2	0
4.	Contribution to leave salary fund				1,00,000	0	0
5.	Visiting Professors, Fellows, Foreign experts & Scientists etc. :						
	(a) Operational Research Sector	1,00,028	12	6			
	(b) Statistical Quality Control Sector	45,346	3	7			
	(c) Research & Training Sector (Transfer to fund a/c.)	40,000	0	0			
					1,85,375	0	1
6.	Scholarship & Stipends (Transfer to fund a/c.) ..				20,000	0	0
7.	Prizes to workers for initiative and outstanding performance				21,993	0	0
8.	Contribution to gratuity fund				77,000	0	0
9.	Machine Tabulation Expenses :						
	(a) Hire & Maintenance of Tabulating equipment, Key Punches and Verifiers etc., including freight etc. ..	3,21,451	5	2			
	(b) Cost of Cards, Cabinets etc.	1,58,641	7	7			
	(c) Payment to IBM & BTM Cos. Ltd., for tabulation and punching work done by them	29,629	8	0			
					5,09,722	4	9
10.	Printing & Publication (including paper for printing) ..				58,671	2	6
11.	Society Type Activities				18,436	4	5
12.	Examination Expenses				11,105	15	3
13.	Books & Journals (including cost of binding) ..				39,563	0	2
14.	Workshop, Photo & Microfilm Section				24,744	0	3
15.	Repairs and replacements of machines, equipment, accessories, furniture & fittings				68,315	13	9
16.	Stationeries & consumable stores				54,043	9	6
17.	Auditor's fees				3,400	0	0
18.	Bank charges and interest				4,390	4	0
19.	Crop-cutting labour charges & experiments ..				6,515	7	0
20.	Telephone & Electric charges				30,338	11	0
21.	Postage, telegrams & other miscellaneous contingencies				44,715	0	6
22.	Rent, Rates & Taxes including those of field and camp offices				1,28,870	14	3
23.	Repairs & maintenance of building & lands ..				52,470	7	3
24.	Transport (including salary to transport unit staff) ..				38,900	1	5
25.	Workers' Welfare and amenities (including salary to staff)				66,157	2	9
26.	Development at Director's discretion				20,661	6	3
27.	Statistical Quality Control Conference				16,424	13	2
28.	Disbursement to Fellowship allowance to ISEC trainees under Colombo Plan				38,249	0	8
29.	Repayment of outstanding liabilities				11,544	3	0
30.	Repayment of previous year's deposit				2,517	4	3
31.	Repayment of loan from funds as per General a/c. of 1953-54 (per contra)				1,75,000	0	0
32.	Closing Balance :						
	Cash in hand and at Banks	25,096	15	1			
	Amount under suspense & advance with Barrackpore, Calcutta, Delhi, Giridih, Bombay & Field Section ..	73,002	11	11			
					98,099	11	0
				Rs.	38,94,363	5	0

Examined and found correct.
P. C. NANDI & Co.
Auditors,
Chartered Accountants

Appendix A

SPEECHES DELIVERED ON THE TWENTYTHIRD ANNIVERSARY DAY

12 December 1954*

REVIEW OF THE WORK OF THE INSTITUTE

BY PROFESSOR P. C. MAHALANOBIS

Friends,

By a change in our constitution Shri Chintaman Deshmukh continues to be our President as he has been for the last 10 years, but at his own desire, we have now a separate Chairman of Committees.

I have great pleasure in welcoming the President, our many guests from overseas who are living with us and working with us, our old workers and old students, our present workers and present students, and also our many friends. ‡

I shall now give a brief review of the work of the Institute. A report bringing the story upto the end of March 1954 has been printed and circulated. I shall speak mainly of developments which have taken place since then.

The most important event in one way has been the inauguration of studies relating to planning for national development by Jawaharlal Nehru on the 3rd of November 1954, a little over a month ago. This is a field to which the Institute is turning its attention for the first time. It is a very important field which is likely to affect, and it has already affected, the whole organization and orientation of our applied work.

This field of basic studies relating to planning deals with what is the best way of national development, what should be the rate of investment, the allocation of resources, and things like that including the training programme for personnel. It has already led to a reorganization of our activities with studies relating to planning as the central theme.

In the National Sample Survey, for example, we have been covering about a thousand villages, fifty towns and the four great cities two or three times a year. We are now doing, in the current eighth round, a survey of agricultural holdings. The new work on planning is giving a definite orientation to the National Sample Survey. Our mind is now directed to future lines of policy and not merely to collecting information for the sake of information. We do not believe in statistics for its own sake. Art may be for art's sake,

* Transcription from magnetic tape-record.

‡ At this stage Professor Mahalanobis introduced the foreign guests.

but to us statistics has always a purpose. We have now got a big social aim in the field of planning. We consider ourselves fortunate that the Institute has been now definitely linked with planning for national development.

In the National Sample Survey, another item of outstanding importance— employment and unemployment— has been already taken up, but from next year it will be done on a bigger scale, namely, a continuing survey of unemployment and employment. The form in which our President (but in a different capacity, as a member of the Planning Commission and as Finance Minister) raised the question was "Can we have our planning directed in such a way that in 10 years, let us say, we shall be able to get rid of unemployment ?" The National Sample Survey, as also the basic studies now being done in the Institute, are being directed to this very fundamental question.

We are also trying to estimate, on the basis of the material which we have already collected, what changes we should expect with economic development, that is, with an increasing level of living, an increasing income and, of course, an increasing expenditure. If we have a developing economy, we have to get ready in advance to meet the increasing demand for goods and services which will arise in future, in 2 years, in 5 years or in 10 or 15 years. We have to look ahead. We have to think of the way things will change. To forecast, not in the sense of stating that this demand must necessarily arise, but anticipating that if such and such things happen, if there is increasing investment, if there is an increasing level of income, then, such and such would be the demand for goods. It is the way of science to decide on a rational course of action on available information ; and also to collect necessary and relevant material for future decisions. This is the real task of statistics to which we are turning our mind.

We are also making a special study of small industries. It is possible that in India, in our plan for national development, we may have to rely very heavily for many years on the cottage industries to supply the increasing demand for goods. So, special studies are now being made on the small industries.

Also, of course, for the last five years, sample surveys have already been conducted on large scale industries. We hope a report will be soon released. Before publishing the report we wanted to make sure, by collecting the information for four or five years, how far reliable would be the information.

There have been other special studies of which I should like to mention one. In Faridabad town, a special enquiry was made which has thrown up a good deal of valuable information about, what may be called, a planned industrial town. If we have industrial development in future, it may mean setting up of 15, 20 or 30 new big enterprizes which would mean the establishment of as many new industrial towns. Such studies also we have started.

I may now turn to the Research and Training School on which also the new work relating to planning is having a big impact, not in diverting the mathematicians or the mathematical statisticians from their theoretical studies but in throwing up fascinating and challenging problems which will keep them engaged more actively than ever. As a matter of fact, we have not got enough mathematical statisticians. There is a shortage of trained personnel. In the Research and Training School also, we are reorienting our

programme with a view to developing mathematical work of a somewhat new kind, which may perhaps be broadly called of an econometric type but quite different from the econometric work in the West.

We have had this year in the Institute an outstanding course of lectures by Dr. Yu. V. Linnik of Leningrad. (I am sorry to say he had to return to his country only a few days ago. He had other engagements. I am particularly sorry because a letter came from his Embassy saying that he could stay with us for some time more, but the letter came too late). He gave a valuable review of the recent work in mathematical statistics in USSR.

We have also started a seminar by Sir Ronald Fisher on the logic of statistical inference which, I venture to suggest, may be called the logic of inductive inference. This is at the highest level of theoretical work. I am mentioning these mathematical courses to indicate that the new orientation towards planning does not in any way mean any decrease or even any diversion of the fundamental work in inference or in mathematical statistics.

I shall come back for a brief reference to the studies relating to planning. We are trying to get a rough picture of what should be the basic approach in physical terms in the Second Five Year Plan or even later. We are trying to have a 'perspective' or a distant view of planning in 10 years, of 15 years or even 20 years. Planning always means a certain amount of compromises between immediate gains and postponed benefits in the future.

The planning work is being organized in a number of different units in some of which our friends from overseas are participating. We have Professor Ragnar Frisch who has great experience of planned economy because Norway has more advanced physical planning than any other country outside the socialist countries and Professor Bettleheim from Paris and Dr. Goodwin from the Cambridge University to help us in this work ; and also we have got the economists and statisticians from USSR. Professor Pisarev is the head of the Statistics Division in the Institute of Economics in the USSR Academy of Sciences ; Dr. Rubinstein and Professor Moskvin are also helping us in this sector.

I may perhaps stress that the lines on which we are working are very definitely related to conditions in India. It is our view, and our friends from different countries of the world are, I believe, in agreement with us, that we need not and we should not copy the methods of any particular country. India has her own problems and big problems ; and we have to work out our own solutions. We have 370 million people ; and in planning we are continually coming back, again and again, to the point that our Plan also has to be thought of in big numbers. We cannot escape it. It is a big country and we have to take a big view of planning.

