

INDIAN STATISTICAL INSTITUTE

FORTYFIFTH ANNUAL REPORT

April 1976 – March 1977



203 Barrackpore Trunk Road

CALCUTTA 700 035

INDIAN STATISTICAL INSTITUTE

President : Shri Subimal Dutt, ICS (Retd.)

The Council

Shri P. N. Haksar, M.Sc., Bar-at-Law, IFS (Retd.)

Members of the Council

Representatives of Government of India (4)

2. (i) Shri V. R. Rao, Director, Central Statistical Organisation and Additional Secretary, Department of Statistics. 3. (ii) Shri S. Vasudovan, Additional Secretary, Ministry of Finance (Department of Expenditure) and Financial Advisor to the Department of Statistics. 4. (iii) Dr. R. D. Deshpande, Director, Department of Science and Technology, Cabinet Secretariat. 5. (iv) Shri V. V. Divatia, Statistical Adviser, Department of Statistics, Reserve Bank of India.

Scientists not employed in the Institute (7)

Representative of ICSSR (1) 6. Shri Bhabatosh Dutta.

Representatives of INSA (4)

7. (i) Dr. B. R. Seth, Director, Birla Institute of Technology. 8. (ii) Professor V. S. Huzurbazar, FNA, Senior Professor & Head, Department of Statistics and Mathematics, University of Poona and Visiting Professor, Department of Statistics, University of Manitoba, Winnipeg, Canada. 9. (iii) Professor A. K. Sharma, FNA, Professor and Jawaharlal Nehru Fellow, Department of Botany, University of Calcutta. 10. (iv) Professor (Mrs.) Asima Chatterjee, FNA, Khaira Professor of Chemistry, Department of Pure Chemistry, Dean, Faculty of Science, University of Calcutta.

Scientists co-opted by the Council (2)

11. (i) Dr. S. S. Shrikhande, Head, Department of Mathematics, University of Bombay, (co-opted on 14.8.76). 12. (ii) Dr. M. G. K. Menon, FRS, Chairman, Electronics Commission; Secretary to the Government of India, Department of Electronics. (proposed on 14.8.76 and finalised on 25.10.76).

Elected representatives of the Institute

Members not employed in the Institute (2)

13. (i) Dr. P. K. Bose, M.Sc., Ph.D., F.S.S. (Lond.), Head, Department of Statistics, University of Calcutta. 14. (ii) Dr. P. V. Sukhatme, M.A., Ph.D., FNA, Maharashtra Association for the Cultivation of Science.

Elected representatives of the employees of the Institute (2)

15. (i) Shri Tapan Basu Mallick, Senior Lecturer. 16. (ii) Shri Rakhal Chandra Paul, Senior Assistant.

Officers of the Institute (Ex-officio) (9)

17. (i) Dr. G. Kallianpur, Director.

Professors-in-Charge (5)

18. (ii) Dr. J. K. Ghosh, Theoretical Statistics and Mathematics Division. (In his absence Dr. B. P. Adhikari). 19. (iii) Dr. J. Roy, Applied Statistics, Surveys and Computing Division. 20. (iv) Dr. D. K. Bose, Social Sciences Division. 21. (v) Shri Ashish Sen, Physical and Earth Sciences Division. 22. (vi) Professor S. K. Roy, Biological Sciences Division. 23. (vii) Dr. Asoke Maitra, Dean of Studies. 24. (viii) Shri S. M. Sundara Raju, Head, SQC & OR Division. 25. (ix) Dr. B. S. Minhas, Head, Delhi Centre. Shri P. G. Sarkar and Shri T. D. Gupta, Principal Officers in Charge of Administration, acted as non-member Secretary in their respective terms.

LIST OF MEMBERS OF DIFFERENT COMMITTEES

1. *Finance Committee of the Council*

1. Director of the Indian Statistical Institute or his nominee (*ex-officio* Chairman); 2. Dr. P. K. Bose, Head of Statistics Department, University of Calcutta; 3. Dr. Bhabatosh Dutta; 4. Dr. B. P. Adhikari; 5. Dr. J. Roy; 6. Shri S. M. Sundara Raju; 7. and 8. Two representatives nominated by the Government of India (Shri V. R. Rao, Director, CSO and Additional Secretary, Department of Statistics and Shri S. Vasudovan, Additional Secretary, Department of Expenditure, Ministry of Finance); 9. Shri P. K. Chatterjee, Senior Accounts Officer, Indian Statistical Institute (*Non-member Secretary*).

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Part I. Teaching, Training, Research, Projects and Publications

I. TEACHING AND TRAINING

1. *Teaching for Degrees and Diplomas*

The following is a list of the number of candidates admitted to the different degree and training courses during the academic sessions 1975-76 and 1976-77 :

		<u>Number of admissions</u>	
		1975-76	1976-77
1. <i>Courses leading to a Degree in Statistics :</i>			
1.1 Bachelor of Statistics with Honours, B.Stat. (Hons.)			
1st year	... ..	19	19
2nd year	... ..	17	15
3rd year	... ..	19	20
4th year	... ..	19	17
1.2 Master of Statistics (M.Stat.)			
1st year	... ..	7	8
2nd year (including 5 students of Delhi Centre)	... ..	22	10
3rd year (including 7 students of Delhi Centre)	... ..	32	36
1.3 Junior and Senior Research Fellows, Visiting Fellows			
	... ..	41	59
2. <i>Specialised Courses in Applied Statistics leading to Diplomas :</i>			
2.1 Statistical Quality Control and Operations Research			
	... ..	14	10
2.2 Diploma in Econometrics and Planning			
	... ..	—	2
3. <i>Courses in Statistics for Persons in Employment :</i>			
3.1 Statistical Officers' Training Course (jointly with the CSO)			
	... ..	21	15
3.2 Indian Statistical Service : Probationer's Training Course (jointly with the CSO).			
	... ..	—	15
3.3 Short duration courses for officers on deputation			
	... ..	—	2
4. <i>Evening Courses :</i>			
4.1 Statistical Methods and Applications (One-year) :			
(i) Calcutta	38	37
(ii) Delhi	36	25

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				<i>Number of admissions</i>	
				1975-76	1976-77
4.2	Two-year Post-Graduate Diploma in Statistical Quality Control and Operations Research (Bombay and Madras) :				
4.2.1	Bombay—1st year	...	...	20	15
	Bombay—2nd year	...	...	8	10
	Madras—1st year	...	...	29	20
	Madras—2nd year	...	...	12	9
4.3	Six-month Evening Course in Statistical Quality Control at Bangalore (July-December 1975 and January-June 1976) ...			54	26
5. <i>Courses in Computer Science :</i>					
5.1	Diploma in Computer Science			7	13
5.2	Intensive Course on Programming and Applications of Electronic Computers			20	28
5.3	Course on Operation of Punch Card Machines			12	10
5.4	Course on Statistical Craftsmanship			—	7
6.	<i>Documentation Training Course, Bangalore</i>			9	12
7.	<i>Special Practical Training in SQC and OR</i>			—	5
Total				456	461

2. INTERNATIONAL STATISTICAL EDUCATION CENTRE (ISEC), CALCUTTA

The International Statistical Education Centre (*ISEC*) is operated jointly by the International Statistical Institute and the Indian Statistical Institute, under the auspices of the UNESCO and the Government of India. During the year, the Centre functioned under a Board of Directors, consisting of *Chairman* : C. R. Rao, *Members* : M. Macaure, A. E. Sarhan, E. Lunenberg (ex-officio members representing the International Statistical Institute), B. D. Pandey (Cabinet Secretary, representing the Government of India), M. Mukherjee and N. Bhattacharya, *Member-Secretary* (representing the Indian Statistical Institute).

2.1. During the year, there were 20 trainees from 12 countries in South and South-East Asia, the Far East, the Middle East and also the Commonwealth countries of Africa in the thirtieth term of the Centre. Fifteen trainees attended the ten-month regular course which provides general training in applied statistics besides specialization in subjects chosen by the trainees, while the remaining 5 attended the one-year Special Courses which continued into the next year (1977-78).

2.2. The Government of India awarded 11 fellowships for the foreign trainees attending the Regular Course—5 under the Technical Co-operation Scheme of the Colombo Plan, 3 under the Special Commonwealth African Assistance Plan (SCAAP), 2 under the

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Commonwealth Fund for Technical Co-operation (OFTC) and 1 under the Commonwealth Fellowship Programme of the Ministry of Education. One Nigerian trainee was financed by his employer, the Nigerian Ports Authority, and 3 Indians by their respective State Governments. Four Maldivians undergoing Special Courses in "Census Procedures" were supported by the Economic & Social Commission for Asia and the Pacific (ESCAP) fellowship and one Ethiopian taking a Special Course in "Sample Surveys" by a fellowship award from the International Statistical Institute.

2.3. The regular course of the thirtieth term opened on 1 June 1976. During June-September, the trainees stayed at Calcutta and had general training in statistical methods and applications, in addition to mathematics and economics. During October-November, they underwent a six-week training in Official Statistics conducted by the Central Statistical Organization, Government of India, New Delhi. This training was arranged at New Delhi and other places like Bombay and Simla. The general training in statistical methods was continued at Calcutta during November 1976-January 1977. In the last phase, during February-March 1977, the trainees received specialized training in particular fields like Sample Surveys, Demography and Vital Statistics, Data Processing, and Economic Planning.

2.4. The trainees in the special course on "Census Procedures" underwent training in general courses in applied statistics, including demography and data processing; they also received training at the Office of the Registrar-General, New Delhi. The trainee in the special course on "Sample Surveys" studied statistical methods, sampling theory and data processing techniques and also participated in live sample survey projects.

2.5. Certificates of Merit were awarded to all the 15 trainees of the Regular Course.

2.6. Dr. Isao Yoshimura, Nagoya University, Japan, stayed at the Centre as Visiting Professor during December 1976-March 1977.

3. PROFESSIONAL EXAMINATIONS

The Institute conducts professional examinations for the Statistical Diploma, Computer's Certificate and Certificates on Punched Card Machines and Statistical Field Surveys in the following centres: Bombay, Bangalore, Calcutta, Delhi, Hyderabad, and Madras. Examinations are held in May and November. During 1976-77, examinations for the certificates on Punched Card Machines and Statistical Field Survey were not held, since there were only a few candidates. The details of the diploma and certificates for which examinations were held are given below.

3.1. *Statistician's Diploma Examination*: During 1976-77, 138 candidates registered (70 in May; 68 in November) for the examinations but 39 candidates (17 in May; 22 in November) failed to appear in any of the papers. Of those who finally appeared, 43 candidates (19 in May; 24 in November) passed in one or more papers.

3.2. *Computer's Certificate Examination*: In 1976-77, 30 candidates (15 in May; 15 in November) registered for the examinations. Eight candidates (3 in May; 5 in November) failed to appear in any of the papers. Of those who finally appeared, 11 candidates (6 in May; 5 in November) passed in one or more papers.

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3.3. *Number of successful candidates qualified during 1976-77 for the award of Diplomas and Certificates in Professional Examinations:* The number of candidates who had successfully completed the entire professional examinations and qualified for the award of Diplomas and Certificates is given below:

Statistician's Diploma: Six candidates (3 in May; 3 in November).

Computer's Certificate: Four candidates (2 in May; 2 in November). Diplomas and certificates to successful candidates for the terms in November 1975 and May 1976 were awarded during the Eleventh Convocation held on 17 February 1977.

II. THEORETICAL STATISTICS AND MATHEMATICS

2.1. *Research work done by G. Kallianpur*

2.1.1. It is known from the previous work of Hitsuda and of Kallianpur that a Gaussian process of a single parameter t ($t \in [0, 1]$) which is equivalent to the Weiner process has a proper canonical representation of multiplicity one. For processes of two parameters this is no longer the case in general. The following results have been obtained in collaboration with Clayton Bromley. If $X = (X_t)$, ($t = (t_1, t_2) \in [0, 1]^2$) is a Gaussian process equivalent to the two-parameter Wiener process then X has a canonical representation of the type recently introduced by Tjøstheim, provided the covariance satisfies certain conditions. The latter are stated in terms of a factorization of the covariance derived by Bromley as an extension of the Gohberg-Krein factorization theorem. This extension yields a more general representation of which the canonical representation is a special case.

2.1.2. Earlier work done with H. Oodaira on Ventcel-Freidlin type estimates for Gaussian processes has been revised and written up for publication.

2.1.3. A book on Non-linear Filtering Theory is being prepared for publication. The work is now in its final stages.

2.2. *Research work done by C. R. Rao, Jawaharlal Nehru Professor*

2.2.1. The problem of simultaneous estimation of parameters has been considered in the framework of empirical Bayes estimation. The James-Stein estimator is shown to be an empirical Bayes estimator in the set up considered by Fisher in the problem of discriminant function for genetic selection. Modifications of the James-Stein estimator when the parameters have a given structure like linear trend with a stochastic disturbance have been worked out. The precisions of individual estimators have been computed. It is shown that although for the James-Stein type estimator the average mean square error over the parameters is less than that for the unbiased minimum variance estimators, the same cannot be claimed about individual estimators. For some individual parameters, the James-Stein type is better and for others it is not. The range of values of individual parameters for which the precision is higher has been computed. The pitfalls in using James-Stein type estimator for decision making on individual parameters have been pointed out.

2.2.2. A characterization of the multivariate normal distribution is obtained through linearity of regression and homoeodasticity about regression. An interesting result arising

out of such characterization is that optimality of linear estimators (or linearity of Bayes estimator) implies normal priors for unknown parameters.

2.2.3. The concept of weighted distributions was introduced by Rao to deal with situations where every observation produced by nature is not given the same chance of being included in a sample. Models for weighted distributions have been developed for discrete and continuous variables and applied to sampling of wild life populations and human families. The models are also useful in studying "damaged distributions," i.e. distributions obtained by scaling down the frequencies by a function of the random variable.

2.3. *Functional Analysis, Topology and Analysis*: A. K. Roy worked on extremal dilations and their associated extremal measures and orderings and dilations of complex representing measures. A. K. Roy and M. Rajagopalan had some results on dilations of measures on compact convex sets. A. K. Roy and A. J. Ellis are working on convex functions on the dual ball of a Lindenstrauss space. A seminar by A. K. Roy was followed by a course on topics in Banach spaces of continuous functions by A. J. Ellis. A course on function algebras was held and the lecture notes by the visiting scientist A. J. Ellis was prepared for publication. Some problems on compact convex sets and peak sets of certain types of function spaces are being investigated. Studies on some generalizations of Rado's theorem to function algebras are in progress by some research students. A. B. Raha obtained results on projective objects and projective resolutions in some categories containing the category of compact spaces as a full sub-category. He is also conducting a seminar course on algebraic topology in which several others are also participating. S. C. Bagchi continued his investigations in Harmonic analysis on Bohr groups. H. Sarbadhikari has prepared her thesis with some contributions to descriptive set theory which is being submitted. She also worked on certain generalizations of selection theorems for multifunctions and for partitions of metric spaces. A. Sitaram worked on positive definite distributions on spaces of the form $K[G]/K$, where G is a semi-simple Lie group and K its maximal compact subgroup. Together with S. C. Bagchi, he also conducted the seminar course on differentiable manifolds, Lie groups and representation theory of locally compact groups. Seminar courses were also conducted in mathematical logic, non-standard analysis with a view to discuss probability theory and several other topics.

2.4. *Probability, Stochastic Process, Probabilistic Number Theory and Ergodic Theory*: E. M. Paul continued his research in probabilistic number theory and the results are summarized in the technical report "On the Distribution of values of Additive Arithmetical Functions." G. J. Babu worked on the distributions of multiplicative functions. He also completed the manuscript of a monograph entitled "Probabilistic methods in the theory of arithmetic functions." A seminar course was conducted in probabilistic number theory. Another seminar course on stochastic process with special reference to continuous time martingales and stochastic integrals was conducted by J. C. Gupta and B. V. Rao. Ergodic properties of number theoretic expansions of real numbers and examples of weakly mixing, non-mixing transformations and flows were studied by S. Natarsjan.

2.5. *Graph Theory and Combinatorial Analysis*: S. B. Rao has worked in self-complementary graphs, characterizations of self-complementary graphs with two factors, and forcibly line-graphic degree sequences, the solution of the Hamiltonian problem for self-complementary graphs, and the range of the number of triangles in self-complementary

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graphs of given order. He also worked on Characterization of planar distance convex simple graphs with S. P. Rao Hebbare and on frequency partitions of Eulerian graphs with V. N. Bhat-Nayak and K. N. Nayak. S. P. Rao Hebbare is working on r -partite self-complementary graphs with T. Gangopadhyay in which they have obtained several results. He also worked on problems of non-existence of large cycles in distance convex simple graphs and planar distance convex simple graphs. S. P. Rao Hebbare and T. Gangopadhyay have worked on Bigraceful graphs, some families of non-bipartite graceful graphs, and some non-graceful graphs. T. Gangopadhyay also studied a correspondence between strongly regular graphs of order m and m -association schemes. He also worked on Bull's eye association scheme. A. R. Rao worked on the clique number of a graph with a given degree sequence. He was also the convener of a symposium on graph theory organised by the Institute during 20-25 December 1976 in which about 25 participants from India and a few from abroad took part. The proceedings of the symposium will be published shortly.

A seminar course was organised in graph theory in which C. Berge from France gave lectures. His lecture notes taken by K. Nirmla is ready for publication. Several seminars were also held in graph theory.

2.6. *Statistics*: G. J. Babu and Kesar Singh have studied the deviations between quantile and empirical processes for θ -mixing random variables. K. Singh also studied the relationship between L and M estimators and the behaviour of asymptotic relative efficiency of some location estimators. More work on weakly dependent random variables is in progress. Y. R. Sarma worked on some asymptotic power properties of some tests of parameters in stationary Markov processes. T. P. Tripathi and S. K. P. Sinha have worked on the estimation of ratio on successive occasions. T. P. Tripathi and P. Miti investigated the use of multivariate auxiliary information in selecting the sampling units. T. P. Tripathi and A. K. Das have studied the admissible estimators for quadratic forms in finite populations. A. K. Das studied the problem of estimation of population ratio on two occasions. Studies on the unified theory of sampling are also in progress. Work is also done in the field of B I B Designs, weighing designs and tactical configurations. Work is in progress in the fields of sufficiency, Bayesian inference in multi-dimensional contingency tables, cluster analysis and testing hypotheses in survey sampling. K. Unni studied some problems of unbiased estimation in algebraic and analytical exponential families and is ready to submit his thesis for a Ph.D. C. Srinivasan submitted a thesis on "A study of admissibility through exterior boundary value problem" for his Ph.D. B. S. Mazumder, J. K. Ghosh and S. Sengupta are working on the problem of statistical investigation of sediment transportation and deposition in moving water. B. S. Mazumder worked on problems in magnetofluid dynamics.