I may now turn to Statistical Quality Control, in which field we have with us for the second time, Dr. Walter A. Shewhart, "the father of SQC". A Policy Advisory Committee has been set up with our President as Chairman, and with leading industrialists and Government officials as members to advise on the broad policy. The Institute has taken up the responsibility for carrying out the work. One whole-time SQC Unit was established last year in Bombay ; this year another unit was set up at Bangalore. In Calcutta also we have one unit working at present. Dr. Taguchi has come to help us from Japan, he will be here for one year. From the United Kingdom, through the Colombo Plan, Mr. Desmond

will arrive tomorrow; and we also hope to have the help of Dr. Hanada, another Japanese expert. This work is now getting well under way; and a Conference on SQC will be arranged in Calcutta in January 1955 to thrash out the various problems.

I shall also refer very briefly to the International Statistical Education Centre which was established in 1950 and has been continuing since then to provide training for students and officials from different countries of Asia. In recent years we are also admitting Indian trainees in increasing numbers from different parts of our own country.

On the applied side there were some new beginnings. A small Biometric Laboratory was established and biometric work was started under the guidance of Professor J. B. S. Haldane who was here from July to October of this year (1954). We hope to continue this line of work.

Another new unit has started under Dr. Harper. We are eager to find out how far modern techniques of aptitude testing are really successful. We are going to start the work within our own walls. We have a large number of workers. We should like to find out what objective tests can be developed to assess their work, and then check the test results against actual records of performance.

There has been some development in the Electronics Laboratory and the Workshop. Last year, a small electronic computer was built. This year a manual (desk) calculating machine has been manufactured entirely in our Workshop. Some progress has also been made in the field of a large digital computer and there have been fruitful discussions with Dr. Ditkin, Mr. Melnikov and Mr. Zimarov of Moscow in this field.

There has been some improvement also in the work of the Welfare and House Committee. We are very happy that all our foreign guests are staying in the Institute premises. We have for this purpose converted a portion of the office into a small hostel; and I hope they are comfortable. It means a great deal to us to have them near us. It is convenient not only for work but I, and I am sure my fellow workers in the Institute, greatly appreciate the opportunity of meeting them in a friendly and homely way.

There has been some expansion also of what is called immovable property. We have acquired a little over an acre of land adjoining the present premises; and we have recently hired a big plot of land of about 9 acres with buildings next door at 202 Barrackpore Trunk Road.

These are the important developments during the past year. About the future also, I should just like to say a few words. In the Research and Training School we are planning to change the type of training. Now it is a two-year course for which only candidates with the Master's degree are admitted. That, of course, will remain. But, in future we hope to make it a three-year course for those who have not got a Master's degree in statistics. And we propose and I think I may announce this with the President's permission, that our proposal will be given sympathetic consideration by Government—to give all trainees stipends from the very beginning. We have found that there are some brilliant students who have to take some kind of a job because they cannot afford to continue their studies after taking their Master's degree. We hope to attract this group by offering stipends. In future every candidate whom we accept for training will be given a generous stipend. We shall watch their work, and this would be an apprenticeship training in the real sense. This is an innovation to which we are looking forward next year.

I have already referred to the work relating to planning. In this connexion, I may perhaps stress that the Institute, although a non-Government organization, is now closely associated with Government agencies like the Central Statistical Organization, or the National Sample Survey which is, of course, a joint enterprise (The NSS Field Branch is under the direct control of the Ministry of Finance but the statistical work is being done in the Institute). Opportunities are steadily increasing for the Institute to come into closer contact with the statistical work in the States, for example, in connexion with the survey of agricultural holdings, which is in progress. This year several meetings of State and Central statisticians were held in the Institute. We are planning to have another joint conference in Calcutta in February 1955 in connexion with the survey of employment and unemployment. In this way the Institute is getting more and more closely associated with Government agencies ; and because of the studies relating to planning, the Institute is also developing closer links with the Planning Commission.

A proposal, or perhaps, not actually a proposal but the idea, of having a Central Act for the Institute has been under consideration by Government for some time. In principle, there is agreement. One or two things have been standing in the way, which perhaps have now narrowed down to one single issue to which I should like to make a brief reference. What I shall say now is, of course, entirely my personal view.

An Institute like ours is, of course, in the public sector. It is in the public sector, but is not a Government department. This distinction is important. The Institute is undertaking mostly Government work, and is likely to continue to do so. It is entirely proper that an Institute like ours should serve the needs of the country. I submit that the Institute can best serve such needs if it is allowed to retain its initiative, its freedom to do its work as it thinks best— to have some scope for experimentation and development on its own.

I may try to explain this idea a little. I have suggested to Government that the Institute should be given grants for an agreed programme of work or for specified projects, of course, on the basis of estimates which would be supplied by the Institute. And, I have also suggested that there should be a little surplus over estimated costs which would serve as a counterpart of profits in private enterprises, or a little margin for development which I may perhaps liken to what wise parents would give to a young boy in the way of pocket money. It may be two per cent, it may be five per cent, or may be one anna in the rupee— I am not suggesting a very big amount— which should be provided as the earnings of the Institute (over and above the agreed costs for projects) and should be set apart as something which the Institute can spend in its own rights and at its own discretion.

This is the one outstanding issue. Personally, I consider this very important indeed. I accept whole-heartedly the idea of an over-all plan for our country. In a country like ours, I do not see how otherwise we can make sufficiently rapid advance. It is very important to have an over-all plan which should be comprehensive ; but it is equally important to preserve and encourage individual initiative to the fullest extent. Ultimately this is the problem of life itself or of human civilization. We must have organizations and institutions, but as things grow bigger and bigger, rigidity sets in.

At this point, I should like to turn for a moment to my own colleagues within the Institute. There also I see signs, and sometimes I am apprehensive, of the rigidities which

seem to be growing in the Institute. If I may use a phrase which is not always complimentary, it seems to me that the Institute tends to get too bureaucratic in many ways. I am not suggesting that this is a problem of government alone. It is a problem of human organization. And I think we should deliberately and in a rational way find out what would be the correct solution.

That is the one issue which, I hope, will be satisfactorily resolved in the near future; and which will enable the Institute to continue its work according to the needs of Government and the country as a whole. The Institute would, of course, work in accordance with the agreed plan ; but the Institute should have the freedom to think out what is the best way of doing its own work— and even to make some mistakes and learn by experience. I venture to suggest that science can progress only through making experiments and, therefore, by taking the risk of making mistakes. Without making mistakes I do not see how science can progress. Therefore, we claim that we should have the freedom of the scientist to have a little margin to make experiments, and also to make mistakes, in the hope and with the firm conviction that we shall, in this way, succeed also in devising new ways and better ways.

This is a point to which I have referred at some length because to me it is of the greatest importance. A plan without this margin of individual freedom and initiative is something which I feel I cannot accept, because I do not think such a plan can succeed. I am speaking purely at the technological, scientific, and the pragmatic level, if you like. The very success of a plan would depend on its providing a margin of freedom to make it flexible. Therefore, for the very acceptance of the idea of an over-all plan, I plead that we must preserve the human initiative.

I hope to be excused if I have treaded on points perhaps beyond a review of our work. But in looking back to the year which is past, my mind naturally is also looking a little bit forward to the future. I thank you all.

SPEECH BY SIR RONALD A. FISHER, F.R.S., Sc.D.

(Professor of Genetics, University of Cambridge, United Kingdom)

It is now seventeen years since I first came to India as guest of the Statistical Institute. At that time, as many of you will remember, the Institute was or seemed to be but a small excrescence or appendage of Presidency College, Calcutta ; it was at least a Calcutta Institute, rather than, as it manifestly is now, an Indian, an all-Indian Institute; and morally and intellectually I have no hesitation in saying already a World Institute.

In those early days, Professor Mahalanobis was a Professor of Physics, but he was no ordinary Professor of Physics. Instead of doing his duty and teaching his students only that science and technology which has led to the atomic bomb, he thought that he could serve his fellow men better by opening the door to knowledge, obtained by statistical means, to knowledge of the natural world and knowledge of the world of society in which we all find ourselves. Perhaps, he thought, as many of us think, that most of the follies and crimes of governments are due to ignorance— ignorance of the people they serve, and the ignorance of the people whom they are all too willing to fight.

At any rate, it was for the programme of understanding the Indian situation by the development of sample survey that Professor Mahalanobis will be honoured and later

remembered throughout the world, he being the primary pioneer of this most vital development. And so it is more than a pleasure, and with much emotion, that I see this sapling of the early days, now one of the material props of the Central Government of this subcontinent.

And I sincerely hope that what the Professor said just now when he used the word 'initiative' will be taken to heart by the Government. I wanted to call your attention to the splendid initiative which Professor has taken throughout these years, putting forward enterprising scheme after enterprising scheme to develop the Institute and its multifarious activities. He is the last man in the world who would allow himself to be tied up or immobilized by red tape, so that I can see it is a serious problem for any government department to consider just how they are to finance him. I only hope that they may find the way.

SPEECH BY DR. WALTER A. SHEWHART

(Bell Laboratories, United States of America)

It is with great pleasure that Mrs. Shewhart and I return to India, after seven years. During this time the Institute has made a remarkable growth in size and service to India. With this growth, it has retained the feeling of good comradeship among its workers, even though its personnel has become international. This has been accomplished under the direction of Professor Mahalanobis, a man of outstanding ability, vision and leadership.

Sir Chintaman Deshmukh, Professor Mahalanobis and Mrs. Mahalanobis with their co-workers are to be congratulated on their achievement— an Institute any country would be proud of. May it continue to grow and to serve India.

PEECH BY PROFESSOR I. Y. PISAREV*

(Institute of Economics, Moscow, U.S.S.R.)

We, the Soviet Scientists, arrived in India at the invitation of the Indian Statistical Institute to share our own experience in the field of statistics and planned economy. We shall consider our goal fulfilled if economists and statisticians of India can profit by our experience to the extent they find useful for them. Making our acquaintance with the work carried out by the Institute, we have found a lot of things which are instructive and useful to ourselves.

Today is a very significant date in the life of the Institute. We have gathered here to celebrate the 23rd Anniversary of the Institute. The Indian Statistical Institute, headed by Prof. Mahalanobis, has done a lot to develop the statistical science in India and we are sure it has made valuable contribution to the statistical science all over the world. Now the Institute is facing new and great problems. The research work started by the Institute in the field of economics is to be intensified. We wish the Institute to gain every success and obtain fruitful results in this field.

We consider that the ties between the Soviet and Indian scientists should develop and become stronger.

It is desirable that the friendly relations between our great peoples, peoples of India and the Soviet Union, should be promoted and strengthened.

*Translated from original speech in Russian.

In the end I should like to say that the Indian Statistical Institute has done a great service in promoting and strengthening friendly ties between the Indian and the Soviet scientists.

Telegraphic Greetings from the USSR Academy of Sciences, Moscow, to Professor Mahalanobis

On the occasion of Twentythird Anniversary of Indian Statistical Institute let me congratulate you and your staff on significant date and to wish further success in your work.

Topchiev, Chief Scientific Secretary, USSR Academy of Sciences

SPEECH BY PROFESSOR CHARLES BETTELHEIM

(National School of Administration, Paris)

It is a pleasure for me to have the opportunity of expressing how glad I am to be in India and in the Indian Statistical Institute for the second time. Last year, we came on the 18th December and so we did not enjoy the pleasure of participating in the same function as this year.

In order to express in a few words what appears to me as the main difference between my experience in the Indian Statistical Institute last year and this year, I would say that I feel my last experience as a pure Indian experience, while I feel my experience of this year as an international one. As you know many foreign statisticians, mathematicians and economists are presently staying in the Indian Statistical Institute and almost every day we have some interesting discussions. I have even the feeling that the Institute is, at the moment, one of the most interesting places in the world, because of the opportunity it gives to people from so many different countries to learn to know each other and to learn from each other.

The Institute, owing to the initiative of Professor Mahalanobis, is a living example of international intellectual cooperation, one of the most important forms of international cooperation. This international experience is, of course, an Indian experience too. It is an Indian experience not only because it is occurring in India or because so many Indian statisticians, mathematicians and economists are participating in the work, but also because, at every moment, we feel the incomparable charm of Indian hospitality, a hospitality which has the power of giving us the feeling of being at home even when we are so far away from our own country. It is for all these reasons that we enjoy so much our work here and our stay in India.

SPEECH BY DR. R. M. GOODWIN, PH.D.

(University of Cambridge, U.K.)

We came from far off; we came here not knowing what to expect. We have been given important and very interesting work to do by Professor Mahalanobis. We have been given good conditions to live in and we are happy here largely due to Mrs. Mahalanobis. The combination of these two, I think, is very favourable for the work we are doing.

Speaking for myself, I feel it is a privilege to take part in the very great work which India is about to undertake to change her conditions of economic and social existence and make a modern nation of herself. I myself am working with a group in the Institute on

the economic structure of India; we are attempting to construct a statistical picture of that structure. This work, I hope, will be important and useful in this great effort of economic planning—the effort to take her future in her own hands and to determine what she wants that future to be.

SPEECH BY MR. G. TAGUCHI

(Electric Communication Laboratory, Tokyo, Japan)

I would like to express my great pleasure of having the opportunity to work here in India together with Professor Mahalanobis and so many other scientists of the world. I do hope to be able to contribute my modest share in the great work undertaken by the Indian Statistical Institute. I am very glad to be forced to speak here a few words in spite of the fact that I can't speak English well, even as in Japan it is a courtesy that the guest is forced to drink wine although he does not drink wine.

SPEECH BY PROFESSOR RAGNAR FRISCH

(University of Oslo, Norway)

I hope you will forgive me for striking a personal note in what I have to say.

I have never been able to work up any enthusiasm for books or articles describing travelling in foreign countries. They have always bored me immensely. In my very young days, however, I noticed to my surprise, that there was one exception : accounts of travelling in India. I also discovered another thing which I could not explain in any rational way. I found particular satisfaction in reading the poetry of Rabindra Nath Tagore which had been translated into Swedish, a language that we, Norwegians, read easily.

Later, in my more mature age, I found new examples of this unexplainable affinity to the Indian way of thinking. It came through contacts with outstanding representatives of India which I had the good fortune to meet when working in the United Nations Organization. In spite of the material differences in the conditions of India and my own country I always felt that there was something fundamental in the outlook which we had in common.

One little event is so characteristic of this that I must relate it. Some years ago, Professor Mahalanobis gave a lecture in Oslo to our economics students. He kept them spell-bound for an hour and a half talking about economic problems in India and the way they handled the National Sample Survey. After the lecture when Mahalanobis and I and some other Faculty Members had an informal gathering I had a slip passed on to me from four or five students asking me to find out whether it would be possible to conclude an arrangement so that these students could come to India to work.

Some years later, when Professor Mahalanobis asked me to come as a United Nations Expert to help in the economic and statistical planning work in India, I had several doubts of a practical sort, but so far as the task itself was concerned it filled my heart immediately and completely. I think that most scientists, and perhaps economists in particular, have one experience in common. Although they may find great satisfaction in solving a particular problem say, a mathematical problem—an intellectual satisfaction in the solution for its own sake—they feel that this satisfaction is *nothing* as compared to the inner joy they feel when they know that their efforts have contributed something, however little, to eliminating the sufferings of man. In the end this is the only thing that can give a lasting satisfaction. This was the spirit in which I joined in the work for a better India.

During my weeks here I have tried to rationalize and explain this surprising affinity which I have always, since my green youth, felt towards the Indian way of thinking. And this morning it suddenly dawned upon me that an explanation exists. It is something exceedingly simple but absolutely fundamental in the economic and political situation of our time.

The key is in the simple yet penetrating idea which your Prime Minister Nehru expressed in a speech reported in this morning's newspapers. Referring to the way in which India had won its independence and the way in which it is now working towards the banishment of poverty, illiteracy, ill-health and malnutrition, he said : "The soil of this country is very peculiar. *In this soil nothing will take root if it is not peacefully planted.*"

This undoubtedly is the key which explains why I, and in a general way, so many Norwegians, feel that the people of India and we have a basic common attitude towards the problems of our time.

Your Prime Minister also specified what is needed now in India : hard thinking and hard work. Both are equally necessary. I cannot imagine any other five words which are more characteristic of the soul and spirit of this great Institution whose anniversary we are celebrating, than just these : hard thinking and hard work. May that always be its soul and spirit.

ADDRESS BY THE PRESIDENT, SHRI C. D. DESHMUKH

Distinguished visitors, visiting scientists, my colleagues and co-workers, ladies and gentlemen,

You have heard Professor Mahalanobis refer to my translation to a position of functionless dignity. I propose to signalise this by contenting myself, more or less, with conducting the proceedings of this meeting. But it was not only for that reason that I suggested that our distinguished scientists should address a few words to us; I thought it only proper that we should hear and listen to, with respect and attention, the observations of this array of scientists which has come here to collaborate in our research and to give us words of appreciation and encouragement. On behalf of the Institute, I cannot thank them enough for their generosity. I am sure you will have realized that theirs is a labour of love and that by no other force, not even money, could you have collected together this galaxy of international talent that you see here today. I do not know if you are aware, that this place is called "Amrapali", that is to say, a mango-grove. I like to think that here in this Institute with its international collaboration, both in the way of experts and trainees, we have the latest version of our old 'Ashramas' or hermitages and I am quite certain that throughout the corridors of history this particular 'Ashrama' could not have been better.

I said that I will content myself with only conducting the proceedings of the meeting, but there are one or two matters which have been referred to with which, I think, I should deal. One is this : the question of the implementation of the announcement that I made last year. I said that the Government of India have decided that the Indian Statistical Institute should be developed as the focal centre for professional training and research on the same lines as higher technological Institutes and be given powers to award diplomas of professional training and qualification, and selected officers from Ministries should be trained in statistical work in the Institute for a suitable period. The question of the Institute being given power to confer degrees would be considered later when the Institute is fully developed. However, I quote, 'I should say that within a measurable period this

decision will be implemented'. Alas, for the tardy progress of some parts of our plan we have yet to complete that period in order that we may be able to measure it. But, as Professor Mahalanobis has told you, the principle has been accepted, and it is only a few matters of detail, albeit important, which are holding us up and which I have no doubt will soon be resolved.

Dealing with the particular matter of pocket-money to which he referred, although I observe that is a characteristic and a vestige of unplanned parenthood, I do concede that something of that nature would be, in principle, again fully justified. I accept everything that he says about the undesirability of any kind of rigidity in a living organism such as a developing nation. In other words, we will all agree that we should plan in a dynamic, and not in a static—although certainly statistical—way. Therefore, I believe that this small matter of some kind of unplanned discretion within the confines of a plan can be settled perhaps to the satisfaction of both Professor Mahalanobis and the Finance Minister on whose behalf I am speaking here— as President of the Institute, I mean.