Several problems in theoretical statistics and mathematics are also being worked out by the research workers, some of whom are working for their Ph.D.'s.

2.7. S. K. Mitra, Y. Dodge and D. Majumdar (*Delhi Centre*) gave an algorithm for the least squares generalised inverse for additive classification model with arbitrary patterns. There are no rounding-off errors and the algorithm can be programmed for electronic computers. S. K. Mitra used the canonical representation of a singular pencil given in Gantmacher's "Applications of the theory of matrices" and a theorem due to Kucera to solve the matrix equation $A \times B + C \times D = E$.

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2.8. K. R. Parthasarathy examined the problem of finding an analytic basis in which a matrix-valued analytic function defined on a domain in the complex plane assumes the Jordan canonical form; using the existence of such bases, an estimate for the differences of Eigen-values of two matrices is obtained. He delivered lectures on this subject at the Indian Institute of Science, Bangalore, and at the Indian Institute of Technology, Kanpur. He also obtained an elementary and quick proof of the well-known Kunita-Watanabe theorem that martingales adapted to Brownian motion are stochastic integrals, indicated how this fails in the case of other processes with independent increments and established a converse of $K-W$ theorem providing a characterization of Brownian motion.

2.9. B. L. S. P. Rao worked in the following areas : *Statistics* : Properties of Maximum Likelihood estimators are studied when the observations form a dependent sequence. These results are used to study Bayesian inference problems for processes. Some rates of convergence of density estimators when the observations are form a stationary Markov process are obtained. *Probability* : Limit theorems for sums of order statistics generalising earlier results of Grenander on sums of minima of random variables are studied. Rates of convergence in the multivariate central limit theorem are obtained by using simple methods which involve Taylor's theorem for several variables. A generalisation of Whittle's inequality, which is a generalisation of Kolmogorov's inequality, is obtained for random elements in Hilbert space and its application to simultaneous confidence regions is given.

2.10. B. Ramachandran and Z. Govindarajulu examined the problem of characterization of the exponential distributions by their strong Markov property. B. Ramachandran re-examines some basic results due to Linnik, offering reorganized, or examining the possibility of simpler, proofs. Both the papers, based on the researches, are to be presented on invitation at the Colloquium in the Methods of Complex Analysis in Probability Theory and Statistics, to be held at Debrecen, Hungary, in August-September 1977.

2.11. K. R. Shah obtained some results on the analysis of designs with a two-way elimination of heterogeneity. These were represented in an invited talk at the annual meeting of the Indian Society for Agricultural Statistics. K. R. Shah and Y. Dodge obtained some results on the estimability of parameter in Hyper-Gracco-Latin Squares with missing observations.

2.12. The Delhi group of economists and statisticians had 12 papers published in journals, 23 papers were submitted/accepted for publication, and 22 technical reports/discussion papers were prepared.

Jawaharlal Nehru Professor C. R. Rao, stationed in Delhi, had two papers published and sent 10 papers for publication.

The statisticians in Calcutta had 5 papers published and sent 29 papers for publication. Twenty-five reports were issued in the Statistics-Mathematics Division.

Teaching and Training activities : As in previous years, all staff members in Calcutta shared the major part of teaching and training activities of the Institute. A weekly colloquium, organised by the Division, featured 30 talks on various fields of mathematics, probability and Statistics.

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III. APPLIED STATISTICS, SURVEYS AND COMPUTING

3.1. The Division of Applied Statistics, Surveys and Computing has a Technical Advisory Committee and a Divisional Committee of Scientific Workers which came into existence after the introduction of the Revised Memorandum of Association of the Indian Statistical Institute.

The activities of the Division during the year are described under the following heads :

1. Teaching and Training, 2. Research, 3. Project work, 4. Operation and maintenance of the H-400 computer system, and 5. Lectures and seminars.

Some of the activities are described below.

3.2. *Teaching and Training* : The Division organised the undermentioned courses.

3.2.1. *Diploma in Computer Science* : Two students completed successfully their course work in 1975-76. Eleven students were admitted to the course in 1976-77.

3.2.2. *Specialisation in Applied Statistics and Data Analysis* : Seven M.Stat. (third year) students completed the course in 1975-76. Seven final year M.Stat. students were admitted to the course in 1976-77.

3.2.3. *Course on Operation of Punch Card Machines* : Ten students completed the course successfully in 1976-76. Nine students were admitted in 1976-77.

3.2.4. *Advanced Course in Applied Statistics* : Two students were admitted to the course to prepare them for a research career.

3.2.5. *Intensive Course on Programming and Applications of Electronic Computers* : Of the 28 trainees admitted to the course, primarily meant for employed persons engaged in computation and data analysis, 27 trainees received Certificates of Merit, and one received the Certificate of Attendance. The emphasis in this course (11 October 1976-24 December 1976) was on the use of electronic computers in research in social sciences.

The trainees were exposed to the various computer systems available in India besides the in-house Honeywell-400 Computer systems.

Talks on different hardware systems were arranged in co-operation with the representatives from the International Computer (I) Ltd., International Business Machines, Comptronics (I) Ltd., and Electronics Corporation of India Ltd.

3.2.6. *Summer School for Biologists on Design and Analysis of Experiments*, Kalyani, 24 May 1976-10 June 1976 : Fifteen biologists from universities and research Institutions all over India attended the Summer School organised jointly by the Bidhan Chandra Krishi Vidyalyaya, Kalyani, West Bengal and the Applied Statistics, Surveys and Computing Division and the Botany Research Unit of the Indian Statistical Institute. The U.G.C., I.C.A.R. and the Department of Science and Technology, Government of India, accorded financial support to the participating scientists.

3.3. *Miscellaneous short courses* : Special courses on computer programming were organised in response to requests from organisations like the World Health Organisation,

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Central Statistical Organisation, Government of India, Bhilai Steel Plant, All India Institute of Hygiene and Public Health, Calcutta, and National Productivity Council, Calcutta.

3.4. *Research* : Statistical methodology and computation were the main fields in which research was conducted. Biometricians attached to the Division were engaged in research on human health planning and on survival and growth factor for fish.

J. Roy and A. K. Adhikari worked on the application of cluster analysis techniques for pattern recognition. S. B. Chakraborty obtained some results on the asymptotic properties of M.L.E.'s of the general growth curve method. He, along with A. K. Chattopadhyay, studied the problem of using prediction equation in future sample when observations are correlated. A. K. Chattopadhyay continued his work on Non-null distributions of Hotelling's generalised T^2 -statistics and asymptotic expansions of distributions of latent roots of two matrices. Sibdas Bandyopadhyay worked on the statistical problems on Adjurants in antivennu production. S. Ghosh obtained some results on balanced 2^k factorial designs of resolution V which allow search and estimation of one extra unknown effect. Arijit Chowdhuri published his results on Horvitz-Thomson's T_1 -class of estimators and on properties of estimators based on sampling schemes with varying probabilities. He also obtained some results on estimating the variance of a finite population and on the efficiencies of some sampling strategies. A. C. Mukhopadhyay continued his work on Design of Experiments and obtained results on Incomplete Block Designs through orthogonal and incomplete orthogonal arrays. He also obtained some lower bounds on $m_1(r,s)$. He is currently working on infinite classes of Hadamard matrices. C. H. Shastry and Subir Bandyopadhyay worked on a sequential file maintenance system. B. C. Das continued his investigations on the time dependent changes in human blood chemistry, haematology and circulatory functions.

Staff members had 7 papers published and sent 18 papers for publication.

A new research project was started in collaboration with the psychometricians of the Institute to determine whether any relationship exists between high and low blood chemical indices and psychological stress in human beings.

Eleven seminars were organised during the year on different topics in applied statistics, survey and methodology and computer sciences.

3.5. *Project work* : The Division took up a number of projects on request from Government organisations and research institutions. Such projects enable staff members to acquaint themselves with live problems requiring statistical methods for their solution. Some of the more important projects are mentioned below :

(i) Evaluation study of the Pilot Insensivo Rural Employment Project, Kamrup District, Assam, of the Ministry of Agriculture and Irrigation, Government of India.

(ii) Cost-benefit study of Rural Electrification Projects in West Bengal sponsored by the Rural Electrification Corporation, Government of India.

(iii) Urban Poverty Survey, Calcutta, partially supported by a research grant from the Indian Council of Social Science Research.

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(iv) System design and development for recruitment and examination procedure of the Union Public Service Commission.

(v) Health and socio-economic survey of Calcutta Metropolitan Area, in collaboration with the Calcutta Metropolitan Development Authority (CMDA).

(vi) Software development project, in collaboration with the Computer Centre, Calcutta University.

(vii) Household survey on distribution of public expenditure on social service in West Bengal, 1976, in collaboration with the Indian Council of Social Science Research.

3.6. *Operation and maintenance of H-400 system* : Thirteen major jobs were undertaken during the year on the computer system.

IV. PHYSICAL AND EARTH SCIENCES

4.1. Chemistry :

The undermentioned research work was conducted.

4.1.1. The adsorption of cationic surfactants on kaolinite and bentonite clays was studied. The adsorption data were examined in the light of existing theoretical models such as Langmuir and B E T equations. Free energies were calculated and co-related to the hydrophobicity of surface active substances.

4.1.2. The adsorption of basic dye-stuffs on bentonite were measured and the data critically examined to interpret the orientation of the dyes in the adsorbed state. The feasibility of computing the specific surface area of bentonite by dye adsorption were extensively discussed.

4.1.3. The anthocyanins in the petals of *salvia splendens*, *salvia hispanica*, *salvia grahamei*, *salvia cognia* and *salvia farinacea* were separated and identified by spectrophotometric and chromatographic techniques.

One research paper was published and three sent for publication.

4.2. Electronics :

4.2.1. *Theoretical Physics* : Research was continued on the following subjects.

(i) Particle physics, (ii) Nuclear physics, (iii) Cosmic rays and astrophysics, (iv) Measurement problem, (v) Solid state physics.

4.2.2. *Digital Systems Research* :

- (i) Fault detection, diagnoses and tolerance in digital hardware
- (ii) Graph theory
- (iii) Switching theory
- (iv) Microprogramming
- (v) Design and development of a signal processing system using FFT.
- (vi) Programme verification and parallel computation.

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4.2.3. *Physics of Fluids :*

- (i) Flow analysis in hydroclone separators.
- (ii) Study of the mechanism of interaction between water-sediment mixture and mobile sand bed.
- (iii) Flame stabilisation by opposed jet.
- (iv) Flow model in a tropical cyclone.

4.2.4. *Sediment Transportation Studies :* An interdisciplinary study of the mathematical and statistical problems related to the transportation of sediments by running water was launched jointly by some geologists, mathematicians and statisticians of the Institute. The problem of (i) grain-size sorting during sediment transportation, and (ii) the mechanism of initiation of ripples are being studied. Sixteen research papers were published.

4.3. *Electronics and Communication Science :*

The fields of research interests which comprised the current activity of the Electronics and Communication Science Unit, are as follows :—

- (i) Advances in computer memory technology including biological memory and Neuron modelling.
- (ii) Pattern recognition methods and applications; biological patterns; formal language: syntactic and Fuzzy set approach.
- (iii) Acoustic-phonetic studies of speech sounds of major Indian languages from automatic recognition and information communication point of view.
- (iv) Digital data communication and man-machine communication studies.
- (v) Cybernetics and system research : Computer simulation of Robotics; control engineering and parameter estimation and identification; applications in planning and policy formulations; cybernetics as a science of engineering and biology.

Sixteen papers were published.

4.4. *Geology :*

(A) An integrated programme of geological research was conducted in the Pranhita-Godavari Valley.

(i) *Palaeontology of the Gondwana :* Osteology and relationship of *Barapasaurus tagorei*, a Lower Jurassic sauropod dinosaur from India.

(ii) *Sedimentology and stratigraphy of the Gondwana :* Detailed sedimentological analysis of a limestone horizon and stratigraphic mapping of the Upper Gondwana sedimentaries in a part of the Godavari Valley.

(iii) *Structural geology :* (a) Structural and metamorphic study of Pakhal Group of rocks, West of Mahabubabad, Warangal, Andhra Pradesh, and (b) Structural and metamorphic study of the Delhi group of rocks around Kharwa, Ajmer District, Rajasthan.

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(B) Studies on the mechanics of sediment transportation in fluvial regimes. The analysis and interpretation of experimental data related to mechanics of sediment transportation by suspension currents.

Shri P. K. Mazumdar mounted the skeleton of *Barapasaurus tagorei*, a sauropod dinosaur, in the Geology Museum of the Institute.

4.5. Physics :

(i) Studies in the interaction of physics and medicine, particularly the investigation into the application of electrophysics in dermatology.

(ii) Studies in biomechanics, particularly, the mechanical properties of skin. One research paper was published.

V. BIOLOGICAL SCIENCES

5.1. Anthropometry and Human Genetics

(i) *Social Biology* : (a) Biosocial and medical study of the Kaoras, a scheduled caste community of West Bengal; and (b) Abortion by social groups in Calcutta.

(ii) Anthropometric, demographic, serological and clinical study of the Portuguese descendants of Mîrpur village, Midnapore district, West Bengal.

(iii) Human adaptation in high altitude.

(iv) Health effect of family planning in Calcutta.

(v) Human chromosome.

(vi) Biochemical polymorphism and blood groups in Indian population.

(vii) Genetic study of human placental enzyme.

(viii) Anthropometric, dermatoglyphic and genetic traits in several caste populations of Maharashtra.

(ix) In-breeding in Maharashtra.

(x) Enzyme and serum polymorphism and their relationship with cervical cancer.

Six research papers were published.

5.2. Biochemistry

(i) Inorganic pyrophosphatase in green leaves.

(ii) Antimicrobial activity of *Cassia tora* leaf.

(iii) A T Pase level in germinating green gram.

Two technical reports were prepared and one paper sent for publication.

5.3. Botany

(i) *Crop breeding programme*, which aims to evolve high-yielding rice varieties from indigenous germ plasm, is in progress.

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(ii) *Intra-specific and inter-specific interactions in crop plants*: The project, which attempts to detect biological interaction and to exploit cooperative interaction for higher yield, is in progress.

The Botany Research Unit collaborated with the Applied Statistics, Surveys and Computing Division in the following projects: (i) Pilot Intensive Rural Employment Project in Assam, and (ii) Cost-benefit study of rural electrification projects in West Bengal. The Unit organised the Summer School for biologists on design and analysis of experiments, Kalyani, 24 May 1976-19 June 1976.

Three papers were published and one project report prepared.

5.4. Crop Science

5.4.1. *The study on levo- and dextro-rotatory phenomenon occurring in some plants and animals including man, received considerable attention.*

(a) *Lusa* on the fruit-yield of coconut from the Research Station at Sakhi Gopal, Orissa, revealed a considerable difference between the left-apiralled (61.59 nuts per tree/year) and right-spiralled (56.12 nuts per tree/year) palms.

(b) Several species of snails under the genus *Amphidromus* were found to have left- and right-handed coiled individuals, while some other species were only right-handed (dextral).

(c) Quantitative data on the asymmetry in five species of Fiddler Crabs were collected from Tamil Nadu and Kerala States. In *Uca vocans* (one of the Fiddler species), a unique case of dominance in right claws for the males was recorded.

(d) 2,143 Indian boys and girls were tested for their handedness.

5.4.2. Application of Mathematics to Biology

(a) This study was extended to the search for the golden ratio in the proportion of the Human body.

(b) Association of Fibonacci system on the spiral of the shell curvature of the *Chambered nautilus* was also investigated.

5.4.3. *Study on the morphology and anatomy of palms was extended to two more species of palms, Salacca edulis and Guizetia gasipaes.*

5.4.4. Natural History

(a) Behaviour studies on the Bayas weaver bird, the common house crow and Fiddler Crabs revealed interesting behaviour patterns.

Nine research papers were published.

5.5. Embryology

(i) The biosynthesis of lipids during embryogenesis in *Limnaea* is now being investigated.

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(ii) The biosynthesis of some sulphur-containing compounds in the absence of nucleus in *Acartularia* and during embryogenesis in *Limnaea* have been investigated.

(iii) The synthesis of certain enzymes during embryogenesis in *Limnaea* has been traced with the help of the new technique using radioactive substrates.

(iv) Attempts have been made to determine the base composition of RNA synthesized during embryogenesis.

(v) Chemical analysis of the pheromone of a tigress have been performed.

(vi) A technique of enzyme encapsulation has been developed.

(vii) A mathematical model of growth, growth control and rhythmic synthesis of certain fundamental macro-molecules has been designed.

Two research papers were published and one sent for publication.

5.8. Leaf Protein

5.8.1. Work on following aspects of leaf protein is in progress :

(i) Screening of local plants.

(ii) Optimal conditions like fertilizer dose, harvesting time and seed rate in various crops.

(iii) Establishment of the optimal conditions by statistically designed experiments.

(iv) Proper utilization of water weeds.

(v) Possible use of by-products like fibre and fluid.

(vi) Nutritional aspects.

(vii) Acceptability problems.

(viii) Storage and keepage quality.

(ix) Processing conditions.

(x) B-carotene stability.

(xi) Some physiological aspects.

5.8.2. A detailed study has been taken up on the rate of uptake of minerals like P.K. & N by water hyacinth from water.

One research paper was published and three papers sent for publications and a report was prepared for the State Planning Board.

VI. SOCIAL SCIENCES

6.1. Demography

The following research work was conducted and a number of reports and technical notes were prepared on most of the items.

6.1.1. *Calcutta Fertility Survey, 1970*

(i) Analysis of couple particulars relating to the various aspects of family planning.

(ii) Differential reporting of contraceptive practices by husband and wife in Calcutta.

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- (iii) Study of attitude of females toward induced abortion.
- (iv) Determinants of fertility change.

6.1.2. *Fertility and Family Planning Survey, Barasat (West Bengal), 1976*

- (i) A study of sterilised couples.
- (ii) Female education in villages.

6.1.3. *Other studies*

- (i) Examination of legislations for fertility regulation.
- (ii) Study of inter-state variation of nuptiality.
- (iii) Study of problems and prospects of population education.
- (iv) Problems of collecting data on health.
- (v) On methodologies for measuring demographic impact of family planning programme.

One technical report was published.

6.2. *Research in Economics and Econometrics*

6.2.1. Research in economics and econometrics was conducted in both the Calcutta and Delhi centres of the Indian Statistical Institute, during the year.

6.2.2. The Economic Research Unit (ERU), Calcutta, conducted studies on applied economic problems, problem of planning and methodological studies in mathematical economics and econometrics. The staff members taught economics and econometrics in the B.Stat. and M.Stat. courses and also conducted the advanced course in economics leading to the Ph.D. degree of the Institute.

6.2.3. The major research projects were the following :

(i) *Survey of Unorganised Transport Workers : Calcutta 1976* : The field work on the project, sponsored by the Indian Council of Social Science Research, was completed during the year. The scrutiny and pre-punching processing has been completed and the material will now be tabulated on the Honeywell H-400 computer.