Now, I shall not deal with the other matters to which Professor Mahalanobis has referred in his review except that, again, apart from employment, there are certain other broad objectives which Government have set before themselves by way of the plan, that is, for instance, the objective of doubling the national income by 1971. And it may be that the means to choose both the objectives, namely, the gradual elimination of unemployment and the establishment of full employment as well as the doubling of the national income would probably be identical. In other words, I am hoping that as a result of the studies, most fascinating studies, that are being conducted here, we shall be presented with certain practicable models out of which we can select a model according to our own conception of our administrative, political and generally implementing capacity. Therefore, we shall all be looking forward with the liveliest interest to the result of the studies that are being conducted here.

We started somewhat cautiously, almost haltingly, and we did not hesitate to label our first five year plan as a preparatory plan. We can no longer go on doing so, and it is time that we started to plan on a really comprehensive basis, within the four corners of the form of Government that we have chosen for ourselves, namely, parliamentary democracy. Now that has its own limitations: there are prices to pay for certain values. Nevertheless, I feel that, by and large, we shall be able to adopt some sort of practicable model which will help us to approach nearer and nearer, through a series of plans, that clear objective which I have just mentioned.

I should also like to extend my welcome to the trainees who have come here to the International Statistical Education Centre. I hope that they have benefited from their presence here, and that they will go back to their respective countries to swell the freemasonry of fact-finders for an international endeavour to raise the standards of living by those key means to which Dr. Frisch referred— peaceful planning, involving hard thinking and hard work.

Planning is an exacting as well as an exciting adventure and everybody has a part to play in it. But, I am quite certain that no one has a more important part to play than the statistician. I have no doubt, however, that they will be more than equal to their responsibilities. There is a saying that nothing succeeds like success ; I should like to say that nothing sticks like statistics, and with that I wish more power to all their calculus. Thank you.

Appendix B

STUDIES RELATING TO PLANNING FOR NATIONAL DEVELOPMENT

The Indian Statistical Institute has been asked by the Planning Commission to take up, in collaboration with the Central Statistical Organization, studies relating to planning for national development.

The work of the Institute is being reorganized and oriented to proceed with these studies. A Programme Committee would decide the general lines of work and set up priorities. The Project Execution Committee will ensure that the work is being done in accordance with the plan. The following twelve research units are being set up for the present.

The purpose of research in statistics and other applied sciences is to promote national development and human welfare. We are glad to have this opportunity to link our work with national planning in India. We are fortunate in having with us many friends from overseas actively participating in our work. It is, above all, a great privilege and an encouragement to have our work inaugurated by Jawaharlal Nehru.

P. C. MAHALANOBIS

Calcutta, 3 November 1954

PROGRAMME COMMITTEE

P. C. Mahalanobis, J. M. Sen Gupta, D. B. Lahiri, N. C. Ghosh, A. Das Gupta, C. R. Rao, P. B. Patnaik, T. Chaudhuri, N. Chakravarti, B. Ramamurti and M. Mukherjee (CSO), Pitambar Pant, Ragnar Frisch, Ch. Bettelheim, R. M. Goodwin

PROJECT EXECUTION COMMITTEE

P. C. Mahalanobis, J. M. Sen Gupta, C. R. Rao, Pitambar Pant, M. Mukherjee (Secretary)

1. Growth Models

Programme : Ch. Bettelheim, R. M. Goodwin, M. Mukherjee, C. R. Rao
Members : Pranbandhu Das, Chidambaram Iyer, A Quayum, A. Rudra (Secretary)
Associates : D. B. Basu, T. Choudhuri, I. Chakravarti, G. Kallianpur, R G. Laha, J. Roy

2. Parameters of Growth Models

Programme : Ch. Bettelheim, M. Mukherjee, J. M. Sen Gupta
Members : Sudhir Bhattacharyya, Sashi Chakravarti, Surapati Chakravarti, A. Mahalanobis, Ravi Kumar, A Roy, G. R. Vernwal, K. G. C. Nair (Secretary)

3. Inter-Industry Relations

Programme : T. Chaudhuri, R. M. Goodwin, N. C. Ghosh.
Members : H. P. Biswas, Ashish Chakravarti, Prasanta Choudhury, Amiya Das Gupta. Kalpana Joshi, Samar Mitra, D. V. R. Murti, B. R. Panesar, Sunit Sinha, I. Chakravarti (Secretary)

4. Manufacturing Industries

Programme : N. C. Ghosh, M. Mukherjee
Members : Ram Lingam Iyer, Kalpana Joshi, Sitangshu Bhattacharyya (Secretary)

5. Production Capacity

Programme : Ch. Bettelheim
Members : Probir Das, A. Haldar, E. Löbel (Secretary)

6. Consumption Studies

Programme : D. B. Lahiri, M. Mukherjee, P. B. Patnaik
Members : Shyam Bose, I. Chakravarti, Sukomal Das, A. Ganguli, R. G. Laha, B. K Panesar, J. Roy (Secretary)

7. Population Studies

Programme : D. B. Lahiri, A. Das Gupta
Members : D. Basu, S. J. Poti, B. N. Sarkar, Dhiren Sarkar, Prasun Sen, Ranjan Som (Secretary)

8. Employment and Unemployment

Programme : N. Chakravarti, A. Das Gupta, N. Ghosh
Members : Ashok Rudra, Prasun Sen, Ranjan Som, H. K. Chaturvedi (Secretary)

9. Land Utilization

Programme : N. C. Chakravarti, J. M. Sen Gupta
Members : Haribhajan Choudhury, R. P. Saha, S. Raja Rao (Secretary)

10. Validity of NSS Data

Programme : D. B. Lahiri, C. R. Rao, J. N. Sen Gupta
Members : Saibal Banerjee, Des Raj, Sambhu Halder, Samar Mitra, S. J. Poti (Secretary)
Associates : D. B. Basu, T. Chaudhuri, I. Chakravarti, Naresh Dutta, G. Kallianpur, A. Matthai, A Rudra, R. G. Laha, J. Roy

11. Interaction between Planned and Unplanned Sectors

Programme : N. C. Ghosh, A. Das Gupta, M. Mukherjee
Members : Sudhir Bhattacharyya, Ashok Rudra, Ranjan Som, Kesav Dutta (Secretary)

12. Field Survey (Unemployment)

Research Unit Nos. 8 and 11 jointly.

Appendix C

PROCEEDINGS OF THE SPECIAL GENERAL MEETING OF THE INDIAN STATISTICAL INSTITUTE : 3 SEPTEMBER 1954

A Special General Meeting of the Institute was held at 5-30 p.m. on Friday, 3 September, 1954 at the city office of the Institute at 9B Esplanade East, Calcutta-1.

Present : Dr. P. N. Banerjea, Vice-President, in the chair. Sri M. N. Banerjee, Sri S. S. Bose, Sri Indubhusan Chatterjee, Sri P. K. Chatterjee, Sri K. N. Chakravarti, Sri Pankoj K. Dey, Sri N. C. Ghosh, Sri Sambhu N. Halder, Sri B. N. Pandey, Sri Pitambar Pant, Sri S. Raja Rao, Sri Rajen Roy, Sri J. M. Sen, Sri J. M. Sengupta, Sri Satasiv Sengupta, Sri S. C. Sen and Sri N. C. Chakravarti (Joint Secretaries).

1. Sri N. C. Chakravarti, Joint Secretary, reported that owing to development of the Institute since the existing rules were framed it has been found necessary to make some changes therein. The Council after careful consideration had proposed some changes in this respect. These proposals had been circulated to all members of the Institute under Notice dated 22 May 1954. He explained the reasons necessitating the suggested changes in rules and proposed that as required under Rule 14 of the rules of the Institute these changes be approved by the meeting. Sri J. M. Sen seconded the proposal.

It was unanimously resolved that the changes proposed in the existing rules of the Institute as reproduced below, be adopted.

CHANGES

"(1) After existing rule (c), the following sub-rule shall be inserted :—

"(d) A person who has rendered distinguished services to the Institute may be elected as President or Vice-President of the Institute.

Such election shall be made at a General Meeting of the Indian Statistical Institute on the nomination by a two-thirds majority of the Council for such period as the Council may determine.

The President and the Vice-Presidents, if any, shall enjoy all privileges of membership and shall not be required to pay any fees or subscription but shall not be office-bearers of the Institute.

The President or, in his absence, a Vice-President shall preside at all general meetings of the Institute at which he may be present."

(2) The words "President" and "Vice-President" wherever they occur in the existing rules, shall be substituted by the words "Chairman" and "Vice-Chairman" respectively.

(3) In existing rule 5(a), the following words shall be inserted after the words "the Institute"—

"which is not attended by the President and of"

(4) The present rule 5(c) shall be substituted by the following :—

"(c) The Treasurer shall be the official custodian of all funds belonging to the Institute."

(5) In rule 5(d), a comma shall be placed after the words "legal transactions" and the following shall be inserted thereafter :—

"shall receive and disburse all funds of the Institute".

(6) After existing rule 6(c), the following shall be inserted :—

"(d) The Chairman and the Secretary of each local branch of the Institute".

(7) Existing rule 11 shall be substituted by the following :—

"11 (a) All properties belonging to the Institute and all banking accounts, documents, securities etc., shall stand in the name of the Institute.

(b) All banking accounts and securities shall be operated on by the Treasurer or the Secretary of the Institute or by any two or more persons at least one of whom must be a member of the Council, who may be authorised to do so by the Council."