(ii) *Study of Energy Policy* : The study on the optimal utilisation for energy resources was continued. Papers were prepared on (a) policy regarding exploration and utilisation of petroleum resources of the country and (b) conservation policy for energy resources in India. Dr. D. K. Bose was a joint author in a paper on "Conservation of Energy Resources in India" prepared under the auspices of the Institution of Engineers (India) for the forthcoming World Energy Conference.

(iii) *Haldia Project Study* : The Unit carried out earlier a sample of industrial and construction labour (including contractor's labour) working in the Haldia Project. The tabulation of the data was completed during the year and the report is being prepared.

(iv) *Industrial Prospects of Haldia Region* : Some staff members are actively associated with a working group formed at the initiative of the West Bengal State Planning Board, for drawing up a perspective plan of industrial development for Haldia.

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(v) *Study on Wage Differentials*: The major part of the work relating to the measurement of inter-regional wage differences on the basis of data published by the Labour Bureau, Simla, was completed for the years 1961-71. The tabulation and measurement of inter-regional and inter-industrial wage differences for the years 1961-72 from unpublished data collected specifically for the purpose has been started.

(vi) *Macro-econometric Model for India*: As a part of the project work, a macro-econometric model for India has been initiated on a study of the changing credit composition of India's export trade since 1961. Some preliminary work has been carried out with the specification of equations for investments in different sectors.

6.2.4. *Training Course*: A course of training in the Methods of State Planning with a Background of Macro-Planning, organised by the Economic Research Unit, 3 January 1977-18 February 1977, was inaugurated by Professor Bhabatoah Dutta, Chairman, Centre for Studies in Social Science, Calcutta. Recognised experts in the field participated in the training course attended by senior and middle level officials of the State Governments in the Eastern Region.

6.2.5. In Economic Theory, the group in the Delhi Centre consisting of V. K. Chetty, D. Dasgupta, T. E. S. Raghavan, P. R. Nayak and D. N. Rao worked on various aspects of production and distribution problems in a monetary economy.

When there are no markets for goods and services, one faces the question of allocating the inputs and outputs among the members of a society. For the first time, a solution to this problem based on three elementary axioms for group decision is proposed by Chetty, Dasgupta and Raghavan. The distribution schemes is shown to reflect the 'Power Structure' of society.

Subsequently, Chetty and Raghavan employing the same distribution scheme, have shown that, when Labour's share is small, it will pay for the workers to absent themselves. This is not only consistent with the observed phenomena, but also shows the invalidity of the so-called 'fundamental theorem of Welfare Economics'.

The consequences of hoarding essential goods like food is analysed by Chetty and Nayak using a model with the ordinary money and a modified concept of Food Money suggested by B. S. Minhas. They show the production will be efficient only when both types of money are present.

The standard model of market economics is shown to involve logical inconsistencies by Chetty and Dasgupta. A consistent framework is provided by a temporary competitive equilibrium involving two or more periods. In addition to the spot markets, if markets for future deliveries in the next period also function, production is shown to be efficient. It is also found to be the minimal set of markets, needed to guarantee efficiency.

The problem of distributing goods through other institutions, when prices are inflexible is investigated by P. R. Nayak. He has shown that while it is possible to distribute through quotas and licences, they are always inefficient.

The problem of optimal taxation in a monetary economy has been investigated by D. N. Rao. His conclusions are diametrically opposite to that of standard results, like "essential goods must be taxed."

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In the area of Economies of Education and Trade, the following contributions may be noted :

T. N. Srinivasan (with J. N. Bhagwati) examined the role of education in a job-ladder model and the fairness-in-hiring rule.

T. N. Srinivasan (with J. N. Bhagwati) clarified various issues in connection with the use of effective rates of protection and domestic resource costs in project selection that takes place in the presence of distortions.

In quantitative economics, T. N. Srinivasan and K. S. Parikh examined the long-term food and energy choices available to India. Energy needs and the possibilities of meeting them have been investigated for agriculture, transport and domestic uses (cooking and lighting) in the context of the requirements of the projected population of over 1100 million people at the turn of the present century. An elaborate programming model has been developed for this purpose.

6.2.6. *Regional Planning* : A project design on 'Integrated Rural Development' was prepared and sent to the Indian Council of Social Science Research for inclusion in its research programmes on the same subject (September 1976).

Studies on spatial patterns and processes of urbanisation are conducted at two levels. As a continuation of an earlier study, an urbanisation map of the distribution of 340 (50,000) population in 1971 of India was prepared.

A study, "Emergence of a metropolis in the process of rapid urbanisation—a case study of Delhi" was completed by D. R. Bhat under the guidance of L. S. Bhat (April 1976).

The Delhi group of statisticians and economists had 12 papers published in journals, 23 papers were accepted/submitted for publication, and 22 technical reports/discussion papers were prepared.

The economists stationed in Calcutta had 3 papers published, three papers were presented at conferences, and 7 technical reports/discussion papers were prepared.

6.3. *Family Planning* :

The Family Planning Research Unit has been conducting research in evaluation, exploring empirical demographic generalisations on response to family planning programme, evolving techniques for obtaining firm population estimates from defective age structure, analysing abortions in demographic aspects, finding consistent solutions of vital rates and obtaining a grouping model for curing spurious age distribution.

An interesting study area in a rural setting consists of five villages under Ganganagar Anchal in Barasat Development Block-II. The investigation, both retrospective and prospective in nature, is principally oriented to the study and development of factors con-founded with low fertility.

Other projects were : (i) Study of the role of voluntary organizations in the promotion of population control programme, and (ii) Sample field verification of performance records related to surgical sterilization and intra-uterine device.

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Three papers were published, three papers sent for publication and three technical notes prepared by staff members.

6.4. *Linguistic Research :*

The programme of research in the Linguistic Research Unit is broadly grouped under the following three headings.

6.4.1. The study of the phonetic structure of Indian languages and the application of the results in the area of speech pathology, teaching of second language and the cultivation of the mother tongue.

Research is being conducted in Bengali, Hindi, Telegu and Punjabi phonetics, speech habilitation and audiometric tests.

6.4.2. Investigation of problems relating to the structure of meaning. Research is being conducted on the behaviour and stability of speech sounds.

6.4.3. A statistical approach to linguistic problems. Statistical studies are in progress in Bengali, Hindi, Telegu, Serbo-Croat, and Punjabi.

6.4.4. *Publications :*

(i) *A Short Outline of Telegu Phonetics* by Djordje Koetic, Alokananda Mitter, Bh. Krishnamurti, Indian Statistical Institute, 1977, pp. 206+(i-iii).

(ii) *English Pronunciation : A Comparative Study of the Articulatory Phonetic Structure of English and Bengali* by Djordje Koetic, Alokananda Mitter (in preparation for press).

6.5. *National Income Research :*

6.5.1. Studies on national accounts with some emphasis on the changes in the Indian economy and the construction of component tables for regional accounts were continued.

6.5.2. A new study was related to the distribution of income amongst earners in industry-occupation categories within a single industry as well as between different industries. An investigation was undertaken to find out the disparities in the distribution of per capita expenditure on education and medicine within each State as well as between different States and also between rural and urban areas in India with the help of NSS data.

6.5.3. An investigation is being carried out on the pattern of expenditure and index of monetization in rural India by States and regions on the basis of the eighteenth round consumption expenditure data, National Sample Survey.

6.5.4. The work on the shifting and incidence of indirect taxes through Leontief's input-output model, undertaken last year, was completed. The discussions and studies so far advanced on incidence theory of indirect taxes including those of Taxation Enquiry Commission (T.E.C.) and the Ministry of Finance are based on micro analysis giving partial pictures which do not reveal comprehensively the overall incidence of indirect taxation. from those of the TEC and Ministry of Finance.

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6.5.5. A study, completed during the year, showed the extent of government subsidy on higher education and the extent to which people in different income groups enjoy such benefits. For this purpose, an enquiry was made in colleges and in a university imparting training in general science and arts, engineering and medicine in Calcutta.

6.5.6. A household sample survey was undertaken in West Bengal—both in rural and urban sectors—for a comprehensive study of the distribution by expenditure levels, of the benefits of public expenditure on social services like education, medical help, distribution of subsidies on rationed commodities, distribution of cash or commodities, free or at subsidised rates, like agricultural land, implements for irrigation, sanitation, fertilizer, seed etc. About 3,000 households divided into four sub-samples were covered. The survey was sponsored jointly by the National Income Research Unit and the Indian Council of Social Science Research. The household enquiry has been completed and scrutiny of data is being carried out.

6.5.7. Between States variation in consumer prices and in level of living (as measured by per capita total household expenditure) was examined by Chatterjee and Bhattacharya (*Sankhyā*, 36, C, 1974) on the basis of NSS eighteenth round (February 1963–January 1964) household budget data relating to rural areas of the country. The budget data were used for constructing indices of inter-regional consumer price differentials, and the Fisher indices comparing different States with rural India were employed for comparing average per capita household expenditure (PCE) in different States in real terms.

6.5.8. Rath (*Arthavijnan*, 15, 1974) used NSS seventeenth round (September 1961–August 1962) data for the same purpose, but treated six groups of commodities, including cereals and products, as single items, in the computation of the price indices. In the calculations of Chatterjee and Bhattacharya (1974), most of these groups were represented by more than one item. However, Rath's procedure could be defended by several arguments.

6.5.9. Work was continued on the book, "Studies in Agricultural Economics."

Ten papers were published, four papers accepted for publication and three technical notes prepared.

6.6. Pre-Census Population Studies :

The Pre-Census Population Studies Unit (P.C.P.S.U.) continued with the following projects during the year :

6.6.1. *Pre-Census Population of India* : The purpose of the project is primarily to compile materials bearing on population and allied socio-economic variables and to edit them for publication. A volume for the Eastern Region, 1811–1820, was prepared in 1922, and materials for other regions are now being edited.

6.6.2. *Statistical Survey of Bengal by Dr. Francis Buchanan, 1807–1814* : Work was continued on the editing of materials relating to Gorakhpur district.

6.6.3. *A Socio-economic Bibliography of India* : A draft volume, *A Socio-economic Bibliography of India, 1870–1970*, submitted to the Indian Institute of Advanced Study in 1971, is now being revised before printing.

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6.6.4. *Analytical studies*: The purpose of analytical studies is, on the one hand, to trace the changes in society over the last two centuries and on the other, to ascertain the deficiencies of historical data.

The undermentioned topics are now being studied

- (a) Bengal, 1780-1800.
- (b) Socio-economic changes in 20 villages of Aligarh district.
- (c) Socio-economic changes in Ballavpur village, Birbhum.
- (d) Methodology of Historical Studies.

Four papers were published.

6.7. *Psychometry*

6.7.1. *Standardisation of objective achievement questions at graduate level*: Objective questions of the achievement type at the graduate level on different subjects will be administered on suitable groups to ascertain their quality and suitability to replace the essay-type examination. Along with these objective questions, corresponding essay-type questions to be answered by the candidates, will be evaluated by specialists and the objective and essay scores will be compared. Items in some of the subject areas were constructed.

6.7.2. *Usefulness of aptitudes, achievement and personality variables in industrial selections*: These comprise follow-up studies of selection tests in which technical assistance was provided to several public and private sector organisations and institutions. The study is aimed at improving the selection tools and methods developed by the Psychometry Research and Service Unit (PRSU) and to identify new areas in which further tests should be developed. These studies are in progress.

6.7.3. *Concepts of Mental Health*: The object of the project is to study what people think and feel about mental health phenomena, particularly *mental disorders*. The pilot study of this project is in progress.

6.7.4. *Psychological correlates of serum uric acid level*: The study in progress is intended to determine the relationship between uric acid levels in blood and achievement motivation and some other personality variables. The Biometry Research Unit is collaborating in the study.

6.7.5. *Validity and other related studies of the selection procedure developed by the PRSU for admission to B.Stat. (Hons.), M.Stat. and Ph.D. courses of the I.S.I., Evening Course, Statistical Craftmanship, Operation for Punch Card Machine and for those public and private sector undertakings for whose personnel and other selections the PRSU has provided technical assistance.*

6.7.6. *Validity Study in Indian Air Lines*: The analysis of aptitude and job knowledge test scores, and person measure validity data collected from the Indian Airlines on about 1600 cases is in progress. The study which is unique of its kind deals with promotion cases. It will analyse the effectiveness of aptitude and job knowledge scores and that of personality measures in predicting success in higher posts.

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6.7.7. *Neuroticism and Delinquency* : The effect of certain environmental and biographical factors on neurotic trend with respect to delinquent and non-delinquent boys and girls. The study is in progress.

6.7.8. *Validity study* : The PRSU helped the Bharat Heavy Plates and Vessels, Vizakhapatnam, and Visweswaraiya Iron Steel, Bhadravati, with the selection of graduate engineers. The performance of those selected candidates is available and the predictive efficiency of the selection variables is being computed.

6.7.9. *Service* : The PRSU took part in the selection of students for diploma and training courses of the Indian Statistical Institute. Technical assistance was provided to public and private sector undertakings, institutions and to other important government organisations in their selection/promotion of personnel and the admission of students to professional courses.

As in previous years, tests for Educational Testing Service and Psychological Corporation, Princeton, U.S.A., were conducted during this period.

6.7.10. *Publications* : The pre-publication draft of the following books by staff members were completed and sent for comments to experts in the field.

- (i) *Objective Type Achievement Test at Graduate Level*—S. Chatterjee and M. Mukherjee.
- (ii) *Handbook of Psychometry*—S. Chatterjee and M. Mukherjee.

6.8. *Sociology*

6.8.1. In the perspective of making a comparative survey analysis on social change and development in the contemporary Indian situation, information was collected on over 2,000 research projects/studies from social science research organisations in India. The tabulation of such information was completed and analysis is in progress for preparing a preliminary report.

Several papers in this connexion were published.

6.8.2. A pre-pilot survey in some places of north India and adjacent States was undertaken to build up a programme for studying the socio-cultural and biological adaptation in contrasting eco-systems. A draft report, from taped interviews, is being prepared.

6.8.3. The first phase fieldwork relating to the project, "Comparative study of Hindu pilgrims and their pilgrimage activities in eastern India" at Puri was completed, and a preliminary report based on collected data is being prepared.

6.8.4. The undermentioned projects were completed (a) Gooroodass Banerjee and his times : a study of socio-political conditions in Bengal, late nineteenth—early twentieth century; and (b) Nepal's experiment with democracy. Mimeographed reports are awaiting publication in book form.

6.8.5. Violence as a tool of change in the Indian polity : A certain volume of field work was conducted and a preliminary report prepared.

6.8.6. The study from secondary sources of the cultural ecology of Asia, as part of a collaborative scheme with the Anthropometry and Human Genetics Research Unit of the ISI, is entitled : Biological variations in human population.

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6.8.7. A comparative study of socio-economic structure and change in some selected villages of Birbhum, West Bengal, is a repeat survey which proposes to compare data collected by Professor P. C. Mahalanobis at Sriniketan in 1937 with contemporary survey data. The first phase of the survey was completed and analysis is going on.

6.8.8. (a) The first phase of the sample survey in certain backward tribal areas in Palamu district (Bihar) was completed and the tabulation of survey data is underway.

(b) A study of group relations in Giridih and the surrounding areas with special reference to the development of schedule castes and schedule tribes is in progress.

6.8.9. The content analysis of views on an aspect of societal change in India. The method of content analysis already developed is now being applied to study in depth the Hindu-Muslim relations in the eighteenth century Bengal. The collection of data is in progress and field research will start soon.

6.8.10. Researches were completed to prepare designs and programmes on : (i) Nuclearisation of joint family structures; (ii) social research on contemporary India; (iii) levels of social integration in rural areas ; (iv) social indicators; (v) family and planning in India, and (vi) sociology of education, West Bengal.

6.8.11. The design of field research on urban group and rural-urban interaction and exploratory studies on the problems of (i) socio-economic polarisation, (ii) social communication, and (iii) social change and development in certain backward regions of the State, especially in the Sundarban Area, was prepared.

Nineteen research papers were published.

VII. STATISTICAL QUALITY CONTROL (SQC) AND OPERATIONS RESEARCH

The Statistical Quality Control (SQC) Division was set up by the Government of India in 1952 under the technical guidance of the Indian Statistical Institute with the objective of promoting applications of Statistical Quality Control and Operations Research (SQC & OR) methods, training of technologists, training of trainers, servicing industrial establishment and conducting research in Statistical Quality Control, Operations Research and allied methods. From a start of three specialists and an annual grant of only Rs. 0.50 lakh, the Division has now grown to twelve centres in the country manned by 52 specialists. Sixtyone factories are being serviced including some of the key sectors viz. steel, electronics and heavy electricals. Twenty-nine important projects were also handled by the Division during the year.

In response to considerable interest and demand from the industries in the region, a Project Centre was located in Pune in October 1976 to extend SQC & OR activities with particular emphasis on training, organisation and development of quality systems in the industries. Twenty-nine factories evinced interest in training and/or service programmes in the area. A special training course in SQC & OR was conducted for 18 participants from different industries in and around Pune during April-June 1977. The ten-week course included field training for eight weeks. Bajaj Auto and TELCO were taken up for project studies and training in Pune.

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The main emphasis during the year was on the training of operatives, application and appreciation programmes for executives, scientists and technologists and also on special project studies to cut down costs by way of reduced wastes and rejections in the factories. At Calcutta, Bombay, Madras and Bangalore, specialised training courses are being conducted regularly in SQC and OR at the professional levels for managers and technologists from industries. The Division has so far trained about 19,000 managers and technologists, scientists and workers, serviced about 1300 factories and produced over 460 specialists in quality control. In addition to popular write-ups in large numbers, the Division has produced so far about 400 research papers, technical literature and manuals in quality control and operations research.

The Institute launched a national training programme for packaged commodities in different centres, which was successfully concluded in Calcutta, Pune and Baroda in October 1976, January 1977 and February 1977 respectively.

During the year, a number of industries participated in an extensive operative programmes. Training manuals and visual aids in regional languages were developed for operative training programmes in quality control. The programmes received considerable attention from the management and the workers alike. Substantial impact is reported in terms of improvement in quality, reduction in cost and better assurance of product for meeting the requirements of customers.

The development of quality systems for supplier plants was one of the key activities undertaken for the Bharat Heavy Electricals, Hindustan Photofilms, steel plants and a number of other consumer-oriented industries.

The development of field quality assurance programmes was another major area in which the Division made considerable headway. A number of important consumer products like X-ray films, tea, and coffee, were successfully covered by the programmes.

The Institute undertook special projects for Brooke Bond (I) Ltd., Modern Bakeries (I) Ltd., Lipton (I) Ltd., WIMCO Ltd., Hindustan Lever Ltd. and others to improve the quality and provide better assurance for the products marketed by them for the benefit of consumers.

The Division carried out significant work in the application of orthogonal array and special designs and analysis of experiments to improve the outgoing quality of the switch gears and other power equipment manufactured in a large number of factories.

The research papers covered interesting results in certain areas. Reliability studies were undertaken in the power generating equipment in Heavy Electricals Units. The field quality assurance manuals were developed for steam and hydro turbine power stations. Special training programmes were conducted for top executives and engineers to train them in field quality programmes in the concerned factories.

The work of the S.Q.C. Division is guided by a high-level Policy Advisory Committee which has rendered signal service in promoting the application of SQC & OR in selected sectors in public and export industries.

Service : Sixtyone factories were serviced during the year and 194 technical reports sent to member plants, including a few special study reports on projects of specific interest to the management. During the period, 16 factories were enrolled for service and 14 plants

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discontinued. The main areas of work on consultative service carried out in the above factories include quality systems design and implementation, special studies aimed at yield improvements, waste and cost reduction, quality evaluation and improvements of products, process control studies, quality information systems, design and reporting, process and product evaluation and development in collaboration with Research and Development Departments of factories, Consumer Research and Market Quality Control Studies, organisation and management of SQC departments in factories, Design and Operation of Quality Audits, Organising for Quality Assurance and conducting statistical research in process and product improvements.

Education and Training: During the period, the Division trained 2,765 managers, technologists and others in a large number of inplant courses for top and middle level management at different centres. Some general and other courses in the basic techniques of SQC were also organised.

Over 1500 operators were covered by orientation and technical training programmes. Twenty-eight training manuals which were designed included manuals developed in regional languages for the training of operators in Hindustan Photo Films Mfg. Co. Ltd., Ootacamund, Dunlop India Ltd., Sahaganj, and Ambattur and K. G. Khosla & Co. (P) Ltd., New Delhi.

A national training programme on "Economic Control and Assurance System for Packaged Commodities" based on the regulatory requirement of Packaged Commodities (Regulation) Order 1975, was planned to run at different centres of the country. So far, it has been successfully concluded at Calcutta, Pune and Baroda.

Altogether 191 persons underwent professional training at the postgraduate level in part-time courses in Bombay and Madras and full-time courses in Calcutta, at the undergraduate level in the part-time course at Bangalore and in the M.Stat. third-year course with specialisation in SQC & OR in Calcutta and Delhi.

The M.Stat. course with specialisation in SQC & OR was started in New Delhi.

Promotion: The highlights of promotional activities were programmes in the public sector enterprises, special seminars and a Conference.

The cloventh interplant review meeting of Hindustan Steel Ltd., held in I.S.I., Calcutta, 21-22 April 1976, was integrated to cover all the steel plants in the country. An Operating Committee for SQC & OR was formed.

A seminar on Total Quality Control of Coal and Coke, organised on 22 April 1976 at the Institute Headquarters was attended by participants from steel plants and Coal India Ltd. A quality control exhibition was organised on the occasion.

The Division organised the Sixth All India Conference on Quality Control at Hyderabad, 20-31 December 1976, where about 500 delegates from all over the country attended and 120 papers were submitted.

Staff members participated in 28 seminars and symposia; 113 lectures and talks were delivered and 20 seminars were organised by different SQC units during the year.

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Introductory visits were paid to 89 plants, 32 pilot studies were completed and 42 promotional reports sent to the factories where survey and pilot projects were carried out.

Research : Fourteen papers were published in journals, 32 papers sent for publication and presented in seminars and conferences. Thirtyfive manuals and technical reports were prepared by staff members during the period.

The research projects in progress includes Bayesian single sampling plan with three decision criteria, linear complementarity problems with Z -matrices and deterministic, shop-sequencing problem.

Dr. K. G. Ramamurty studied the application of the modified exponential distribution to a variety of industrial situations, including cloth cutting, textile winding and cutting procedures for material and incidence of defects.

VIII. LIBRARY, DOCUMENTATION AND INFORMATION SCIENCES

1. Library

1.1. With the addition of 4,120 new books and 3,667 bound volumes of journals, the total collection of the Central Library at Baranagar rose to 1,42,244 volumes at the close of the year. The library has also a large collection of 33,226 reprints, 3,75,000 maps, microfilms, microfiches and photoprints. The services of the Branch libraries at Bombay, Bangalore, Giridih and Delhi were co-ordinated with those of the Central Library to service researchers, students and staff of the Institute.

1.2. *Acquisition* : Three thousand six hundred and seven books were accessioned during this period.

1.3. *Technical Processing* : The library classified and catalogued 2,979 and 4,120 books respectively.

1.4. *Periodicals* : The library received 2,568 periodicals during the year, of which 688 were received on subscription, 1,001 on exchange and 877 on a complimentary basis.

1.5. *Membership* : The total membership of the library during the period was 2,820, the break-up of which was as follows : General members including staff, research scholars, students and guests : 2,239; student members (outside) : 367; seasonal members, 163; Institute members : 51.

1.6. *Circulation* : Altogether 50,760 books and periodicals were issued and 45,117 publications returned to the circulation desk during the period.

1.7. *Documentation Service* : The Documentation Unit prepared bibliographies on (i) Studies on Calcutta, (ii) Public Sector Industries, and (iii) Small Scale Industries, for the use of scientists.

1.8. *Reprographic and Photographic Services* : The Photographic Unit prepared 7,442 frames of microfilm negatives from documents and prepared 7,206 photoprints, 5,996 bromide enlargements and 410 slides for lectures, besides a large number of photographs of scientific subjects, specimens and functions held in the Institute.

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The Reprography Unit prepared 4,308 copies of prints from documents, books, and periodicals and reproduced 31,805 copies of prints by offset printing process (Rotaprint).

1.9. *Translation Services* : The Translation Unit provided English translation of 11 documents, of which 4 were from Russian, 3 from German, 1 from Chinese and 3 from Japanese. Two documents in English were translated into French and one document in English was translated into German.

1.10. *Reports and Records* : One thousand three hundred and thirtynine reports and data books were accessioned and 84 research papers, published in *Sankhyā* were indexed at the Reports and Records Unit. Altogether 4,937 volumes were processed and shelved, according to the new classification scheme introduced.

1.11. *Collection of Special Materials* : The transliteration of title pages and classification of Russian books in the Collection of Special Materials was taken up simultaneously and some progress has already been made.

1.12. *Circulating Library* : The Workers' Circulating Library had a collection of 27,430 books and the total number of members was 2,513. Altogether, 393 books were added to the stock of the Circulating Library which issued 40,341 books during the period.

1.13. *W. A. Shewhart Collection* : The W. A. Shewhart collection which was donated by Mrs. Edna Shewhart to the ISI Library comprises about 4,000 books and research documents.

1.14. *Restricted Collection* : The Library has more than 2,500 rare books in its restricted collection. There is also a sizeable collection of books in Russian and Japanese languages, received through exchange arrangements.

2. *Documentation Research and Training Centre (DRTC), Bangalore*

2.1. *Training* : Eleven candidates were admitted to the course in Documentation and Information Science, which commenced on 1 August 1976.

2.2. *Research* : The main subjects of research in documentation and information science which formed the basis of several papers were :

(i) Information Technology : application of electronic computers in information handling.

(ii) Classification.

(iii) Indexing and Thesaurus.

(iv) Library and Information Science Personnel Development : national policy, curriculum development.

(v) Plan for a documentation and information system for iron and steel technology (for Steel Authority of India Ltd.).

2.3. *Seminars and Workshop*

(i) The All-India Seminar on Library and Information Manpower Development, organised jointly by the D.R.T.C. and the Indian National Scientific Documentation Centre, Delhi, was held in Bangalore, 6-10 December 1976. The faculty of the D.R.T.C. prepared

a working document (153 pages, mimeographed) on different topics and sent copies to participants.

(ii) A workshop on Selective Dissemination of Information was held in the D.R.T.C., 3-7 May 1976, for the benefit of the library and information centres of the Bharat Heavy Electricals Ltd.

(iii) The members of the DRTC faculty participated in the Seminar on Mass Communication Media and their Problems, Bangalore, 14 November 1976.

2.4. Collaboration and Consultation Work

(i) At the request of the Steel Authority of India Ltd. (Central R & D, Ranchi), the D.R.T.C. prepared a 215-page report on and plan for, a documentation and information system for iron and steel technology.

(ii) Professor Neelameghan prepared a syllabus for a Master's Course in Library Science for the Madras University.

(iii) On a request from the Railway Board, Professor Neelameghan prepared a note presenting a brief summary of a plan for the development of a technical information service network in railway engineering and technology, with the Research Designs and Standards Organisation, Lucknow, as the focal point.

(iv) The DRTC continued to collaborate with the Sarada Ranganathan Endowment for Library Science in the publication of the periodical, *Library Science with a slant to documentation*.

2.5. *Joint Projects*: The third and fourth training courses on Documentation and Information Services, sponsored by the Department of Science and Technology, Government of India, were held at the Bhabha Atomic Research Centre (12 August 1976-21 September 1976) and at the Jadavpur University (28 March 1977-30 April 1977) who were also organisers of the course, besides the DRTC and INSDOC. The DRTC faculty participated in the teaching programme of both the courses.

2.6. *International Collaboration*: (i) The United Nations Educational, Social and Cultural Organisation (UNESCO) recently designated the DRTC as the National Information Transfer Centre for collecting and reporting information on research in progress and publications in library science to the UNESCO for a programme called the International Information System on Research in Documentation (ISORID). During the period, the DRTC sent to the UNESCO, information on 40 research projects and 8 research reports.

(ii) The committee on classification of the International Federation for Documentation which has been functioning in the DRTC since 1973 has brought out four issues of the *FID/CS Newsletter* during the period.

(iii) Professor Neelameghan prepared a first draft of the policy guidelines on information manpower development, for the UNESCO.

(iv) At the request of the UNESCO's Division of Libraries, Documentation and Archives, the DRTC organised a meeting of supervisors of library and documentation

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schools in the Asian Region, Bangalore, 9-12 November 1976. Invited heads of schools for library and information studies from Bangladesh, India, Indonesia, Malaysia, Philippines, Sri Lanka, and Thailand discussed issues relating to intra-regional co-operation. Observers from the International Federation of Library Association and the Thai Library Association also attended the meeting which was inaugurated by Professor Vijaydevaraj Urs, Vice-Chancellor, Mysore University.

In accordance with a decision of the meeting, a news-letter, *L & I. S. Education in Asia* was published in January 1977, which the object of disseminating information about activities in library and information science education in the Asian region.

(v) At the request of the International Committee for Social Science Information and Documentation, Professor Neelameghan prepared a commentary on the applicability of the UNISIST Information Policy Objectives to social sciences.

2.7. *Publications* : (i) Volume of papers, Seminar on Library and Information Manpower Development: National Regional and International Aspects, Bangalore, 8-10 December 1976, pp. 153 (mimeographed).

(ii) NATIS : *Library and Information Science Manpower Development in the Asian Region* : Report of a meeting of supervisors of library and documentation schools in the Asian region, Bangalore, 9-12 November 1976, pp. 206.

2.8. *Research papers* : Thirtyfour research papers by the DRTO staff were published and three papers sent for publication.

2.9. *Talks and Colloquia* : Staff members delivered 9 talks in other organisations. Students organised 14 weekly colloquia and submitted 17 projects.

2.10. *Library* : The DRTO library acquired 298 books (including bound periodicals) and five new periodicals during the period.

IX. CONFERENCES, SYMPOSIA AND SEMINARS

Among the different conferences, symposia, seminars and workshops organised by the Indian Statistical Institute or in collaboration with other scientific organisations were the following :

9.1. *Second Seminar, Personnel Selection and Appraisal Systems, New Delhi, 17 April 1976* : The seminar was organised by the Psychometry and Research Service Unit of the Indian Statistical Institute and sponsored by the Bureau of Public Enterprises, Ministry of Finance, Government of India. Shri P. K. Mukherjee, Union Minister for Revenue and Banking, inaugurated and Shri P. N. Haksar, Deputy Chairman, Planning Commission and Chairman, Indian Statistical Institute, presided.

The Seminar was attended by about 150 delegates mainly consisting of the chiefs of public sector undertakings, persons manning the personnel departments and academicians associated with the selection and appraisal of personnel through scientific methods. The seminar discussed the ways and means by which psychometric methods developed by the

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psychometricians of the Indian Statistical Institute could be best utilised in the selection, placement and promotion in public sector organisations.

9.2. *Workshop on Selective Dissemination of Information, Bangalore, 3-7 May 1976*: The workshop was organised jointly by the Documentation Research and Training Centre, Bangalore, and the Bharat Heavy Electricals, Ltd., for the benefit of the library and information centres of the BHEL.

9.3. *A Workshop on Regional Sociology, Calcutta, 6-7 May 1976*: The workshop, organised by the Sociological Research Unit, was attended by scholars from the Indian Statistical Institute and from the Departments of Anthropology and Geography, Calcutta University, Department of International Relations, Jadavpur University, Anthropological Survey of India, Centre for Study of Social Sciences, Calcutta, and Department of Sociology, Kalyani University. The proceedings of the Workshop were published in the *Bulletin of the International Sociological Association*, Montreal, Canada.

9.4. *Seminar on Statistics for Administration in Government and Commercial Organisations, Bangalore, June 1976*: Two hundred delegates representing administrators, statisticians from banks, commercial organisations, Central and State Government departments participated in the seminar, jointly organised by the Karnataka Branch, Indian Statistical Institute, and the Officers Association, Bureau of Economics and Statistics, Karnataka.

9.5. *All India Seminar on Library and Information Manpower Development, Bangalore, 6-10 December 1976*: The seminar was organised jointly by the Documentation Research and Training Centre, Bangalore and the Indian National Scientific Documentation Centre, Delhi.

9.6. *Symposium on Graph Theory, Calcutta, 20-25 December 1976*: The Symposium, organised by the Division of Theoretical Statistics and Mathematics, was attended by 25 participants including Professor C. Borge, Director of Research, and Dr. M. Doza, Associate Professor of Research, CNRS, Paris. Twenty-six research papers were presented and there were five expository lectures.

9.7. *Sixth All India Conference on Quality Control, Hyderabad, 29-31 December 1976*: The Conference, organised by the Statistical Quality Control Division of the Indian Statistical Institute, was attended by about 500 delegates who presented in the technical sessions 102 working papers in engineering, chemicals, electricals, electronics, textile and process industries. Special sessions were organised on the following subjects: (i) Problems and prospects of quality control in the service industry, (ii) Education and training, (iii) Quality Control in research and development and (iv) Quality in export. Ten institutions participated in an exhibition organised on the occasion.

9.8. *All-India Interdisciplinary Symposium on Recent Trends of Research and Developments in Digital Technique and Pattern Recognition, Calcutta, 15-17 February 1977*: The Symposium sponsored by the Indian Statistical Institute, Calcutta, and held in its campus was inaugurated on 15 February 1977 by Professor D. Kostic, Director, Institute for Experimental Phonetics and Speech Pathology, Belgrade, Yugoslavia. Scientists who attended the symposium included those from the Institutes of Technology, Indian Institute

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of Science, Bangalore, the major engineering colleges and universities, and the Ministry of Defence.

Technical sessions were held on the following subjects: (i) Digital Techniques, (ii) Automatic Character Recognition, (iii) Digital Communication, (iv) Pattern Recognition, Methods, (v) Biomedical Applications, and (vi) Automatic Speech Recognition. A panel discussion was held on "Application of Pattern Recognition Techniques for Development." Altogether 41 papers were presented at the technical sessions.

9.9. *Seminar on The Kotic Methodology for Habilitation of Speech and Language in the Hearing-Impaired, Calcutta, 20 February 1977.* The seminar was conducted by Visiting Professor D. Kostic, Director, Institute for Experimental Phonetics and Speech Pathology, Belgrade, Yugoslavia, and Shreemati Alokamanda Mittor, for the benefit of teachers of deaf children in Bengali-medium schools.

X. PUBLICATIONS

The following publications were brought out during the year :

Santhyā : The Indian Journal of Statistics, the official organ of the Indian Statistical Institute.

Series A : Volume 37, Parts 1, 2, 3 & 4. Volume 38, Part 1.

Series B : Volume 37, Parts 1, 2, 3 & 4. Volume 38, Part 1.

Series C : Volume 37, Parts 1 and 3. (Sample Surveys : Theory and Practice)

Series C : Volume 37, Parts 2 and 4. (Quantitative Economics)

XI. SOCIETY-TYPE ACTIVITIES : BRANCHES

1. Karnataka Branch :

1.1. *Membership :* There were 53 members at the end of the year (life members : 19; institutional members : 6; and ordinary members : 28). During the year, two ordinary members were admitted, one ordinary member resigned and one ordinary member became a life member.

1.2. *Seminar on Statistics for Administration in Government and Commercial Organisations, Bangalore, June 1978 :* The Seminar was organised by the Officers' Association of the Bureau of Economics and Statistics, Karnataka and the Karnataka Branch, I.S.I. The Seminar, attended by 200 delegates, provided the first opportunity in the State for discussions regarding the type of data required for different purposes, the position regarding available data and its shortcomings and the improvements required. Thirty papers were presented and discussed under four groups.

Members of the Karnataka Branch participated in the seminar on the Data Base of Indian Economy, 22-24 December 1978, Bangalore. The Seminar discussed some neglected areas of social statistics with reference to education and health. Shri C. S. Seshadri, Chairman of the Branch, was the local secretary of the seminar.

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1.3. *Surveys* : At the request of the Karnataka Small Scale Industries Association, the Karnataka Branch furnished a framework for conducting a survey of small-scale industries in the Bangalore metropolitan area.

1.4. *Lectures* : Under the joint auspices of the Indian Association for Quality and Reliability, Officers Association for the Bureau of Economics and Statistics, Karnataka and the Karnataka Branch, Dr. S. Chatterjee and Dr. (Miss) Manjula Mukherjee of the Indian Statistical Institute delivered lectures on "Objective methods for industrial personnel requirement."

Dr. V. S. Viswanath, Professor of Chemical Engineering, Indian Institute of Science, Bangalore, gave a talk on "Elucidation of Reaction Mechanisms" (15 December 1976).