(8) The amendments noted under items (1), (2) and (3) shall take effect from the time of taking of office by office-bearers and the Council elected for the 1954-55 session but the election of Chairman and Vice-Chairman for that session shall be arranged on the basis of the revised rules."

2. Sri N. C. Chakravarti reported that these changes, as now adopted by the General Meeting, would in due course be placed before a second General Meeting of the Institute for confirmation as required under rules.

P. N. BANERJEA
Chairman

N. C. CHAKRAVARTI
Joint Secretary.

PROCEEDINGS OF THE SPECIAL GENERAL MEETING OF THE INDIAN STATISTICAL INSTITUTE : 21 SEPTEMBER 1954

A Special General Meeting of the Institute was held at 5-30 p.m. on Tuesday, 21 September 1954 at the city office of the Institute at 9B, Esplanade East, Calcutta-1.

Present : Sri J. M. Sen, in the chair, Sri M. N. Banerjee, Sri S. S. Bose, Sri K. N. Chakravarti, Sri I. Chatterjee, Sri Pankaj K. Dey, Sri A. Ganguly, Sri Mohan Lal Ganguli, Sri N. C. Ghosh, Sri S. N. Halder, Sri B. N. Pandey, Sri K. C. Poddar, Sri S. Raja Rao, Sri Rajen Ray, Sri J. M. Sengupta, Sri S. Sengupta, Sri S. C. Sen and Sri N. C. Chakravarti (Joint Secretaries).

1. Sri N. C. Chakravarti, Joint Secretary, reported that the certain proposed changes in the existing rules of the Institute, had, as required under Rule 14 of the Rules of the Institute, been circulated to all members of the Institute on 22 May 1954 and were unanimously adopted at a Special General Meeting of the Institute held on 3 September 1954. He also pointed out that, according to rules of the Institute, these changes have to be confirmed by a subsequent General Meeting of the Institute. He accordingly proposed that the proposed changes be approved by the present meeting. Sri Chakravarti also explained to the meeting the need for making such changes.

The proposal was seconded by Sri S. C. Sen.

2. It was resolved unanimously that the following changes in the rules of the Indian Statistical Institute, already adopted by General Meeting on 3 September 1954, be confirmed.

"(1) After existing rule (c), the following sub-rules shall be inserted :—

"(d) A person who has rendered distinguished services to the Institute may be elected as President or Vice-President of the Institute.

Such election shall be made at a General Meeting of the Indian Statistical Institute on the nomination by a two-thirds majority of the Council for such period as the Council may determine.

The President and the Vice-Presidents, if any, shall enjoy all privileges of membership and shall not be required to pay any fees or subscription but shall not be office-bearers of the Institute.

The President or, in his absence, a Vice-President shall preside at all general meetings of the Institute at which he may be present."

(2) The words "President" and "Vice-President" wherever they occur in the existing rules, shall be substituted by the words "Chairman" and "Vice-Chairman" respectively.

(3) In existing rule 5 (a), the following words shall be inserted after the words "the Institute"—

"which is not attended by the President and of"

(4) The present rule 5 (c) shall be substituted by the following :—

"(c) The Treasurer shall be the official custodian of all funds belonging to the Institute."

(5) In rule 5(d), a comma shall be placed after the words "legal transactions" and the following shall be inserted thereafter :—

"shall receive and disburse all funds of the Institute."

(6) After existing rule 8(c), the following shall be inserted :—

"(d) The Chairman and the Secretary of each local branch of the Institute."

(7) Existing rule 11 shall be substituted by the following :—

"11 (a) All properties belonging to the Institute and all banking accounts, documents, securities etc., shall stand in the name of the Institute.

(b) All banking accounts and securities shall be operated on by the Treasurer or the Secretary of the Institute or by any two or more persons at least one of whom must be a member of the Council, who may be authorised to do so by the Council."

(8) The amendments noted under items (1), (2) and (3) shall take effect from the time of taking of office by office-bearers and the Council elected for the 1954–55 session but the election of Chairman and Vice-Chairman for that session shall be arranged on the basis of the revised rules."

J. M. SEN,
Chairman.

N. C. CHAKRAVARTI,
Joint Secretary.

INDIAN STATISTICAL INSTITUTE

PROCEEDINGS OF THE TWENTY SECOND ANNUAL GENERAL MEETING OF THE INDIAN STATISTICAL INSTITUTE : 30th OCTOBER 1954

The annual general meeting of the Indian Statistical Institute was held at 3 p.m. on Saturday, the 30th October 1954 at the City Office of the Institute, 9B Esplanade East, Caloutta.

Present : Dr. S. K. Banerji, Vice President, in the chair. Sri Mahendra Nath Banerjee, Sm. Chameli Bose. Sri Shyamsundar Bose, Sri K. N. Chakravarti, Sri Nistaran Chakravarti, Sri Indubhusan Chatterjee, Sri P. K. Chatterjee, Sri Pankaj Kumar De. Sri Amalendu Ganguly, Sri D. M. Ganguly. Sri Nanigopal Ganguly, Sri Sambhunath Halder, Dr. Rabindranath Maitra, Sri Mohi Mohan Mukherjee, Sri Pitambar Pant, Dr. P. B. Patnaik, Sri K. C. Poddar, Sri S. Raja Rao, Sri Rajen Roy, Sri J. M. Sen, Sri S. C. Sen and Sri N. C. Chakravarti (Joint Secretaries).

1. *Annual Report and Audited Account :* Sri N. C. Chakravarti, Joint Secretary, in presenting the draft Annual Report and Audited Statement of Accounts apologised for the delay in circulating the papers. He explained the salient features of the Report and the Statement of Accounts.

Sri Nistaran Chakravarti enquired whether any statement of assets and liabilities had been prepared as had been recommended by the Council at his suggestion.

Sri N. C. Chakravarti replied that a statement had been prepared as at the end of 1951–52 and is available for inspection by members in the Institute Office.

The Chairman then invited comments on the Draft Annual Report and Audited Statement of Accounts from the members. As none of the members present offered any comments, the Annual Report and Audited Statement of Accounts for the year 1953–54 were unanimously adopted subject to drafting changes in the report at the time of publication.

2. *Election of Office-bearers and the Members of the Council :* The Chairman stated that in accordance with the Bye-laws of the Institute relating to elections, recommendations of the Council had been circulated to members and the members were invited to make alternative nominations if so desired. As no alternative nominations had been received the Chairman declared the persons named below as duly elected as Office-bearers and members of the Council for the session 1954–55. (as in Appendix I).

2.1. The Chairman also invited attention of the members to the recent changes made in the Rules of the Institute in accordance with which the designation of the President and Vice-Presidents among Office-bearers had been changed to Chairman and Vice-Chairman but the Institute would continue to have a President and some Vice-Presidents to be elected on the nomination of the Council in accordance with the new rules. The Council had already circulated their recommendations on the subject, suggesting the election of Sri C. D. Deshmukh as President and Dr. P. N. Banerjea, Professor D. R. Gadgil and Sir Shri Ram as Vice-Presidents of the Institute for the ensuring year. All the members present agreed to the proposals of the Council in this respect.

Resolved that Sri C. D. Deshmukh be elected as President of the Institute and Dr. P. N. Banerjea, Professor D. R. Gadgil and Sir Shri Ram be elected as Vice-Presidents of the Institute for 1954–55.

3. *Appointment of Auditors :* Resolved that Messrs. P. C. Nandi & Co., Chartered Accountants, who had been Auditors of the Institute for the last few years be appointed Auditors of the Institute for the year 1954–55 on such remuneration as may be decided by the Council.

Proposed by—Sri N. C. Chakravarti
Seconded by—Sri Nistaran Chakravarti.

4. *Miscellaneous :*

4.1. The meeting placed on record their appreciation of the work done and services rendered to the Institute by the retiring office-bearers and members of the Council.

4.2. Sri N. C. Chakravarti, Joint Secretary, reported to the meeting certain recent developments of the Institute retarding expansion of the work under the Statistical Quality Control and Operational Research Units and other sectors. He also referred to the impending visit of the Prime Minister, Pandit Jawaharlal Nehru, to the Institute on the 3rd November 1954.

4.3. The meeting terminated with vote of thanks to the chairman.

N. C. CHAKRAVARTI,
Joint Secretary.

S. K. BANERJI,
Chairman.

Appendix I

MEMBERS OF THE COUNCIL, 1954-55

President: The Hon'ble Sri C. D. Deshmukh
Vice-Presidents: Dr. P. N. Banerjea, Prof. D. R. Gadgil, Sir Shri Ram
Chairman: Sri B. Rama Rau
Vice-Chairmen: Dr. S. K. Banerjee, Prof. S. N. Bose, Sri K. P. Goenka, Sir D. N. Mitra
Treasurer: Dr. Satya Churn Law
Secretary: Professor P. C. Mahalanobis
Joint Secretary: Sri Nihar Chandra Chakravarti and Sri S. C. Sen
Members: Srimati Chameli Bose, Prof. K. N. Chakravarti, Sri Nistaran Chakravarti, Sri Mohanlal Ganguli, Prof. H. C. Ghosh, Sri Nimai Charan Ghosh, Prof. D. G. Karve, Prof. K. B. Madhava, Srimati Nirmal Kumari Mahalanobis, Sri K. C. Mahindra, Sri N. T. Mathew, Dr. U. S. Nair, Sri Pitambar Pant, Prof. P. B. Patnaik, Dr. B. Ramamurti, Dr. C. R. Rao, Sri S. C. Ray, Dr. N. Sundararama Sastry, Sri J. M. Sen, Sri Sadasiv Sengupta.

Appendix II

GOVERNING BODY OF THE RESEARCH AND TRAINING SCHOOL, 1954-55

Sri B. Rama Rau (*Chairman, ex-officio*), Prof. P.C. Mahalanobis (*Secretary, ex-officio*), Sri C. V. Narasimhan and Sri Bali Ram Bhagat (*Representatives of Government of India*), Dr. N. Sundararama Sastry (*Reserve Bank of India*), Dr. U.S. Nair (*Inter-University Board*), Mr. J. A. R. Tainsh (*Associated Chambers of Commerce*), Sri D. N. Mukherjee (*Federation of of Indian Chambers of Commerce and Industry*). Dr. P. V. Krishna Iyer (*National Institute of Sciences of India*), Dr. J. P. Niyogi (*Indian Economic Association*), Sir Shri Ram, Dr. S. K. Banerjee, Prof. S. N. Bose, Prof. K. B. Madhava, Sri Nihar Chandra Chakravarti, Sir D. N. Mitra and Dr. C. R. Rao (*Representatives of Indian Statistical Institute*), Registrar, Indian Statistical Institute (*Ex-officio*).

FINANCE COMMITTEE OF THE GOVERNING BODY, 1954-55

Sri B. Rama Rau (*Chairman, ex-officio*), Prof. P. C. Mahalanobis (*Secretary, ex-officio*), Sri C. V. Narasimhan and Sri S. Jayasankar (*Representatives of Government of India*), Dr. N. Sundararama Sastry (*Representative of Reserve Bank of India*), Mr. J. A. R. Tainsh and Sri Nihar Chandra Chakravarti (*Members of the Governing Body*), Director of Research & Training School (*Ex-officio*).

Appendix III

COMMITTEES SET UP BY THE COUNCIL, 1954-55

Finance Committee:

Sri B. Rama Rau (*Chairman*), Sri Satya Churn Law (*Treasurer*), Prof. P. C. Mahalanobis (*Secretary*), Sri K. N. Chakravarti, Sri Nihar Chandra Chakravarti, Sri Mohanlal Ganguli, Sri S. C. Ray, Sri J. M. Sen, Sri S. C. Sen (*Convener*).

Journal Committee:

Prof. S. N. Bose, Sri Debabrata Basu, Dr. G. Kallianpur, Sri Debabrata Lahiri, Prof. K. B. Madhava (*Madras*), Prof. P. C. Mahalanobis, Sri Moni Mukherjee (*Delhi*), Dr. U. S. Nair (*Travancore*), Sri Pitambar Pant (*Delhi*), Dr. B. Ramamurti (*Delhi*), Dr. C. R. Rao, Dr. P. B. Patnaik and Dr. N. Sundararama Sastry (*Bombay*). Sri A. Mahalanobis to act as Secretary of the Committee.

Examination Committee:

Dr. N. Sundararama Sastry (*Bombay*), Dr. V. M. Dandekar (*Poona*), Sri Nistaran Chakravarti, Prof. P. C. Mahalanobis, Sri Mohanlal Ganguli, Sri Nimai Charan Ghosh, Sri K. N. Chakravarti, Sri A. Mathai, Sri Pitambar Pant (*Delhi*), Dr. B. Ramamurti (*Delhi*), Sri Nihar Chandra Chakravarti, Dr. C. R. Rao, Sri S. Raja Rao, Sri J. M. Sengupta, Sri Sadasiv Sengupta and Dr. S. K. Banerjee and Dr. U. S. Nair (*Representatives of the Governing Body*).

Appendix IV

OFFICE BEARERS AND COUNCIL OF BOMBAY BRANCH, 1954–55

President : Shri V. L. Mehta
Vice-Presidents : Prof. C. N. Vakil, Shri R. G. Saraiya, Shri L. S. Vaidyanathan, Dr. N. S. R. Sastry
Joint Secretary : Shri K. C. Cheriyan and Dr. K. S. Rao
Treasurer : Dr. D. T. Ladkawalla
Members of the Council : Dr. R. L. N. Aiyangar, Prof. M. C. Chakravarti, Shri V. V. Divatia, Shri H. T. Parekh, Shri A. S. Palekar

Appendix V

OFFICE BEARERS AND COUNCIL OF MYSORE STATE BRANCH 1954–55

Members of the Executive Committee—

President : Shri R. Natarajan
Vice-President : Professor S. K. Ekambaram
Secretary : Professor Srinagabhushana
Hony. Treasurer : Shri R. Ramaswami
Members : Shri A. Ananthapadmanabha Rao, Shri R. Gururaja Rao, Shri Ravi L. Kirloskar, Shri S. K. Rana, Shri H. S. Narayana Rao, Shri R. Suryanarayana Rao, Shri A. Venkatarao Telang, Shri M. C. Satyanarayana Rao

Appendix VI

LIST OF PAPERS COMPLETED DURING 1954-55

(A) *Theoretical*

BASU, D.

1. An inconsistency of the method of maximum likelihood, *Ann. Math. Stat.* March 1955.
2. A note on the theory of unbiased estimation, *Ann. Math. Stat.* June 1955.
3. On statistics independent of a complete sufficient statistics (submitted to *Sankhyā*).
4. The concept of asymptotic efficiency (submitted to *Sankhyā*).
5. A note on mapping probability spaces, *Vestnik Leningradskogo Universiteta* (in press).
6. A note on a stochastic model constructed by V. M. Dandekar, *Sankhyā* (in press).

CHAKRAVARTI, INDRAMOHAN

7. Canonical and partial canonical correlations, *Cal. Stat. Assoc. Bull.* Vol. 5.
8. A note on error of elasticity coefficients (in press).

CHATTERJEE, S.

9. Effect of long time interval on Dr. Philpott's oscillation ratio.
10. Analysis of records of the Word Association Test (English).
11. Hindi Word Association Test (Pilot Study).

DASGUPTA, B.

12. (With Rev. Charles Riddle) The relationship between Cattell's 'Culture-Free Test' and 'High School Final' marks in the Punjab (I).

DES RAJ

13. On sampling with probabilities proportionate to size, *Ganita*, Vol. 5 (in press).
14. On the method of overlapping maps in sample surveys, *Sankhyā* (in press).
15. A note on the determination of optimum probabilities in sampling without replacement, *Sankhyā* (in press).
16. Contributions to sampling theory (D. Phil. thesis submitted to the Calcutta University).

HALDANE, J. B. S.

17. Methods for the biometry of animal behaviour.

HARPER, A. E. (Jr.)

18. The essence of personal counselling.
19. (With Dr. J. Edwards) Experimental psychology workbook (a book).
20. Projecting school populations: A. population statistics: Major trends, B. Some sources of confusion in population and enrolment statistics and projections.

KALLIANPUR, G.

21. (With R. P. Pakshirajan) The central limit theorem for m-dependent random variables. *Vestnik Leningradskogo Universiteta* (in press).
22. Two dimensional Polya random walk (in press).
23. (With C. R. Rao): On some properties of maximum likelihood estimates.

KUDO, A.

24. Confidence interval for the extreme observations in a second sample based on the information of the first sample (in press).
25. Some generalisation of the tetra-choric correlation applicable to a two-way classification with three classes for each (in press).
26. On the distribution of a statistic relating to the testing of outlying observations (in press).

LAHA, R. G.

27. On a property of the Normal and Gamma distributions. *Proc. Amer. Math. Soc.* (in press).
28. On a characterisation of the stable law with finite expectation. *Ann. Math. Stat.* (in press).
29. On the stochastic independence of the mean and a homogeneous quadratic statistic *Vestnik Leningradskogo Universiteta* (in press).
30. On the characterisation of factors in the bifactor theory of Spearman (in press).
31. On the stochastic independence of two second degree polynomial statistics in normally distributed variates (in press).

MATTHAI, A.

32. The planning of sampling investigations in statistical quality control and sample surveys (Thesis submitted to the Calcutta University for D. Phil. degree).
33. Single sampling acceptance plan for gauging (submitted to the SQC Conference, Calcutta).

PAKSHIRAJAN, R. P.

34. (With G. Kallianpur) Two dimensional Polya random walk (in press.).

PATNAIK, P. B.

35. A non-parametric test for two samples based on empirical distribution functions.
36. Further uses of non-central range.
37. Precision of the estimates of components of variance.
38. Application of range methods to bivariate distributions.

PAUL, E. M.

39. The structure of measurable sets in function spaces.
40. On measure-preserving transformations generated by stationary stochastic processes.

RAO, C. R.

41. Estimation and tests of significance in factor analysis, *Psychometrika*, June 1955.
42. The theory of estimation by minimum chi-square (submitted to *Int. Stat. Conference*, 1955).
43. Analysis of dispersion for multiply classified data with unequal numbers in cells (in press).
44. (With G. Kallianpur) On some properties of the maximum likelihood estimates (in press).

ROY, J.

45. On some problems in multivariate analysis (Thesis for the D. Phil. degree submitted to the University of Calcutta).
46. Quality control by gauging—(Read before the Indian Science Congress, Baroda, 1955).
47. On some quick decision methods in univariate and multivariate analysis.

ROY, S. K.

48. Distribution of chloride concentration in urine.

RUDRA, A.