XII. LIST OF SCIENTIFIC PAPERS PUBLISHED

A. MATHEMATICS AND STATISTICS

1. KALLIANPUR, G. (1977) : Review, 'Gaussian Processes, Function Theory and the Inverse Special Problem' By Dym, H. and McKean, H. P. Academic Press, 1976, 333 pp. *J. Am. Statist. Ass.*
2. — (with Etomadi, N.) (1977) : Non-anticipative transformation of the two-parameter Wiener process and a Girsanov theorem. *J. Multivariate Analysis*, 7.
3. — (1977) : A linear stochastic system with discontinuous control. (Paper based on a talk). *Proc. International Symposium on Stochastic Differential Equations*. Kyoto, Japan, July 1976.
4. MITRA, S. K. (with Moore-Thorne, B.) (1976) : Linear estimation in general linear models. *Essays in Probability and Statistics* : A volume in honour of Professor J. Ogawa. (ed. Ikeda *et al.*) Shinko Tsuho, Tokyo, 189-201.
5. — (with Khatri, C. G.) (1976) : Hermitian and non-negative definite solutions of linear matrix equations. *SIAM J. Appl. Math.*, 31, 4, 579-585.
6. — (1976) : Non-existence of UMVUE's, some examples. *Gujarat Statist. Rev.*, 3, 2, 27-30.
7. PARTHASARATHY, K. R. (with Schmidt, K.) (1976) : A new method for construction of factorisable representations for current groups and current algebras. *Comm. Math. Phys.*, 50, 167-175.
8. PRAKASA RAO, B. L. S. (1976) : On a characteristic property of point process. *J. Aust. Math. Soc.*, 21, 108-111.
9. — (1976) : Limit theorems for sums of order statistics, *z. Wahrscheinlichkeitstheorie*, 33, 285-307.
10. — (1976) : Absolute stability of a stochastic integro-differential system. *J. Math. Analysis Applic.*, 54, 666-673.
11. RAO, C. R. (1976) : Growing responsibilities of Government statisticians. *Occasional Papers*, No. 4, Asian Inst. Statistics, Tokyo.

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18. RAO, C. B. (1976): Prediction of future observations with special reference to linear models. *Multivariate Analysis*, IV.
18. — (1976): Cluster analysis applied to a study of race mixtures in human populations. *Proc. Advanced Seminar on Classification and Clustering*, Madison.
14. — (1976): Simultaneous estimation of parameters—a compound decision problem. *Statistical Decision Theory and Related Topics*, Vol. 2, (ed.) Gupta, S. S. and Moore, D.S. 327-350.
16. — (1976): Statisticians, statisticians and public policy making. *Silver Jubilee Souvenir Volume*, Central Statistical Organisation.
16. — (1976): Characterization of prior distributions and solution to a compound decision problem. *Annals of Statistics*, 4, 823-835.
17. — (1976): The weighted distributions: a survey of their applications (with Patil, G. P.), *Proc. Conference on Applications of Statistics*, Dayton.
18. ROY, A. K. (1976): Extremal dilations and their associated extremal measures. *J. Functional Analysis*, 22, 9-31.
19. — (with Rajagopalan, M.) (1976): Some results on dilations of measures on compact convex sets. *J. Math. Pures App.* Paris 55, 173-188.
20. SARBADHIKARI, H. (1976): A note on some properties of A functions. *Proc. Am. Math. Soc.* 56.
21. SARMA, Y. B. (1976): Large sample theory of sequential estimation in stationary Markov processes. *Publ. de l'Inst. de statist. de univ. de Paris*, 21, 57-70.
22. TRIPATHI, T. P. (1976): On double sampling for multivariate ratio and difference methods of estimation. *J. Indian Soc. Agric. Statist.*, 28.

B. APPLIED STATISTICS, SURVEYS AND COMPUTING

1. BANDYOPADHYAY, SUBIR (with Sartry, C. H., Bandyopadhyay, Sudhansu, and De Sarkar, S. C.) (1976): A sequential file maintenance system. *Proc. CSI Symposium*.
2. CHAKRABORTY, S. B. (1976): On asymptotic properties of m.l.e.'s of the general growth curve method. 2P. 3, *Ann. Inst. Statist. Math.*, Tokyo.
3. CHATTOPADHYAY, A. K. (1976): Non-null distributions of Hotelling's generalised T -statistic. *Calcutta Statist. Ass. Bull.* 24 (93-96), 33-41.
4. — (with Pillai, K. C.) (1976): Maximisation of a matrix function and asymptotic expansions of distributions of latent roots of two matrices. *Annals of Statistics*, 4, 4, 796-806.
5. CHAUDHURI, ARLJIT (1976): A simple method of sampling without replacement with inclusion-probabilities exactly proportional to size. *Metrika*, 22, 147-153.

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6. CHAUDHURI, ABU T. (1976) : Some results concerning Horvitz-Thompson's T_1 -class of estimators. *Metrica*, 22, 217-223.
7. — (1976) : Some properties of estimators based on sampling schemes with varying probabilities. *Aus. J. Statistics*, 17, 22-28.

C. ANTHROPOMETRY AND HUMAN GENETICS

1. BASU, A. *et al* (1976) : Morphology, serology, dermatoglyphics and micro-evaluation of some village populations in Haiti, West Indies. *Human Biology*, 48, 2, 245-269.
2. MUKHERJEE, B. N. (with Das, S. K. and Malhotra, K. C.) (1976) : Serum protein and enzyme polymorphism in the Dhangers of Maharashtra. *Ind. J. Med. Res.*, 64, 1240-1244.
3. — (with Kate, S. L. and Khedkar, V. A.) (1976) : Cellulose acetate membrane electrophoresis : a simple, rapid and inexpensive method for detection of haemoglobin variants. *Ind. J. Phy. Anth. & Hum. Genet.* (Lucknow), 2, 1, 113-119.
4. PAKDASI, KANTI (1976) : A bisocial study of the people of Bangladesh. *Bull. Cultural Research Institute* (Calcutta), 12, 1 & 2, 101-109.
5. — (1976) : Population composition by social groups in West Bengal. *Ind. J. Phy. Anth. & Hum. Genet.* (Lucknow), 1, 2, 103-118.
6. — (with Banerjee, A. R. and Das, A. K.) (1976) : *Biosocial Studies in India : A Reading in Collected Papers*. 1961-70, Editions Indian, Calcutta.

D. BOTANY

1. ROY, S. K. (1976) : Iron metabolism in *white top* pea chlorophyll mutant. *J. Cytol. Genet. Cong. Suppl.*, 146-150.

E. CHEMISTRY

1. PAL, B. K. (with Ghosal, D. N.) : Adsorption of cetyl pyridinium chloride and cetyl trimethyl ammonium bromide on bentonite. *Indian J. Chemistry, CSIR*.

F. CROP SCIENCE

1. DAVIS, T. A. (with Altevoigt, R.) (1976) : Giant turtles and robber crabs of the South Sentinel. *Yojana*, 20, 75-79.
2. — (1976) : Is the coconut crab a pest of the coconut? *World Crops*. (In press).
3. — (1976) : Coconut for the roof garden. *Indian Horticulture*, 21, 3-4.
4. — (1976) : The wild date in Bangladesh. *Wildlife*, 18, 508-509.
5. — (with Charles, Winston) (1976) : The pojibaye can take root in India. *Indian Farming*, 26, 13-31.

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6. DAVIS, T. A. (1976): The coconut palm and its products a review. *J. Plantation Crops*, 4, 29-31.
7. — (1976): Right and left-twisting Hibiscus flowers. *Seed Pod. J. American Hibiscus Soc.*, 4, 21.
8. — (with De, S. K. and Pal, A. K.) (1976): The koel as a brood parasite of the crow. *Science Reporter*, 14, 6-12.

G. DEMOGRAPHY

1. RAMAN, M. V. (with Sarkar, B. N.) (1976): Calcutta Fertility Survey 1970: Report (Household Schedule), Demographic Research Centre, I.S.I., Calcutta, p. i-x, 1-123.

H. DIGITAL SYSTEM

1. SINHA, B. P. (with Srimani, P. K. and Choudhury, A. K.) (1976): Some studies on optimal specification of ROM's in microprogrammed digital computers. *Proc. Symp. Comput. Architecture and System Design, I.I.T., New Delhi, Nov. 24-26, 22-56.*
2. — (with Srimani, P. K., Sen, A., Chakrabarti, M. K. and Choudhury, A.K.) (1976): A microprogrammed approach to FFT Processing. *Proc. Symp. Comput. Architecture and System Design, I.I.T., New Delhi, Nov. 24-26, 43-55.*
3. — (with Srimani, P. K. and Choudhury, A. K.) (1976): A new algorithm for the generation of all maximal compatible classes. *J. Computer Society of India*, 7, 1, December.
4. — (with Srimani, P. K., Sen, A., Chakraborty, M. K., Daagupta, A. R. and Choudhury, A. K.) (1977): Testing of the static and dynamic performance characteristic of 4 bit \times 2 bit AM-2605 multiplier chip in 8 bit \times bit configuration. *Proc. National Seminar on Testing and Evaluation, National Test House, Calcutta, S: 1/EC/8, 1-16 January.*
5. SRIMANI, P. K. (with Sinha, B. P. and Choudhury, A. K.) (1976): On certain investigations on control memory minimization in microprogrammed digital computers. *Proc. Symp. on Comput. Architecture and System Design, I.I.T., New Delhi, Nov. 24-26, 63-70.*
6. — (1976): A programmable fault testing equipment for combinational circuits. *J. Institute of Electronics & Telecommunication Engineering*, 22, 7, 486-491, July.
7. — (with Das, S. R. and Dutta, C. R.) (1976): On multiple fault analysis in combinational circuits through Boolean difference. *Proc. Institute of Electrical & Electronics Engineering*, 64, 1447-1449, September.
8. — (with Das, S. R. and Dutta, C. R.) (1976): Boolean difference and multiple fault analysis in combinational circuits. *Proc. Nineteenth Midwest Symposium on Circuits and Systems, Wisconsin, U.S.A., 10-13 August.*

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9. SRIMANI, P. K. (with Sinha, C. P. and Choudhury, A. K.) (1976) : An efficient scheme to generate all the cliques of a symmetric graph. *Proc. Nineteenth Midwest Symposium on Circuits and Systems*, Wisconsin, U.S.A., 308-312. August.
10. — (with Sinha, B. P. and Choudhury, A. K.) (1977) : Generation of all maximal complete subgraphs of a given graph. *Proc. All India Interdisciplinary Symposium on Recent Trends of Research and Developments in Digital Technique and Pattern Recognition*, Indian Statistical Institute, 16-17 February.

I. DOCUMENTATION AND LIBRARY SCIENCE

1. GOPINATH, M. A. (1976) : Dewey and Ranganathan (Editorial). *International Classification*, Frankfurt. May.
2. — (1976) : Colon Classification. Symposium on Classification in the 1970s—Second Look. *Ed. by Maltby, Clive Bingley*, London, Chapter IV.
3. — (1977) : Languages of indexing and classification : A linguistic study of structure and functions. (A review). *International Classification*, Frankfurt..
4. NEELAMEGHAN, A. (1976) : Information technology : applications in development catalysing activities in India. *Library Science*, V 13, N.3-4; Sept-Dec. Paper H.
5. — (1976) : Master of science in information science : a proposal. *Library Science*, V 13, N.3-4, Sept-Dec. Paper N.
6. — (with Devadason, F. J.) (1976) : Introductory course in computer applications in information processing for library and information science schools in India. *Library Science*, V 13; N.3-4, Sept.-Dec. Paper P.
7. RAVICHANDRA RAO, I. K. (1976) : Computerisation of POPSI. *Library Science*, V 13, N.3-4, Sept-Dec. Paper J.
8. — (with Iyer, Hemalatha) (1976) : Computer-based SDI : Cobol programme. *Library Science*, V 13, N.3-4, Sept.-Dec. Paper K.
9. SETHARAMA, S. (1976) : Library and information science research in India : An analytical study based on the input to ISORID. *Library Science*, V 13, N.3-4, Sept. Dec. Paper M.

J. ELECTRONICS, COMPUTERS AND COMMUNICATION SCIENCE

1. DAS, J. (with Majumdar, A. K.) (1977) : Information processing in artificial neural net. *Proc. All India Interdisciplinary Symposium on Recent Trends of Research and Developments in Digital Technique and Pattern Recognition*, Calcutta, 16-17 February.
2. DUTTA, A. K. (with Ganguli, N. R., Mukherjee, B. and Roy, S.) (1977) : A formant transition as a cue for automatic recognition of plosive. *Proc. All India Interdisciplinary Symposium on Recent Trends of Research and Developments in Digital Technique and Pattern Recognition*, I.S.I. Calcutta, 16-17 February.

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8. — (with Das, J.) (1967) : Formation of magnetic bubbles and their application as computer storage element. *C.S.I.R. J. Technology*, 35, 3, March, 149-162.
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10. — (with Pal, S. K.) (1977) : Fuzzy sets and decision-making approaches in vowel and speaker recognition. *I.E.E.E. Trans. on Sys. Man. & Cyb.* August.
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13. — (with Pal, S. K. and Chowdhury, B. B.) (1977) : Fuzzy sets in hand-written character recognition. *Proc. All India Inter-disciplinary Symposium on Recent Trends of Research and Developments in Digital Technique and Pattern Recognition* ISI, Calcutta, 15-17 February.
14. — (with Datta, A. K. and Das, J.) (1977) : On some methods of automatic testing of electronic memory cores and planes. *Proc. Conference on Testing and Evaluation*, Calcutta, 8-10 January.
15. MAJUMDAR, A. K. (1977) : Least squares identification algorithm of linear systems. *Proc. Annual Convention*, Computer Society of India, 14-16 January.
16. — (1977) : On a minimum parameter mathematical neural model. *Proc. All India Interdisciplinary Symposium on Recent Trends of Research and Developments in Digital Technique and Pattern Recognition*, ISI, 15-17 February.

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K. EMBRYOLOGY

1. BRAHAMACHARY, R. L. (with Ghosal, D.) (1976) : Sulfated macromolecules in early embryo of *Limnaea*. *Z. Naturforsch.*, 31, 488.
2. TAPASWI, P. K. (1976) : Investigation on the biosynthesis of sulphur containing compounds in *Limnaea* (Mollusca) oocytes, capsules and jelly during oogenesis period. *Acta Embryol. exp.*, Palermo, Italy, 3, 267-271.

L. FAMILY PLANNING

1. GUHA ROY, S. (with Dasgupta, A.) (1976) : Population estimates for Bangladesh : The use of a specific transitional population model. *Popul. Stud.*, London, 30, 1, 15-35.
2. SENAPPTA, A. (1976) : Dialogue with MIP patients in a hospital ward. *J. Family Welfare*, 22, 4, June 23.

M. LEAF PROTEIN

1. MATAI, S. (with Bagchi, D. and Chanda, S.) (1976) : Effect of seed rate, nitrogen level and leaf age on the yield of extracted protein from five different crops in West Bengal. *J. Sci. Food & Agriculture*, 278-286.

N. LINGUISTIC RESEARCH

1. MITTER, ALOKANANDA (with Krishnamurti, Bh.) (1977) : A Short Outline of Telugu Phonetics. Djurdje Kostic. Indian Statistical Institute, 1-206.

O. PHYSICS

1. GUPTA, A. B. (with Halder, B.) (1976) : Electrophysics and its applications in dermatology. *The Indian Practitioner* : XXIX, 8, 387-400.

P. PHYSICS OF FLUIDS

1. DERNATH, K. D. (with Ghosh, A.) (1976) : On stationary rectilinear vortices in the corner of plane walls meeting at right angle. *Bull. Calcutta Math. Soc.*, 66, 91-99.

Q. PLANNING, ECONOMIC STATISTICS AND ECONOMETRICS

1. BHATTACHARYYA, N. (with Chatterjee, G. S.) (1976) : On levels of consumer prices in rural area of different states by area of budget. *J. Income and Wealth*, Indian Association for Research in National Income and Wealth, I, 1, 59-66.
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4. CHATTOPADHYAY, SUHAS (1977): Falling tendency of the rate of profit in Indian manufacturing industries. *Social Scientist*, Jan., Feb. 64-65, 24-48.
5. DEY, B. (1976): Redistribution of consumer expenditure through taxation and benefits and level of living—a case study in West Bengal. *Arthavijana*, March 1, XVIII.
6. — (1976): A measure of disparities in distribution of higher educational facilities. *Arthavijani*, XVI.
7. ROY, B. (1976): Growth of real income in West Bengal: 1960-61 to 1973-74, *Arthavijani*, XVI.
8. ROY, BINA (1976): Growth of income from small-scale industries in India over the plan period. *Industrial Situation in India*, May, V, 2.
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10. — (1976): An assessment of the eastern regions' development. *ERA* August, I, 5.
11. RUDRA, A. (with Chattopadhyay, M.) (1976): Size-productivity revisited. *Economic and Political Weekly*, September, XI, 39.
12. — (1976): Planning for the development of indigenous technology. *UNCTAD*, Geneva, October.
13. SHARMA, A. N. (with Bhat, D. R.) (1976): The pattern of urban development in the Karnal district. *Jour. Agr. Geog. Soc.*, V, (1974—late issue).

B. PRE-CENSUS POPULATION STUDIES

1. BHATTACHARYYA, ANIMA (with Dasgupta, Sandhya) (1976): Twenty-two villages in the district of Etawah. Some trends in socio-economic conditions, 1822-1971. *Quarterly Columns*, 1, 1, January-March, 33-42.
2. BHATTACHARYYA, DURGAPRASAD (1977): Data Base of Historical Demography in India since 1771. Bose, Ashis, et al ed. *Population Statistics in India*, New Delhi. (Data Base of Indian Economy, Vol. III). Vikash Publishing House, 375-378.
3. — (1977): A document of a socio-economic survey of Gorakhpur, 1813-14. *Proc. India Historical Records Commission*. Fortyfourth Session, 231-237.
4. DEB ROY, RAMA (1977): Panchas bachhare taman kicohui badlayani—a note on a survey of Ballavpur, Birbhum. *Bhumilazmi*, 1, 4, 6-7.

S. PSYCHOMETRY

1. BANERJEE, SURENDRANATH (1976): A study on psychic determinism of some physically-handicapped children. *J. Psychological Researches*, 20, 3.

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2. CHATTOPADHYAY, S. (with Mukherjee, M., Chakraborty, S. N. and Hasan, M. K.) (1976) : Effect of sex, urbanisation and caste on anxiety. *J. Psychological Researches*, 20, 3, 55-58.

T. SOCIOLOGY

1. BANDYOPADHYAY, SURAJ (1976) : Caste 'lost' and caste 'regained' : some aspects of a sociology of empirical research on village India, *Dimensions of social change in India*, 115-134, eds. Srinivas, M. N., Sahaiah, S. and Parthasarathy, V. S., New Delhi, Allied Publishers.
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8. — — (with Rudra, Asok) (1976) : Size-productivity revisited. *Economic and Political Weekly*, Bombay, 11 (39), A-104-A-116.
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11. — — (1976) : An empirical investigation on a few sociological correlates and their influence on job satisfaction. *Abstract, Brochure on Paper Abstracts of the Fourteenth Annual Conference, Indian Academy of Applied Psychology, IIT, Kharagpur*, Dec. 20.
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14. MUKHERJEE, B. (1977) : Social change and diagnostic research in : *Dimensions of Social Change in India* (35-58), eds. Srinivas, M. N., Seehalah, S. and Parthasarathy, V. S., New Delhi, Allied Publishers.
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16. — (1976) : *Family and Planning in India*, Orient Longmans, New Delhi.
17. — (1978) : The construction of social indicators, *The use of socio-economic indicators in development planning*, 33-59, ed. Unesco, Unesco Press, Paris.
18. — (1977) : Report on a workshop on regional sociology, *Social Science Information*, Paris, 15 (6), 979, 980, and *Sociological Bulletin*, New Delhi, 1, 104-106, March 1978.
19. SOCIOLOGICAL RESEARCH UNIT (1976) : Understanding social reality, *Curr. Anthrop*, Chicago (USA), 17 (2), 220 & 242.