49. A critical survey of some test methods in time series analysis. *Cal. Stat. Assoc. Bull.* Vol. 5, No. 2.

(B) *Economic Planning*

BETTELHEIM, C.

1. Scheme of a model of reasoning for the elaboration of the 2nd Five Year Plan in India.
2. Notes on the economic policy.
3. Investment allocation and increase in national income.
4. Observations on the social conditions necessary for a rapid and planned economic development.

BHATTACHARYYA, S.

5. A note on the concentration of production and labour in some selected industries and its consequences.

CHAKRAVARTI, N. C.

6. A plan for land reform (for consolidation of holdings and other purposes).

CHAKRAVARTI, A. and SENGUPTA, S.

7. On a method of grouping industries by similarity of outlay structures.

CHOUDHURY, T. P. and GOODWIN, R. M.

8. Transactions Matrices for the Indian Union 1950-51.

DUTTA, U.

9. A preliminary study of inter-industry relations in India.

DASGUPTA, A. and MAJUMDAR, M.

10. India 1951-2001 population projections.

FRISCH, RAGNAR

11. Planning for economic development in India—A memorandum on the broad macro economic aspects of the problem.
12. A short memorandum on a technique for elaborating the new Five-year Plan for India.
13. General remarks on the programming matrix.
14. A basic instrument in the planning work.
15. Investment, consumption and employment under a balanced expansion.
16. The programming chart with a preliminary draft of a nomenclature of production sectors.
17. The methodology of planning in an undeveloped country.
18. A sequence or calculations for determining an optimal plan-frame by means of linear programming.
19. Some preliminary results on experimental plan-frame No. 1.
20. The compact form of the Gaussian Algorithm for solving linear equations and inverting matrices in the general case where the original matrix need not be symmetrical.
21. Experimental plan-frame No. 1. Structure of the set up and numerical results.

GANGULY, A.

22. Consumption patterns in different occupation groups.

GOZULOV, A. I.

23. Some basic balances of national economy.

LANGE, O.

24. Some data on the economic development of Poland.
25. Agrarian reform in Poland.

MAHALANOBIS, P. C.

26. Note on studies relating to planning for national development now being conducted at the Indian Statistical Institute in collaboration with the Central Statistical Organization.
27. Draft plan-frame of the Second Five-year Plan.

OSTROVITIANOV, K. V.

28. Scientific principles of planning of the national economy of the USSR.

RAO, V. K. R. V.

29. Second Plan—aims and philosophy.

ROY, J., CHAKRAVARTI, I. M. and LAHA, R. G.

30. A study of concentration curves as description of consumption pattern.

ROY, J. and LAHA, R. G.

31. Preliminary estimates of relative increase in consumer demand in rural and urban India

RUBINSTEIN, M. I.

32 The history of the electrification plan of the Soviet Russia.

RUDRA, A.
33. Balance relations involved in the Bettelheim model.

SARKAR, B. N.
34. Labour force from census data.

SENGUPTA, P.
35. The concepts of employment and unemployment in India and their measurement.

Appendix VII

LIST OF TRAINEES IN THE RESEARCH AND TRAINING SCHOOL

Trainees who completed the two-year training course in June 1954

1. Aikot, J. K. (*Bihar*), 2. Balakrishnan, T. R. (*Travancore-Cochin*), 3. Bansal, J. P. (*U.P.*), 4. Bhasin, K. K. (*Punjab*), 5. Doraiswamy, P. K. (*Madras*), 6. Gopaladesikan, V. N. (*Madras*), 7. Gupta, H. G. (*U.P.*), 8. Gupta, R. S. (*Punjab*), 9. Ravi Kumar (*Punjab*), 10. Premi, M. K. (*U.P.*), 11. Prasad, C. R. (*Andhra*), 12. Rama Rao, M. S. (*Madras*), 13. Singal, M. S. (*Pepsu*), 14. Singh, Pritam (*Punjab*), 15. Sinha, S. K. (*West Bengal*), 16. Sivaramakrishnan, P. V. (*Madras*), 17. Sundaresan, K. S. (*Madras*).

Second Year Class-1954-55

1. Bhasin, Y. P. (*Punjab*), 2. Hariharan, G. (*Bombay*), 3. Iyer, S. Ramanatha (*Poona*), 4. Jain, R. C. (*U.P.*), 5. (Miss) Kastoori, R. (*Madras*), 6. Kukreja, O. P. (*U.P.*), 7. Nair, G. K. (*Travancore-Cochin*), 8. *(Miss) Nanjamma, N. S. R. (*Coorg*), 9. *Narasimhamurti, M. (*Madras*) 10. Rajagopal, S. (*Madras*), 11. Sangal, S. P. (*U.P.*), 12. *Sen N. (*U.P.*) 13. Sethi, V. K. (*U.P.*), 14. Sharma, B. V. R. (*Madras*), 15. Sharma, H. C. (*Himachal Pradesh*), 16. Srinivasan, T. N. (*Madras*).

*Admitted to the Second year class after a qualifying test.

First Year Class-1954-55

1. Arora, R. C. (*Punjab*), 2. Dass, S. N. (*Punjab*), 3. Dutt, C. S. (*Bihar*), 4. Gopalakrishnan, P. (*Madras*), 5. Gupta, G. R. (*U.P.*), 6. Gupta, J. P. (*U.P.*), 7. Kansal, S. M. (*U.P.*), 8. Kumar, K. (*U.P.*), 9. Misra, G. D. (*Delhi*), 10. Nankana, A. N. (*Punjab*), 11. Prakash, V. (*U.P.*), 12. (Miss) Premlata, G. (*Hyderabad*), 13. Rai, K. R. (*Rajasthan*), 14. Rao, G. D. (*Madras*), 15. Subramaniswamy, V. (*Madras*), 16. Talwar, T. (*Delhi*).

Appendix VIII

OFFICERS ON DEPUTATION

1. N. P. Mahadevan, *Lecturer, Osmania College, Kurnul:* (20 March 1954 to 14 June 1954): Practical Statistics.
2. B. B. Mohanti, *Statistical Assistant, Directorate of Public Instruction, Orissa :* (26 July to 24 October 1954): Educational Statistics.
3. R. Krishna Pillai, *Lecturer, Statistics Division, Travancore University:* (6 December to 28 December 1954): Statistical Inference.

4. Krishnaswamy Iyengar, *Lecturer, Department of Statistics, University of Mysore:* (7 December to 28 December 1954): Statistical Inference.
5. P. M. Roy, *Demonstrator, All India Institute of Hygiene & Public Health, Calcutta:* (8 December to 28 December 1954): Statistical Inference.
6. Lakshmi Narayan, *Lecturer in Statistics, Patna University:* (8 December to 28 December 1954): Statistical Inference.
7. Sri Atindra Mohan Cun, *Research Scholar, Department of Statistics, University of Calcutta:* (8 December to 28 December 1954): Statistical Inference.
8. Prodyot Kumar Bhattacharyya, *Research Scholar, Department of Statistics, University of Calcutta:* (8 December to 28 December 1954): Statistical Inference.

Appendix IX

LIST OF TRAINEES IN THE INTERNATIONAL STATISTICAL EDUCATION CENTRE

7th Term (January–June 1954) and 8th Term (August 1954–April 1955).

1. (Miss) Ma Khin Khin (*Burma*), 2. U. Htin Gyaw (*Burma*), 3. U. Sein (*Burma*), 4. V. Navaratanam (*Ceylon*), 5. J. Soeparko (*Indonesia*), 6. Soemartono (*Indonesia*), 7. Henri Harsono (*Indonesia*), 8. Soemarto (*Indonesia*), 9. R. R. Suradiwidjaja (*Indonesia*), 10. Zia Mujedi (*Iran*), 11. A. Ghandeharain (*Iran*), 12. Kritendra Kumar Malla (*Nepal*), 13. Abdul Habib (*Pakistan*), 14. Ramzan Ali Khan Majlis (*Pakistan*), 15. Haider Ali (*Pakistan*), 16. Mohd. Musheer (*Pakistan*), 17. (Miss) Carmen R. Reloj (*Philippines*), 18. Agapito M. Garcia (*Philippines*), 19. Doroteo, N. V. Girado (*Philippines*), 20. (Mrs.) Felisa R. Barretto (*Philippines*), 21. Bernabe M. Navarro (*Philippines*), 22. (Miss) Bui Thi Dung (*Viet Nam*), 23. (Miss) Than Thi Hong (*Viet Nam*), 24. Flt. Lt. T. T. Karamchandani (*India*), 25. Narain Prakash Srivastava (*India*), 26. Rajendra Kumar Misra (*India*), 27. Abdul Khaleque (*India*), 28. Jatindra Nath Sharma (*India*), 29. Madan Mohan Misra (*India*), 30. N. L. Sharma (*India*), 31. Rakhal Chandra Giri (*India*), 32. Satinder Kumar Jain (*India*), 33. Shiv Dayal (*India*), 34. S. R. Pathak (*India*), 35. S. Vadivelu (*India*), 36. Raghubar Datta Pant (*India*), 37. Krishna Ranjan Singh (*India*), 38. Kewal Krishna Iyer (*India*), 39. Ram Bahadur Saxena (*India*), 40. Bhagat Singh Narula (*India*), 41. Dhan Roop Mall Jain (*India*), 42. Chidambaram Hariharan (*India*), 43. Bishwanath Prasad Srivastava (*India*), 44. Gopal Rao Joshi (*India*), 45. Rabindra Nath Bose (*India*), 46. S. Vasudavan (*India*), 47. Ramanandam Vadrene (*India*), 48. Ramprasad Ghosh (*India*), 49. Srikrishna Singh (*India*), 50. K. H. Sujansingani (*India*).