U. STATISTICAL QUALITY CONTROL

1. BASU, P. K. (1976) : Plant wide quality improvement programme—approach and organisation. *Quality* (House Magazine of BHEL), June 1-2.
2. GOPALAN, V. (1976) : Statistics in decision making. *Management Review and News Letter*, Baroda Management Association, January 9-16.
3. LAKSHMIKRANTHAN, P. R. (1977) : Quality assurance in liquid filling operations. *QR J.* January 1-2.
4. MUKHERJEE, S. P. (1976) : On the estimation of quality of one reserve through statistical models and decision process. *Indian J. Earth Science*, 4, 2, 137-141.
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V. THEORETICAL PHYSICS

1. BANDYOPADHYAY, P. (with Bhattacharyya, S.) (1976) : Lepton-hadron relation, and the copious electron production with small transverse momenta in pp scattering at $S = 2800 \text{ Ge}^2$. *Lettere al Nuovo Cimento*, 17, 393.
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3. — (with Roy, S.) (1976) : Some remarks on non-local field theory and space-time quantisations. *International Journal of Theoretical Physics* (U.K.).
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5. SEN, S. (with Basak, S.) (1976) : Decay and CP conservation. *Lettere al Nuovo Cimento*, 15, 635.

Part II Convocation, Visiting Scientists, Honours and Awards, Scientific Tours and Assignments

XIII. ELEVENTH CONVOCATION : INDIAN STATISTICAL INSTITUTE

13.1. The Eleventh Convocation of the Indian Statistical Institute, held on 17 February 1977, was presided over by Shri Subimal Dutt, President of the Institute. Shri P. N. Haksar, Chairman, Indian Statistical Institute, welcomed the guests. Professor Harold Cramer, School of Actuarial Mathematics and Mathematical Statistics, University of Stockholm, Sweden, delivered the Convocation Address. Professor G. Kallianpur, Director, Indian Statistical Institute, presented the annual review of research and training. Ninety-six candidates received diplomas and certificates.

Eleven candidates were awarded the Ph.D. degree, 27 the M.Stat. degree and 18 the B.Stat. degree. In the professional examinations, six candidates were awarded the Statistician's Diploma. Thirty-four candidates were awarded diplomas in Statistical Quality Control and Operations Research after completing successfully their training in Bombay, Calcutta and Madras.

13.2. Convocation : International Statistical Education Centre, Calcutta :

The International Statistical Education Centre (ISEC), Calcutta, held its annual convocation on 29 March 1977. Certificates were awarded to 20 trainees from 12 countries who successfully completed the thirtieth term of the ISEC (*June 1976-March 1977*) and the Special Courses. Professor Bhabatoosh Dutta, Chairman, Centre for Studies in Social Sciences, Calcutta, presided. Professor G. Kallianpur, Director, Indian Statistical Institute, welcomed the guests. Dr. N. Bhattacharyya, Member-Secretary, Board of Directors, ISEC, presented the report of the term.

XIV. VISITING SCIENTISTS

A number of distinguished foreign scientists participated in the research, training and other scientific activities of the Institute during the year. Some of them came to the Institute on invitation and spent fairly long periods at the Institute to assist in the regular work, while others came for short periods and gave lectures and seminars. Most of them were available for consultations by research workers and teachers of the Institute.

1. The following scientists visited the Institute on invitation and worked for fairly long periods during the year.

DR. EDWIN H. COLBERT, Division of Vertebrate Palaeontology, Museum of Northern Arizona, U.S.A.; accompanied by Mrs. Colbert (12-31 January 1977) came on his second visit in connexion with geological research being conducted at the Institute and to participate in the Fourth International Gondwana Symposium. He had come to the Institute earlier in 1964. *Lectures* : Antarctic fossils ; key pieces in the Gondwana puzzle.

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PROFESSOR YADOLAH DODGE, Head, Department of Statistia and Computer Science, Jundi Shapur University, Ahwas, Iran (8 June 1976-28 July 1976) collaborated with Dr. K. R. Shah in a series of papers, during his stay in the Delhi Centre. He visited Calcutta (8-10 July 1976) and discussed some biometrical problems relating to cultivated date palms.

PROFESSOR V. P. GODAMBE, Department of Statistics, University of Waterloo, Canada, who participated in the teaching for the M.Stat. courses, visited for the whole of the academic year 1975-76 at the Delhi Centre. He left on 5 August 1976. *Lecture (Calcutta)*: Estimating equations.

DR. ZAKRULA GOVINDARAJULU, Department of Statistics, University of Kentucky, Lexington, U.S.A. (14 November 1976-8 March 1977) taught as a Visiting Professor in the M.Stat. courses at the Delhi Centre. He delivered six lectures at the Delhi University and visited the universities of Punjab, Osmania and Gujarat and the Indian Institute of Mathematics, Ahmedabad, to deliver seminar lectures. He gave talks on the following occasions :

- (i) Annual Conference, Indian Econometric Society, Tirupati, 17-19 December 1976,
- (ii) Seminar in Statistical Inference, Chandigarh, 21-25 December 1976. He had visited the Institute earlier in 1966-67 and 1974.

PROFESSOR IOOB KIRPATOVSKY, Professor of Surgery and Chief of Department of Operative Surgery and Laboratory of Transplantation of Organs, People's Friendship University, Moscow (9 July 1976-1 October 1976) came under the Indo-Soviet Cultural Exchange Programme to study family planning and organ transplantation in India and visited Bombay, Bangalore, Calcutta, Delhi and Madras.

DR. JURGEN KLEFFE, Central Institute of Mathematics and Mechanics, Academy of Science, German Democratic Republic (November 1976-19 February 1977) came under the Indo-G.D.R. agreement on scientific co-operation. His work was mainly concerned with linear model theory where the dispersion matrix involves unknown parameters. He participated in a lecture series on linear models at the Delhi Centre. He had discussions on the mathematics of sunflower head and the bio-mechanics of the coconut crown in the Crop Science Unit.

PROFESSOR D. KOSTIC, Director Institute for Experimental Phonetics and Speech Pathology, Belgrade, Yugoslavia (15 December 1976-4 April 1977) came to the Institute on his ninth visit during the year in connection with the programme of fundamental linguistic research being conducted in collaboration between the Indian Statistical Institute and the Institute of Experimental Phonetics and Speech Pathology. His visit was arranged under the Indo-Yugoslav Cultural Exchange Programme.

Professor D. Kostic visited Agartala, Hyderabad and Delhi in connection with his research work. In Agartala, Tripura State, he conducted a ten-day seminar on the Integration of Hearing-impaired Children in schools for children with normal hearing, at the Institute for Speech Rehabilitation, Agartala (1-10 February 1977). He met State Ministers and officials to discuss problems in the education of hearing-impaired children.

In Hyderabad, he inaugurated a Special Course in Linguistics for language teachers in the Osmania University (21 January 1977). He held discussions with professors at the

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Omanis University and representatives of the Health Service Department on inter-disciplinary collaboration in the area of speech pathology.

In Delhi, he had discussions at the Department of Linguistics, Delhi University, Central Hindi Institute, and the National Council of Educational Research Training (NCERT), on the preparation of a methodology for speech habilitation of hearing-impaired children with Hindi as their mother-tongue and on a study of the acoustic and articulatory structure of Punjabi.

In Calcutta, he conducted a one-day seminar for teachers of deaf children on 'The Kostiic Methodology for Habilitation of Speech and Language in the Hearing-Impaired' (20 February 1977).

Lectures: (i) The relevance of linguistics in education (Agartala), and (ii) Basic articulatory parameters of speech sound classification (Calcutta).

PROFESSOR ANDREW T. A. LEARMONTH, Department of Geography, Open University, Milton Keynes, U.K. (1 November 1976-25 February 1977) came on a visit jointly sponsored by the Indian Council of Social Science Research and the Indian Statistical Institute, to work at the Regional Survey Unit, ISI, Delhi, with which he had been associated since 1966. During his stay, he studied recent trends in regional survey and planning and aspects of medical geography. *Lectures*: (i) The Open University System (Delhi and Calcutta), (ii) Eco-systems and human geography or eco-systems too, (iii) Medical geography: problems of common interest with statisticians?

PROFESSOR V. MOUREMSTOV, Department of Political and Social Sciences, Institute of Oriental Studies, USSR Academy of Sciences; accompanied by Mrs. Mouremstov. 9 September 1976-6 August 1977.

PROFESSOR T. E. S. RAOHAVAN, Department of Mathematics, University of Illinois, Chicago Circle, U.S.A., participated in the teaching for the M.Stat. courses and stayed at the Delhi Centre for the whole of the academic year 1966-76. He left on 5 July 1976.

PROFESSOR K. SCHMIDT, University of Warwick, England, spent a substantial part of the academic year 1976-78 at the Delhi Centre, to participate in the teaching of M.Stat. courses as a Visiting Professor. He left in March 1978.

PROFESSOR K. R. SHAH, Department of Statistics, University of Waterloo, Canada, (19 July 1976-30 April 1977) taught in the M.Stat. courses in the Delhi Centre as a Visiting Professor. He collaborated with Visiting Professor Yadolah Dodge in a series of papers. He attended the Thirteenth Annual Conference, Indian Society of Agricultural Statistics, Bhubaneswar (30 December 1976-1 January 1977) and presented a paper. He also delivered seminar lectures at the I.S.I.

DR. N. SHINOZAKI, Keio University, Japan (3 October 1976-20 December 1976) worked at the Delhi Centre and participated in a seminar series on Linear models.

PROFESSOR G. TAOUCHI, College of Science and Engineering, Aoyama Gakuin University, Tokyo, S.Q.C. expert (25 March 1976-9 April 1976 & 3-7 January 1977) conducted a number of training courses on Design and Analysis of Industrial Experiments with special reference to orthogonal array, at the SQC centres of the Institute.

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DR. HARUO YAMAI, Department of Epidemiology, Faculty of Medicine, University of Tokyo (25 January 1977-6 April 1977) worked at the Delhi Centre.

DR. ISAO YOSHIMURA, Nagoya University, Japan (11 December 1976-3 April 1977) came to work as the Visiting Professor, International Statistical Education Centre, Calcutta. He taught the regular course trainees, "Statistical Methods" during December-January; later during February-March, he taught, "Regression Analysis" and "Measures of Inequality" to the group of regular course trainees specialising in Economic Planning. He also offered a short course of lectures on "Data analysis of pollution problems" for the M.Stat. third year students, specialising in Applied Statistics and Data Analysis.

Seminars : Statistical analysis of environmental pollution problems.

II. The following are some of the scientists who paid short visits, gave lectures and/or seminars, and participated in conferences :

PROFESSOR S. S. ABHYANKAR, Purdue University, USA. 18-26 January 1977.
Lectures : Algebraic geometry.

DR. RANAN B. BANERJEE, Department of Computer and Information Science, Temple University, Philadelphia, U.S.A. 19 July 1976. *Lecture* : Pattern recognition.

DR. A. K. BASU, Laurentian University, Sudbury, Canada. 16-23 June 1976.
Lectures : (i) Functional central limit theorem for stationary random fields; (ii) Rate of convergence to normality for dependant random variables.

PROFESSOR A. P. BASU, Chairman, Department of Statistics, University of Missouri, Columbia, U.S.A. 10 January 1977. *Lecture* : Some problems in reliability estimation.

PROFESSOR G. K. BHATTACHARYYA, University of Wisconsin, U.S.A. 28 August 1975-31 May 1976. *Lecture* : Inference on system reliability for component testing.

SHRI G. G. BHATTACHARYYA, Research Fellow, University of Ghana, spent a few weeks at the Delhi Centre, ISI, intermittently during October 1976-January 1977 and worked with Dr. K. R. Shah. *Seminar* : Analysis of experiments.

PROFESSOR J. M. BENNET, University of Sydney, Australia. 25 October 1976.
Lecture : Quadratic programming.

PROFESSOR A. BENSOUSSAN, University of Paris and Iria, Racquencourt, 27-30 January 1977. *Lecture* : Impulse control.

PROFESSOR C. BERG, Director of Research, C.N.R.S., Paris. 27 November 1976-25 December 1976. *Lectures* : (i) Fractional graph theory and the Zarankiewicz problem, (ii) Introduction to hypergraphs, (iii) Scheduling problems and multi-colouring graphs (Delhi).

DR. M. N. BHATTACHARYYA, University of Queensland, Australia. *Lectures* : Linear filter, the series models, and their applications in evaluating an econometric model. 15 November 1976.

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DR. W. J. GAMBROW, Dean, School of Library and Information Science, University of Western Ontario, Canada. 8-10 December 1976. *Sarada Bangsanathan lectures (DRTO):* Bibliographical control of early books and its significance for international cooperation.

SRI A. B. CHAKRABORTY, Scientist, Indian National Scientific Documentation Centre, New Delhi. December 1976-January 1977. *Lectures (DRTO):* Symbolic language.

MR. NIGEL R. CROOK, Fellow in Economics, School of Oriental and African Studies, University of London, U.K., 24 September 1976-21 October 1976, worked in the Demography Unit. His work was mainly concerned with research in demographic characteristics (structure and change) in Indian towns during 1951-71, with particular reference to the Eastern Region, using empirical data and theoretical models to indicate the demographic consequences of industrial location policies over time. *Seminar:* Some demographic implications of industrialisation.

PROFESSOR HARALD CRAMER, Sweden. 17 February 1977-1 March 1977. *Lectures:* (i) A comparison between Wiener's generalised harmonic analysis and the theory of stationary stochastic processes, (ii) Introductory survey of the multiplicity theory of stochastic processes; (iii) Some further contributions to multiplicity theory.

DR. P. DASGUPTA, Systems Manager, Operations Research Group, Baroda. 6 July 1976. *Lecture:* VARIAN computer systems.

DR. S. DASGUPTA, University of Minnesota, U.S.A. 1-10 September 1976. *Lectures:* (i) Nearest neighbour rule of density estimation, and pattern recognition, and (ii) S -unimodal function.

PROFESSOR CHANDRAKANT M. DRO, Department of Mathematics, University of Ottawa, Canada. 1 September 1976-1 October 1976. *Lecture:* Limit theorems for delayed sums.

SRI P. J. DEIVADASAN, Computer Centre, Indian Institute of Technology, Madras. 14 May 1976. *Lecture:* TEXTPAC and police information system.

PROFESSOR MICHEL DEZA, Associate Professor of Research, C.N.R.S., Paris. 16-25 December 1976. *Lectures:* (i) On t designs and matroid designs, (ii) On coding theory and permutation groups (Delhi Centre).

PROFESSOR ALLAN J. ELLIS, Department of Mathematics, University College, Swansea, Wales, U.K.; accompanied by Mrs. Ellis. 21 January 1977-23 March 1977. *Lecture:* Proof of a non-compact Choquet theorem using martingales.

PROFESSOR D. N. GHOSH, Howard University, U.S.A. 10 January 1977. *Lecture:* Some topics in H -algebras and generalised Hilbert space.

SRI B. GUHA, Scientist, Indian National Scientific Documentation Centre, New Delhi. 5 May 1976. *Lecture:* Current trends in international cooperation among information systems.

PROFESSOR HERBERT HAYES, University of Tubingen, Federal Republic of Germany. 19-21 April 1976. *Lecture:* Sufficiency and comparison of experiments.

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DR. H. T. HOOKWAY, Deputy Chairman and Chief Executive, British Library Board, London. 8 December 1976. *Lecture (DRTC)*: The British Library.

Mrs. HEATHER JOSHI, Economic Adviser's Office, Department of Health and Social Security, U.K. 24 December 1976. *Lecture*: The urban informal economy and its boundaries.

SRI S. L. KATE, Reader in Biochemistry, Genetics Division, B. J. Medical College, Poona. 23-26 December 1976. *Seminar lectures*: (i) Distribution of haemoglobin types in some Maharashtrian populations; (ii) A study of G-6-PD deficiency and some genetic markers among the Warlis, a Western Indian tribal group.

PROFESSOR JAN KUCERA, Washington State University, Pullman, U.S.A. 16-17 December 1976. *Lecture*: Multiplication of temperate distributions.

ACADEMICIAN M. A. LAVRENTIEV, USSR Academy of Sciences, delegate, Indian Science Congress, Bhubaneswar. 30 December 1976-1 January 1977. *Lecture*: Quasi conformal mappings and their applications.

PROFESSOR M. M. LAVRENTIEV, USSR Academy of Sciences, delegate, Indian Science Congress, Bhubaneswar. 30 December 1976-1 January 1977. *Lecture*: Not well-posed problems of analysis.

PROFESSOR IAN B. MACNILL, University of Western Ontario, Canada. 9 April 1976. *Lecture*: Testing for change of parameter at unknown time.

SRI N. M. MALWAD, Scientific Officer, Bhabha Atomic Research Centre, Bombay. 7-12 March 1977. *Lectures (DRTC)*: International nuclear information system.

DR. P. P. M. MEINCKE, Provost, University of Toronto, Canada. 16 February 1977. *Lecture (DRTC)*: Appropriate technology.

DR. K. N. MURTHY, Sardar Patel Institute, Ahmedabad. 3 July 1976. *Seminar*: Non-linear demand analysis.

SRI K. S. NAGARAJAN, Officer-in-charge, INSDOC Regional Centre, Bangalore. February-March 1977. *Lectures (DRTC)*: Repography.

DR. V. I. PATAPOV, Deputy Director, Institute of the Far East, USSR Academy of Sciences. 23 February 1977-4 March 1977. *Seminar*: Development of agriculture in China : modern period.

DR. PATSIOR R. PENLAND, an expert in Communication Science, University of Pittsburgh, Pennsylvania, U.S.A. (February-March 1976) was in the Documentation and Research Training Centre, Bangalore, on a fellowship programme. *Lectures*: (i) Human communication among librarians; (ii) Inductive and deductive approaches to communication. (iii) Intrapersonal communication system; (iv) Intrapersonal aspects of human communication.

DR. GOPAL PRASAD, School of Mathematics, Tata Institute of Fundamental Research, Bombay. 8-10 November 1976. *Lecture*: Strong approximation in algebraic graphs.