Appendix X

LIST OF SUCCESSFUL CANDIDATES IN PROFESSIONAL EXAMINATIONS
STATISTICIAN'S DIPLOMA EXAMINATION—AUGUST 1955
A. GENERAL PAPERS

PAPER I (*Theoretical*): Gopaldas Monga (B11), Charan Singh Grewal (D22), Harish Chandra Sinha (L5), N. P. Mahadevan (M4), T. Jacob (P2), Nandury Gopalakrishna Murty (P6), Shishirkumar Shrcedhar Jogdeo (P12), Sakharam Trimbak Awade (P14).

PAPER II (*Theoretical*): Promode Kumar Gupta (B5), Triloke Khosla (B6), Shivendra Bahadur (C7), Niranjan Singh (D7), R. L. Khanna (D18), S. Harihara Aiyar (D20), Charan Singh Grewal (D22), Narayan Kondaji Sonavane (P7), Narayan Krishnaji Chandekar (P9), Shishirkumar Shreedhar Jogdeo (P12).

PAPER III (*Theoretical*): K. Mukundan (B8), Gopaldas Monga (D11), Niranjan Singh (D7), R. L. Khanna (D18), Charan Singh Grewal (D22), T. Jacob (P2), Narayan Kondaji Sonavane (P7), Arawind Parashuram Joag (P10), Shishirkumar Shreedhar Jogdeo (P12), R. Viswanath (P15), Sharas Chandra Gopal Moghe (P16).

PAPER VI (*Practical*): Promode Kumar Gupta (B5), Gopaldas Monga (B11), Krishnamurthi Ramachandran (C2), Shivendra Bahadur (C7), R. L. Khanna (D18), Charan Singh Grewal (D22), Ramesh Shankar (L3), T. Jacob (P2), Suresh Govind Pradhan (P3), Narayan Krishnaji Chandekar (P9), Sharas Chandra Gopal Moghe (P16), Yamuna Shridhar Ghaisas (P19), Anant Raghavendra Kulkarni (P20), Narayan Narasinha Koti (P21).

PAPER VII (*Practical*): Pramode Kumar Gupta (B5), Krishnamurthi Ramachandran (C2), Narayan Krishnaji Chandekar (P9), Narayan Narasinha Koti (P21).

B. SPECIAL PAPERS

PAPERS IV AND V (*Theoretical*)

(i) *Mathematical Theory of Sampling Distributions:* Gopaldas Monga (B11), Bhavaraju Subbarao (P11).

(ii) *Theories of Inference:* Nil.

(iii) *Design of Experiments (Construction of Designs):* Promode Kumar Gupta (B5).

(iv) *Design of Experiments (Applied):* Promode Kumar Gupta (B5), Niranjan Singh (D7), R. L. Khanna (D18), S. Harihara Aiyer (D20).

(v) *Sample Survey (Theoretical):* Triloke Khosla (B6), Niranjan Singh (D7), R. L. Khanna (D18).

(vi) *Sample Survey (Applied):* Triloke Khosla (B6), Brij Nandan Pandey (C5).

(vii) *Economic Statistics:* Vasudeo Vyasacharya Ghalsasi (B14).

(viii) *Statistical Quality Control:* Gopaldas Monga (B11), N. P. Mahadevan (M4), T. Jacob (P2), Narayan Kondaji Sonavane (P7), R. Viswanath (P15), Sharas Chandra Gopal Moghe (P16).

(ix) *Vital Statistics and Population Studies:* T. Jacob (P2), Nandury Gopalkrishna Murty (P6).

PAPERS VIII AND IX (*Practical*)

(i) *Mathematical Theory of Sampling Distribution:* Gopaldas Monga (B11).

(ii) *Theories of Inference:* Nil.

(iii) *Design of Experiments (Construction of Designs):* Nil.

(iv) *Design of Experiments (Applied):* Promode Kumar Gupta (B5).

(v) *Sample Survey (Theoretical):* Yamuna Shridhar Ghaisas (P19).

(vi) *Sample Surveys (Applied):* Amiyamoy Chatterjee (C3).

(vii) *Economic Statistics:* Nil.

(viii) *Statistical Quality Control:* Gopaldas Monga (B11), S. Rangachary (M1), T. Jacob (P2), Nandury Gopalakirshna Murty (P5)

(ix) *Vital Statistics and Population Studies:* T. Jacob (P2).

(x) *Probit Analysis:* Nil.

COMPUTER'S CERTIFICATE EXAMINATION—JULY 1954

PART IA SECTION I: Biswanath Chatterjee (C1), Kamal Kanti Mukherjee (C4), Amiya Kumar Banerjee (C7), Parimal Kumar Bose (C8), Arunkanti Ghosal (C13), Biswanath Ghosh*(C14), Satyaranjan Mitra (C36), Tapendra Nath Deb* (C39), Tripti Mohan Chatterjee (C42), Prafulla Kumar Basak* (C43), Prasanta Sen (C46), Bharat Kumar Mitra* (C48), (Miss) Jamuna Roy (C54), Tinkari Paul (C63), Nirmal Kanti Dasgupta* (C66), Caesar Vincent D'Souza (P5).

PART IA SECTION II: Parimal Kumar Bose (C8), Kalidas Chatterjee (C11), Biswanath Ghosh* (C14), Sashi Bhusan Roy (C24), Satya Ranjan Mitra (C36), Tapendra Nath Deb (C39), Profulla Kumar Basak (C43), Bharat Kumar Mitra (C48), (Miss) Jamuna Roy (C54), Nirmal Kanti Dasgupta* (C66), Santosh Kumar Bhattacharjee (C72).

PART IB SECTION I: Prabir Chandra Sen (C60), Gajanan Shivram Errum (P6).

PART IB SECTION II: Nil

PART IC SECTION I: Prabir Chandra Sen (C60), Subir Kumar Roy (C61).

PART IC SECTION II: Govinda Dhan Paul (C10), Lalit Mohan Ghosh (C22), Prabir Chandra Sen* (C60), Subir Kumar Roy (C61), Pabitra Kumar Dey Sarkar (C64), Mukti Nath Mukherjee (C68), Santosh Kumar Bhattacharjee (C72), Laxman Shripad Dandge* (P1), Vinayak Mohanraj Shaligram (P2), Gajanan Sivram Errum (P6).

* Denotes Distinction.

STATISTICAL FIELD SURVEYS CERTIFICATE EXAMINATION : JULY 1954

PART I SECTION A: Lakhinder Singh (C1), Durga Charan Karmakar (C5), Kamal Krishna Das (C7).

PART I Section B: Lakhinder Singh (C1), Achintya Kumar Chatterjee (C2), Durga Charan Karmakar (C5), Kamal Krishna Das (C7).

PART I Section C: Lakhinder Singh (C1), Kamal Krishna Das (C7).

PART II SECTION A: Lakhinder Singh (C1), Kamal Krishna Das (C7).

PART II SECTION B: Lakhinder Singh (C1), Ajit Majumder (C4), Kamal Krishna Das (C7).

STATISTICAL FIELD SURVEYS CERTIFICATE EXAMINATION : FEBRUARY 1955

PART I SECTION A: Nawal Kishore Singh* (C11), Jaharlal Ghosh (C13), Bhabarup Bhattacharjee**(C23), Naresh Chandra Sood (D1), Krishan Kumar Mangi (D4), Md. Muslim (G5).

PART I SECTION B: Benoy Ranjan Chakravarty (C5), Rasik Chakravarty (C6), Nirode Baran Bhattacharjee (C8), Nawal Kishore Singh (C11), Jaharlal Ghosh (C13), Nanigopal Ganguly (C14), Harendra Nath Chatterjee (C15), Premranjan Dasgupta (C21), Bhabarup Bhattacharjee (C23), Naresh Chander Sood (D1), Krishan Kumar Mangi (D4).

PART I SECTION C: Surinder Nath Kapur (C3), Nawal Kishore Singh** (C11), Jaharlal Ghosh (C13), Mahendra Nath Bandyopadhyay** (C22), Bhabarup Bhattacharjee (C23), Naresh Chander Sood (D1), Vidya Sagar Sarda (D10).

PART II SECTION A: Nawal Kishore Singh** (C11), Mahendra Nath Bandyopadhyay (C22), Naresh Chander Sood (D1), Rameshwar Lal Mehta (D2), Vasudev Sharma (D3), Hira Lal Jain (D7), Som Nath Goswami (D8), Jas Karan Singh (D11).

PART II SECTION B: Saroj Chandra Chakravarty (C9), Nawal Kishore Singh (C11), Mahendra Nath Bandyopadhyay (C22), Bhabarup Bhattacharjee (C23), Rameshwar Lal Mehta (D2), Vasudev Sharma (D3), Dev Raj Chawla (D6), Hira Lal Jain (D7), Som Nath Goswami (D8), Jas Karan Singh (D11), Rabindranath Ganguly (D14).

Note : *Denotes Distinction in theoretical papers.

**Denotes Distinction in practical papers.

The figure under brackets indicates the roll number of each candidate and the letters 'B', 'C', 'D', 'L', 'M' & 'P' stand for centres Bombay, Calcutta, Delhi, Lucknow, Madras and Poona respectively.