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SHRI A. S. RAJKADA, Scientist, Indian National Scientific Documentation Centre, New Delhi. 27 September 1976. *Lecture*: OHEM/SDI—India and computer-based information retrieval.

DR. N. P. RAO, Director, Defence Institute of Stores Preservation and Packaging, New Delhi. 18 September 1976. *Lecture*: Packaging design for protection and communication.

DR. E. SAMAHA, Director, National Documentation Centre, National Council for Scientific Research, Lebanon. 27 & 28 November 1976. *Lectures*: (i) Current agricultural research information system; (ii) Documentation activities in Lebanon.

PROFESSOR P. K. SEN, University of North Carolina, Chapel Hill, U.S.A. 16 July 1976–2 October 1976. *Lectures*: (i) Non-parametric statistical inference based on weak convergence of stochastic processes; (ii) Robust statistical procedure in clinical trials and life-testing problems.

PROFESSOR NUBUO SHINOSAKI, Department of Mathematics, Faculty of Engineering, Keio University, Japan. 18–26 December 1976.

DR. RANJAN KUMAR SOM, United Nations Expert on Population Studies, 10 August 1976. *Lecture*: U.N. activities in the field of population.

PROFESSOR B. V. SUKHATME, Department of Statistics, Iowa State University, Ames, U.S.A. 1–3 July 1976. *Lecture*: Sampling with unequal probabilities and without replacement.

SHRI H. G. SURYANARAYANA, International Computers (India) Ltd., Bangalore. December 1976–January 1977. *Lecture (DRTC)*: COBOL programming.

DR. M. D. TURNER, Programme Director for Earth Sciences, National Science Foundation, Polar programmes, Washington; accompanied by Mrs. J. Turner. 16–30 January 1977. He joined the excursion to the Godavari Valley where the geologists of the Institute have been conducting field investigation, after the Fourth International Gondwana Symposium. *Lecture*: My experience in Antarctica.

III. The following are some of the visitors who came to the Institute for short periods on different assignments:

PROFESSOR R. E. BARLOW, University of California, U.S.A. 27 November 1976–1 December 1976.

PROFESSOR R. J. BHANSHALI, University of Liverpool, U.K. 23–26 April 1977.

DR. HANS GRUNBERG, F.R.S., Professor Emeritus, University College, London. (7–14 November 1976) accompanied an expedition, organised by the Crop Science Unit, to study asymmetry of mollusc at the Sagar Islands, West Bengal.

PROFESSOR J. E. JAYNE, University College London. 4 April 1977–15 May 1977.

DR. V. A. KAMATH, Head, Library and Information Sciences, Bhabha Atomic Research Centre, Bombay. 9 May 1976.

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PROFESSOR KRASOVEC, a leading demographer and agricultural economist from Ljubljana, Yugoslavia, visited the Delhi Centre. 23 December 1976.

PROFESSOR LEONID SEMERONOVICH KUZNESTOV, Assistant Professor, Chair of Thermodynamics and Heat Engines, Peoples' Friendship University, Moscow, (8 April 1976-28 May 1976), visited the SQC Units in Bombay and Madras.

PROFESSOR K. R. PARTHASARATHY, Indian Institute of Technology. 29-31 August 1976.

SHRI S. PARTHASARATHY, Scientist-in-charge Indian National Scientific Documentation Centre, New Delhi. 5 May 1976.

PROFESSOR N. W. PIRIE, Emeritus Professor, University of Reading, U.K. (22-24 September 1976) who had helped in initiating research work in the Leaf Protein Unit during earlier visits, came on his fifth visit for consultations. His trip was sponsored by the Royal Society as a delegate to the International Union of Biologists.

PROFESSOR M. S. RAJUNATHAN, School of Mathematics, Tata Institute of Fundamental Research, Bombay. 28 February 1977-1 March 1977.

PROFESSOR S. S. SRIKHANDÉ, Department of Mathematics, Centre for Advanced Studies of Mathematics, Bombay University. 29-31 August 1976.

DR. FRIEDRICH STANG, Director, Geographical Institute, Rhemish-Westphalian Technical University, visited the Delhi Centre for discussions regarding problems relating to industrial development, urbanisation and integrated regional development. 8 December 1976.

PROFESSOR L. TCHERKASSKY, Head of Publication Department, Institute of Oriental Studies, USSR Academy of Sciences. 2-23 March 1976 & 25 November 1976-8 December 1976.

DR. VLADIMIR YASHKIN, Institute of Oriental Studies, USSR Academy of Sciences. 7 November 1976-1 December 1976.

PROFESSOR GEORGE TILLO, University of Wisconsin, Madison, U.S.A. 11-13 February 1976.

XV. HONOURS, AWARDS AND SPECIAL ASSIGNMENTS

15.1. *Honours and Awards* : Dr. G. Kallianpur, Director, was elected member of the following committees :

- (i) Chairman, Advisory Committee, Shantiswarup Bhatnagar Prize for Science and Technology, 1976 and 1977.
- (ii) Member (*ex-officio*), Advisory Committee, Anthropological Survey of India.
- (iii) Member, Specialist Panel in Mathematics, University Grants Commission (two years).
- (iv) Member, Academic Planning Board, Jadavpur University, 1976.
- (v) Member, Committee for Conference on Stochastic Processes, for a term of four years (1977-1981).

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Dr. C. R. Rao Jawaharlal Nehru Professor, was awarded an honorary D.Sc. degree by the University of Athens, Greece, at a Special Convocation, 15 April 1976. He was also awarded an honorary D.Sc. degree by the Osmania University at a Convocation, 13 March 1977.

Dr. C. R. Rao was elected Chairman, Indian Econometric Society, for a period of five years at the Society's Sixteenth Annual Conference.

Shri Suhas Chatterjee (*Economic Research*) was awarded the Ph.D. degree by the Calcutta University in 1976 for his thesis, "Technological progress and the law of falling tendency of the rate of profit in classical and Marxian economics."

Shri P. Roy Choudhuri (*Electronics*), a research scholar in theoretical physics during 1969-72, who submitted his thesis in 1972 from the Indian Statistical Institute, was awarded the D.Sc. degree by the Calcutta University.

15.2. *Special Assignments*: Dr. D. K. Bose (*Economic Research*) served as a member, Expert Committee set up by the State Planning Board, Government of West Bengal, for the preparation of a report on "Environmental Pollution in the State of West Bengal," which was released in July 1976.

Shri P. Bandyopadhyay (*Electronics*) acted as the Chairman, Seminar (Particle Physics Section) organised by the Calcutta Chapter, Indian Physics Association, Calcutta, September 1976.

Dr. L. S. Bhat (*Delhi Centre*) was invited to serve as a member, Economic Development Council, Government of Uttar Pradesh, for the formulation of regional and district plans.

Shri Durgaprasad Bhattacharyya (*Pre-Census Population Studies*) was nominated by the Government of India as a member, Standing Committee, Indian Historical Records Commission. He was re-elected as the Secretary, Socio-economic Research Institute, Calcutta.

Shri M. Chattopadhyay (*Sociology*) was selected a member, Committee on Data Archives, Indian Council of Social Science Research, New Delhi.

Sreemati Jayshree Duttgupta (*Electronics*) re-joined the Institute in March 1977, after completing successfully her M.Phil degree at the Brunel University, London.

Professor R. Mukherjee (*Sociology*) was elected member of the following-committees:

- (i) UNESCO Expert Committee on Indicators of Economic and Social Change, Paris.
- (ii) Executive Committee and Editorial Committee, International Sociological Association, Montreal, Canada.
- (iii) Board of Studies in Statistics, University of Nagpur, as an expert.
- (iv) National Committee for the Tenth International Congress of Anthropological and Ethnological Sciences (constituted by the Ministry of Education, Government of India).

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(e) Special Committee, Indian Council of Social Science Research, to evaluate the programme of training in research methodology.

(vi) Research Committee, Indian Council of Social Science Research.

(vii) Executive Committee and Editorial Committee, Indian Sociological Society, New Delhi.

Professor A. Neelamegham (*D.R.T.C.*) served as a member, Special Advisory Board set up by the UNISIST (World Information System for Science and Technology) for preparing the general outline for a course in administration for managers of information services and centres.

Dr. Supriya Sengupta (*Geological Studies*) was re-elected to the Council, Geological, Mining and Metallurgical Society of India, for a second term in February 1977.

XVI. SCIENTIFIC TOURS AND ASSIGNMENTS ABROAD

Professor G. Kallianpur, Director, attended the European Meeting of Statisticians, Grenoble, France, 6-10 September 1976, and gave a lecture on 'Non-linear Filtering Theory'.

Professor G. Kallianpur left for Canada in November 1976, and gave a lecture on 'A Problem in Non-linear Prediction', at the Department of Mathematics, McGill University, Montreal, Canada.

Dr. C. R. Rao, Jawaharlal Nehru Professor, attended the (i) Second meeting of the Directors, International Statistical Education Centre, Amsterdam, 20-23 April 1976, (ii) Meetings of the Executive Committee, International Statistical Institute, 26-27 April 1976, and (iii) Meetings of the Executive Committee and Council, International Statistical Institute, Belgrade, 30 August 1976. The scientific programmes and the arrangements for the international conference in Delhi were discussed at these meetings.

Dr. C. R. Rao attended the annual meeting, Institute of Mathematical Statistics (I.M.S.), New Haven, 18-20 August 1976. At the General Business Meeting of the I.M.S. on the 19th, Dr. Rao took charge as President of the Institute from the past President Professor D. L. Burkholder. He also presided over the council meeting and the banquet. Dr. Rao is the first person outside the USA to be made the President of the I.M.S. Dr. Rao proposed at the Council meeting of the I.M.S. on 20 August that a regional meeting of the I.M.S. jointly with the Indian Statistical Institute may be held in New Delhi immediately after the International Statistical Conference in December 1977. The proposal was accepted.

Dr. C. R. Rao attended the joint meeting of the International Biometric Society and the American Statistical Association, Boston, 21-24 August 1976. He was an invited discussant in the sessions on (i) Multivariate methods in biometry, (ii) Growth studies, and (iii) Statistical ecology.

Dr. C. R. Rao attended the undormentioned gatherings :

(i) Advanced Seminar on Classification and Clustering, 3-5 May 1976, Mathematics Research Centre, University of Wisconsin, Madison.

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Invited talk : Cluster analysis applied to a study of race mixture in human populations, 4 May 1976.

(ii) Symposium on Statistical Decision Theory and Related Topics, 17-19 May, 1976, Purdue University, West Lafayette, Indiana.

Invited talk : Simultaneous estimation of parameters—a compound decision problem, 19 May 1976.

(iii) Symposium on Applications of Statistics, 14-18 June 1976. Wright State University, Dayton, Ohio.

Invited talk (with G. P. Patil) : Weighted discrete distributions, 14 June 1976 and also banquet speech, 16 June 1976.

Special invited lectures were delivered by Dr. C. R. Rao at the following : 1. University of Athens, Greece, 16 April 1976. 2. University of Wisconsin, White Water, USA, 6 May 1976. 3. University of Wisconsin, Milwaukee, 7 May 1976. 4. Kent State University, 21 May 1976. 5. Oakridge National Laboratory, 24 May 1976. 6. University of Tennessee, Knoxville, 25 May 1976. 7. University of Texas, Genetics Research Centre, Houston, 31 May 1976. 8. Institute of Statistics, Belgrade, 9 September 1976.

Dr. N. Bhattacharyya (*Economic Research*) participated in a five-week study tour of the United Kingdom, USA, and Brazil as a member of a team of Indian scientists deputed by the Government of India for studying various aspects of a three-year project on "Road User Costs" undertaken by the Central Road Research Institute (CRRI), New Delhi, with financial support from the Government of India and the World Bank. The Indian Statistical Institute will collaborate with the C.R.R.I. in the statistical aspect of the project. The Indian team had discussions with scientists engaged in similar research. Dr. Bhattacharyya left India on 11 February 1977 and returned on 21 March 1977.

Dr. Sankar Chatterjee (*Geology*), on leave from the Institute, served on the staff of the Department of Paleontology, University of California, Berkeley; Museum of Comparative Zoology, University of Harvard, Cambridge, U.S.A. and as Associate Professor, Department of Geology, George Washington University, Washington, D.C.

Professor D. Dutta Mazumdar (*Electronics and Communication Science*) went to Singapore to present a paper at the First South East Asia Regional Computer Conference, 6-9 September 1976. He visited the Singapore University and scientific organisations at Bangalore and Kuala Lumpur on his return journey.

Shri M. A. Gopinath (*D.R.T.O.*) participated in a course in Experimental Data Handling organised jointly by the International Council for Scientific Union, Committee on Data for Scientific and Technology and the World Information System for Science and Technology, held at the University of Zagreb, Yugoslavia, 16-20 August 1976.

Shri R. K. Lahiri (*Economic Research*) attended the following : (i) World Conference on Development, Budapest, 2-24 October 1976, as a delegate nominated by the Ministry of External Affairs, Government of India. (ii) Indo-Soviet Seminar on Role of the Public Sector, organised by the Soviet-India Friendship Society, Moscow, 25-27 October 1976.

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He also visited the Karl Marx University in Budapest and Belgrade, Kiev, Leningrad and Tashkent.

Dr. K. C. Malhotra (*Anthropometry and Human Genetics*) visited the following institutions in the U.S.A. (1 April 1976-10 May 1976) to deliver seminar lectures : University of Cornell, University of Pennsylvania, University of Buffalo, University of Lawrence and the Centre for Demographic and Population Genetics, Houston.

Professor R. Mukherjee, Distinguished Scientist (*Sociology*), went to Paris to attend the UNESCO's Expert Committee Meeting on Social Indicators, 19-23 April 1976, as chairman of the meeting. On his way back, he visited the Bielefeld University, Federal Republic of Germany, 24-27 April 1976.

Professor Mukherjee left for the U.S.A. on 18 March 1977 in connexion with a teaching assignment at the Department of Sociology, State of University of New York, Binghamton, U.S.A.

Professor A. Neelameghan (*DRTC*), on an invitation from the United Nations Inter-Agency Task Force on Information Exchange and Transfer of Technology, New York, participated in the Expert Group meeting, Vienna, Austria, 12-16 April 1976. He led the *ad-hoc* working group on "Networking."

The Government of India nominated Professor Neelameghan to participate in the first UNISIST (World Information System for Science and Technology) meeting on the Planning and Implementing of National Information Activities in Science and Technology, Herceg Novi, Yugoslavia, 20-23 April 1976. He presented a key-note paper on "National Information Policy" for discussion.

While in Belgrade, Professor Neelameghan visited the following Institutions on invitation from the Yugoslav National Commission for Cooperation with the UNESCO : (i) Atomic Energy Research Institute, (ii) Federal Statistical Organisation, and (iii) National Library of Yugoslavia.

As the representative of the Government of India, Professor Neelameghan attended the second meeting, UNISIST Ad-hoc Committee on Educational Training Policy and Programme, Paris, 19-21 May 1976. He prepared notes for discussion on "National Information Manpower Development Policy" and "Designing of Library and Information Science Curriculum."

As a member of a three-man team, Professor Neelameghan visited Ghana, 4-24 July 1976, to advise and assist the Council of Scientific and Industrial Research, Ghana, in drawing up a plan and programme for establishing a national information system for science and technology.

Professor Neelameghan participated, on invitation from the UNESCO, in the preparatory meeting of experts, Paris, 28-30 September 1976, to draw up an agenda and documentation plan for holding the Inter-governmental Conference on the Strategy and Policies for Information (SPIN) to be held in 1977. It is being organised jointly by the UNESCO and the Inter-governmental Bureau of Informatics.

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Professor Neelameghani was selected by the Government of India to head the nine-man delegation to the first Indo-US Joint Seminar on Information Resources in the Areas of Energy, Environment and Natural Resources, Washington, D.C., 13-15 October 1976. He contributed a paper, "Information Technology in Resources Management," for discussion at the joint seminar and presented an overview of the STI Infrastructure in India, at the opening session.

The Indian delegation also participated in the Annual Conference, American Society for Information Science (ASIS), San Francisco, 4-9 October 1976.

The team also visited organizations with information facilities in Washington, DC, San Francisco and Columbus and observed the demonstration of information access system.

Professor Neelameghani participated in the UNISIST Seminar on Education and Training of Users of Scientific and Technological Information, Rome, 18-21 October 1976. He contributed a note on "Some aspects of the education and training of information users in high schools and colleges." He was also the rapporteur at the seminar. He is a member of the UNESCO Committee.

At the invitation of the United Nations Asian Development Institute, Bangkok, Professor Neelameghani attended the Development Information Consultative Committee meeting, Pattaya, Thailand, 26-27 February 1977.

Dr. K. R. Parthasarathy (*Delhi Centre*) visited the University of Dar-es-Salaam, Tanzania, 1-10 April 1977, as an external examiner for the B.Sc.-M.Sc. examinations. He also delivered two lectures.

Dr. B. Ramachandran (*Delhi Centre*) spent a month in June-July 1976 with the Department of Mathematics, McGill University, Montreal.

Shrimati Tandra Rao (*Applied Statistics, Surveys and Computing*) left for Belgrade on leave on 29 March 1977.

Dr. J. Roy (*Applied Statistics, Surveys and Computing*) visited the Central Institute of Mathematics and Mechanics, Berlin, German Democratic Republic, from mid-August to mid-September 1976 and gave four lectures. He also visited the Staklova Institute of Mathematics, Moscow, the Technical University, Dresden, and the Computer Training Centre of Messrs. Robotron, Leipzig.

Dr. A. Rudra (*National Income*) attended, as an invited participant, the meeting of the Evaluation of the World Employment Programme of the International Labour Organisation, Geneva, 6-10 December 1976. Dr. Rudra visited the Food and Agricultural Group of the International Institute of Applied Systems Analysis in Vienna.

Dr. T. N. Srinivasan (*Delhi Centre*) left for the U.S.A. on 15 May 1976 and returned on 21 July 1976. While in the U.S.A., he worked at the Department of Economics, Massachusetts Institute of Technology, and gave seminars at the World Bank, Washington D.C. He left on one year's leave of absence on 11 January 1977, to take up an assignment at the M.I.T.

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Dr. S. Tendulkar (*Delhi Centre*) returned on 30 August 1976, after completing a two-year assignment as economist in the Income Distribution Division, Development Research Centre, World Bank. During this period, he worked on the growth and distribution problems of the Third Malaysian Plan for 1976-80.

XVII. SCIENTIFIC ASSIGNMENTS IN INDIA

Professor G. Kallianpur, Director, gave a lecture on 'Energy inequalities for Gaussian Processes', at the Centre for Advanced Study in Mathematics, Bombay University, 30 August 1976.

Dr. A. Basu (*Anthropometry & Human Genetics*) attended the (i) Sixty-fourth session, Indian Science Congress, Bhubaneswar, 3-7 January 1977 and delivered a special lecture, (ii) Third Annual Conference, Indian Anthropological Society, Santiniketan, 14-15 August 1976.

Shri T. K. Basu (*Biometry*) participated in the All India Convention of Chemists, Bangalore, 11-14 December 1976.

Shri S. K. Bhowas (*Sociology*) attended the following: (i) Annual Conference, Indian Anthropological Society, Santiniketan, 14-15 August 1976, as a rapporteur, (ii) Sixty-fourth session, Indian Science Congress, Bhubaneswar, 3-7 January 1977, as a delegate.

Dr. D. K. Bose (*Economic Research*) participated in the following: (i) A meeting of experts of the Indian National Committee for the Tenth World Energy Conference, set up by the Engineers (India), Delhi, 19 April 1976. (ii) Meetings of Expert Committee for Simplification of Returns on Coal Statistics set up by the Ministry of Energy, Government of India, 16 July 1976 and 20 November 1976.

Shri Durgaprasad Bhattacharyya (*Pre-Census Population Studies*) attended the following and presented papers, along with Shri Rama Deb Roy:

1. Sixteenth Annual Conference, Indian Econometric Society, Tirupati, 17-19 December 1976.
2. Fourth National Seminar on Data Base of Indian Economy, Bangalore, 22-24 December 1976.
3. Sixth Meeting, Standing Committee, Indian Historical Records Commission, New Delhi, 24 December 1976.
4. Forty-fifth session, Indian Historical Records Commission, Mysore, 1-2 February 1977.
5. Seminar on Urban Settlement, Gopalpur-on-sea, 28-29 March 1977.

Shri P. Chakrabarti (*Sociology*) attended the Third Annual Conference, Ethnographic and Folk Culture Society, Lucknow, 23-25 January 1977, and presented a paper.

Shri A. K. Chatterjee (*Economic Research*) attended the International Seminar on Role of the State Sector in Developing Countries, New Delhi, 10-12 December 1976. He presented a paper.

Dr. M. K. Chakraborti, Shri B. P. Sinha and Shri P. K. Srimani (*Electronics*) attended and presented papers at the Second All India Symposium on Computer Architecture and System Design, New Delhi, 24-26 November 1976.

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Dr. Asru Kumar Chaudhuri (*Geological Studies*) underwent a one-year course of training in the use and interpretation of aerial photographs applied to geology and was awarded a diploma with honours by the National Remote Sensing Agency, Indian Photo-Interpretation Institute, Dehra Dun, U.P. He left on 4 April 1976 and returned on 29 March 1977.

Shri A. K. Das (*Math-Stat*) attended the Thirtieth Annual Conference, Indian Society of Agricultural Statistics, Bhubaneswar, 30 December 1976-1 January 1977.

Dr. B. C. Das (*Biometry*) attended and presented papers at the following: (i) Symposium on Integrated Earth Sciences, Calcutta, April 1976. (ii) Sixteenth Annual Conference, Indian Econometric Society, Tirupati, 17-19 December 1976. (iii) Fourth National Seminar on Data Base of Indian Economy, Bangalore, 22-24 December 1976. (iv) Indian Population Study Conference, Bangalore, 27-31 December 1976.

Professor T. A. Davis (*Crop Science*) attended the International Symposium on Coconut, Kasaragod, 28-30 December 1976, and presented a paper.

Professor T. A. Davis and Shri S. S. Ghosh (*Crop Science*) attended the Symposium on Coastal Area Replantation Enterprises, Brahmagiri, Orissa, 5-7 February 1977. Professor Davis served as Chairman for one of the sessions. Shri Ghosh presented a paper.

Shri Banamali Dey (*National Income*) attended the Sixteenth Annual Conference, Indian Econometric Society, Tirupati, 17-19 December 1976, and presented a paper.

Shri R. Dey (*Economic Research*) attended the Sixteenth Annual Conference, Indian Econometric Society, Tirupati, Andhra Pradesh, 17-19 December 1976.

Shri P. Gajpathi (*Economic Research*) attended the following:

- (i) Sixteenth Annual Conference, Indian Econometric Society, Tirupati, 17-19 December 1976.
- (ii) Fifty-ninth Indian Economic Conference, Mysore, 28-30 December 1976. He presented a joint paper with Shri S. Bose.

Shri T. N. Ghosh (*Sociology*) attended the Fourteenth Annual Conference, Indian Academy of Applied Psychology, Kharagpur, 27-29 December 1976 and presented a paper.

Dr. A. Ghosh and Shri P. Bhattacharya (*Electronics*) attended and presented a paper at the Twentyfirst Congress, Indian Society of Theoretical and Applied Mathematics, Bangalore, 8-11 December 1976.

Shri A. B. Gupta (*Physics*) participated in the Seminar on Environmental Pollution, Barasat, 12-14 February 1977.

Shri R. Gupta (*Anthropometry & Human Genetics*) attended the (i) Sixty-fourth Session, Indian Science Congress, Bhubaneswar, 3-7 January 1977 and (ii) Third Annual Conference, Indian Anthropological Society, Santiniketan, 14-16 August 1976. He presented a paper each at both the conferences.

Dr. S. L. Jain, Dr. T. Roychowdhury, Shri T. S. Kutty, Dr. Asru K. Choudhuri and Shri D. K. Budra (*Geological Studies*) participated in the Fourth International Gondwana

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Symposium, Calcutta, 17-22 January 1977. Dr. S. L. Jain served as a member of the Organising Committee and Dr. T. Roychowdhury and Shri T. S. Kutty served as leaders of the geological excursion for the delegates to the Pranhita-Godavari Valley, 22-29 January, 1977.

Dr. S. L. Jain, Shri T. S. Kutty, Dr. T. Roychowdhury and Dr. S. Chatterjee presented a paper in Section III, Fourth International Gondwana Symposium, on "Some characteristics of *Barapasaurus lagotzi*, a sauropod dinosaur from the Lower Jurassic of Deccan, India."

Shri R. K. Lahiri (*Economic Research*) attended the following :

- (i) Seminar on Teaching of Economics in Schools, Patna, 2-4 April 1976.
- (ii) Working Group Meeting on the project "Peasant Organisation in India," Delhi, 17-18 September 1976.

Dr. K. C. Malhotra (*Anthropometry & Human Genetics*) attended the following conferences and read papers : (i) Seminar on Genetics and Social Organisation, Bangalore, 16-19 June, 1976; (ii) Third All India Conference, Indian Society of Human Genetics, Delhi, 27-31 December 1976; and (iii) Third Annual Conference, Ethnographic and Folk Culture Society and Indian Association of Physical Anthropologists, Lucknow, 23-25 January 1977.

Shri B. S. Mazumder (*Math-Stat*) attended the Conference of the Indian Society of Theoretical and Applied Mathematics, Bangalore, 8-11 December 1976.

Professor R. K. Mukherjee (*Sociology*) attended the Tenth All-India Sociological Conference, Chandigarh, 25-26 November 1976. He also attended a number of conferences and seminars organised by the Indian Council of Social Science Research, New Delhi, the Rural Electrification Corporation and other organisations.

Dr. S. K. Mitra, Shri B. L. S. Prakasa Rao (*Delhi Centre*) and Shri Z. Govindarajulu (visitor) participated in the UGC-sponsored All India Seminar in Statistical Inference, Chandigarh, 21-23 December 1976 and presented invited addresses.

Dr. S. K. Mitra and Shri K. R. Shah (*Delhi Centre*) participated and presented papers at the Symposium on Linear Models and Design of Experiments held in connection with the Thirtieth Annual Conference, Indian Society of Agricultural Statistics, Bhubaneswar, 30 December 1976-1 January 1977.

Shrimati Alokanda Mittor (*Linguistic Research*) attended the Seminar on Integration of Hearing-impaired Children in schools for children with normal hearing, Agartala, 1-10 February 1977. She presented a paper at the one-day seminar for teachers of deaf children on The Kostic Methodology for Habilitation of Speech and Language in the Hearing-impaired, Calcutta, 20 February 1977.

Shri B. N. Mukherjee (*Anthropometry & Human Genetics*) participated in the following and presented papers : (i) Third All India Conference, Indian Society of Human Genetics, Delhi, 27-31 December, 1976; and (ii) Third Annual Conference, Ethnographic and Folk-culture Society and Indian Association of Physical Anthropologists, Lucknow, 23-25 January 1977.

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Professor A. Neelameghan (*DRTC*) participated in the following :

- (i) Seminar on Access to Bibliographic Data Bases, Bombay, 18 September 1976. He chaired a session and contributed a paper.
- (ii) Inaugural Session, Seventh National Seminar, Indian Association of Special Libraries and Information Centres, Burdwan, 28-31 December 1976. He was director of a session and delivered the presidential address.
- (iii) India-EEC Joint Action Defining Committee for Co-operation in Science and Technology, New Delhi, 31 January 1977-6 February 1977. He was chairman of a working group.
- (iv) Seminar on Technical Information Services for Developing Countries, Madras, 3-5 March 1977. Professor Neelameghan contributed a paper. Shri Gopinath and Shri Soetharama also participated.

Dr. K. R. Parthasarathy (*Delhi Centre*) presented the results of a joint paper with Professor K. Schmidt at the Symposium on Advanced Mathematical Techniques in Problems of Physics, 26-29 December, 1976.

Shri M. V. Raman (*Demography*) participated in the following :

- (i) Seminar on Population and Law, Annamalainagar, 10-12 September 1976. He presented a paper.
- (ii) International Seminar on Problems of Fertility Control in India, Annamalsainagar, 10-14 January 1977. He presented a paper and acted as Chairman for one of the technical sessions.

Dr. C. R. Rao, Jawaharlal Nehru Professor, attended the following :

- (i) Silver Jubilee function, Central Statistical Organisation, Government of India, New Delhi, 17 November 1976. He delivered a special address, "Statistics for accelerating economic and social development."
- (ii) Expert Group meeting, National Nutrition Monitoring Bureau (set up by the Indian Council of Medical Research), Hyderabad, 1 December 1976. He chaired the meeting.
- (iii) Sixteenth Annual Conference, Indian Econometric Society, Tirupati, 17-19 December 1976. He presided over the conference and delivered the presidential address.
- (iv) Fourth National Seminar on Data Base of Indian Economy, Bangalore, 22-24 December 1976. He gave an address at the inaugural function and also presided over the plenary session.
- (v) Sixth All India Conference on Quality Control, Hyderabad, 29-31 December 1976. As President of the Conference Executive Committee, Dr. C. R. Rao gave the welcome speech at the inaugural function. In this connexion, he broadcast talks on "Quality—the highway for higher standard of living and profit" from the Delhi and Hyderabad stations of the All India Radio. He also addressed a press conference on 1 December 1976 in Hyderabad.

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(vi) Dr. Rao attended the inauguration of joint research programme of the Indian Statistical Institute and the Bhaskaracharya Pratishthanan, Pune, 21 March 1977. The Pratishthana, a research institute devoted to mathematics, was recently founded at Pune.

Dr. C. R. Rao, Sarvasri V. K. Chetty, D. Dasgupta, L. R. Jain and Z. Govindarajulu (*Delhi Centre*) participated in the Sixteenth Annual Conference, Indian Econometric Society, Tirupati, Andhra Pradesh, 17-19 December 1976, and presented invited addresses papers. Dr. C. R. Rao presided over the inaugural function and delivered an address. He was elected Chairman of TIES for a period of five years.

Dr. C. R. Rao and all the technical staff members of the SQC Unit at ISI, Delhi, participated in the Sixth All India Conference on Quality Control, Hyderabad, 29-31 December 1976, organised by the Statistical Quality Control Division. Dr. Rao gave the welcome speech at the inaugural function, and Shri A. N. Nankana and Shri G. C. Talukdar presented papers.

Dr. Bina Roy (*National Income*) attended the following and presented papers :
(i) Symposium on Recent Development in Survey Methodology, Calcutta, March 1976.
(ii) Seminar on Industrial Development, Calcutta, 7 May 1976, and (iii) Fourth National Seminar, Data Base of Indian Economy, Bangalore, 22-24 December 1976.

Dr. J. Roy and Shri A. K. Adhikari (*Applied Statistics, Surveys and Computing*) presented a paper at the All India Interdisciplinary Symposium on Recent Trends of Research and Developments in Digital Technique and Pattern Recognition sponsored by the Indian Statistical Institute, Calcutta, 15-17 February 1977.

Shri B. N. Sarkar (*Demography*) participated in the following :

1. Fourth National Seminar on Data Base of Indian Economy, Bangalore, 22-24 December 1976.
2. Population Conference, Bangalore, 27-29 December 1976. He presented a paper.
3. Sixty-fourth Session, Indian Science Congress, Bhubaneswar, 3-7 January 1977. He presented a paper.

Dr. T. N. Srinivasan (*Delhi Centre*) participated in a Symposium on the Fifth Five Year Plan, New Delhi, December 1976. He was discussion leader in a session on Health Statistics at the Fourth National Seminar on Data Base of Indian Economy, Bangalore, December, 1976. He participated in a seminar on "New International Economic Order" organised by the Ford Foundation, New Delhi, December 1976.

Sarvasri S. D. Tondulkar, L. S. Bhat, S. M. Kansal and M. R. Saluja (*Delhi Centre*) participated in the Third Conference, Central and State Statistical Organisations, New Delhi, 24-28 February 1977.

Part III. Administration and Office-bearers

XVIII. GENERAL ADMINISTRATION

18.1. *Membership* : During the year 1976-77, seventeen persons were enrolled as ordinary members and one organisation as an institutional member of the Institute. The membership of 22 ordinary members were terminated in terms of Regulation 3.1 of the

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Institute. Nine ordinary members became life members. Four organisations (one life and 3 ordinary members) converted their membership to institutional membership. Four ordinary members resigned and, according to information available, two life members and one ordinary member died.

Thus, the membership position as on 31 March 1977 was 431 members (296 ordinary, 120 life, 4 honorary life, and 11 institutional members).

During the year, 144 seasonal members and 250 student members were enrolled for a one-year term.

18.2. *General Meetings :*

18.2.1. *Annual General Meeting :* The Annual General Meeting for the year 1976-77 was held on 1 April 1977.

18.3. *Meetings of Council and Governing Body, Research and Training School :* In terms of the old Rules and Bye-laws, the Council of the Institute met jointly with the Governing Body, RTS, on 24 July 1976.

In terms of the Revised Regulations and Bye-laws, the Council met four times during the year on (i) 13 August 1976, (ii) 14 August 1976, (iii) 26 October 1976 and (iv) 31 March 1977.

18.4. *Meetings of the Finance Committee :* The Finance Committee of the Council met twice during the year on 21 October 1976 and 31 March 1977.

The Vice-President, Office-bearers and members of the Governing Body, Research and Training School and members of the Council, Finance Committees and Examinations Committee, as published in the previous year's Annual Report 1975-76, continued to hold their offices till 24 July 1976.

A list of President, Chairman, members of the ISI Council and the Academic Council who were elected/nominated in terms of the New Regulations and Bye-laws is given in Chapter XIX.

18.5. *Implementation of Revised Memorandum of Association, Regulations and Bye-laws of the Institute :* Dr. Gopinath Kallianpur was appointed Director of the Institute under the revised regulations and bye-laws of the Institute in terms of the resolution of the joint meeting of the Governing Body, Research and Training School and the ISI Council held on 24 July 1976. Consequent on Dr. Kallianpur's assumption of charge as Director of the Institute on 25 July 1976, the Revised Memorandum of Association, Regulations and Bye-laws of the Institute came into force with effect from the same day.

18.5.1. In terms of the Revised Regulations and Bye-laws of the Institute, the under-mentioned committees were also set up for the smooth functioning of the Institute :

(i) Finance Committee, (ii) Journal Committee, (iii) Examinations Committee, (iv) Works Advisory Committees for Baranagar and Delhi, (v) Technical Advisory Committee for different Divisions, and (vi) Joint Consultative Committees for scientific and non-scientific workers.

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The names of members of each committee are given in Chapter XIX.

18.6. *Institute Staff* : The following officials continued to function during the year in the posts mentioned against each name till 24 July 1976, when the Revised Memorandum of Association, Regulations and Bye-laws of the Institute came into force :

- (i) Dr. C. R. Rao : Secretary-Director
- (ii) Dr. D. Dutta Mazumdar : Joint Secretary for Calcutta area
- (iii) Dr. K. S. Parikh : Joint Secretary for Delhi area.

Professor M. Mukherjee continued as Director, Research and Training School, till the assumption of charge as Director of the Institute by Dr. G. Kallianpur on 25 July 1976. Dr. K. S. Parikh was in charge of the Administration, Accounts and the construction programme at the Delhi Centre.

18.7. *New Appointments* : The senior staff of the Institute was strengthened during the year by the addition of the undermentioned persons :

1. Dr. G. Jogesh Babu, M.Stat., Ph.D., Associate Professor, Math-Stat.
2. Dr. Subrata Bandyopadhyay, M.Tech., Ph.D.(Sc.), System/Numerical Analyst.
3. Dr. Subir Bandyopadhyay, B.Sc., B.Tech.(Cal), M.Math.(Waterloo), Ph.D.(Cal.), System Analyst.
4. Dr. A. K. Banerjee, Economist, Visiting Fellow, Delhi Centre.
5. Dr. Arijit Choudhury, M.A., Ph.D., Associate Professor, Applied Statistics, Surveys and Computing.
6. Dr. Dipankar Coondoo, M.Stat., Ph.D., Lecturer, Economist.
7. Dr. Subir Ghosh, M.Sc. (Cal.), Ph.D. (Colorado), Research Fellow, Applied Statistics, Surveys and Computing.
8. Dr. Arun Kumar Mazumdar, M.Tech., Ph.D.(Applied Physics), Ph.D.(Electrical Engineering), Lecturer, Electronics.
9. Dr. Ashok Kumar Mitra, Ph.D., Professor, Economist.
10. Dr. K. Mukherjee, Associate Professor, Stat-Math, Delhi.
11. Dr. K. R. Parthasarathi, Professor, Delhi.
12. Shri Sankar Kumar Paul, M.Tech., Computer Engineer.
13. Dr. S. B. Rao, M.A., Ph.D., Associate Professor.
14. Dr. B. L. Praksaa Rao, Ph.D., Professor, Delhi.
15. Shri Siddheswar Roy, B.Sc. (Hons.), M.Stat., Programmer.
16. Dr. Rajkumar Roychoudhury, M.Sc., Ph.D., Lecturer, Electronics.
17. Dr. Ramprasad Sengupta, Ph.D., Lecturer, Delhi.

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18. Dr. K. Sikdar, M.Stat., Ph.D., Lecturer.
19. Dr. P. K. Srimani, B.Sc., M.Tech. (Radio Physics & Electronics), Computer Engineer.
20. Shri Alladi Sitaram, B.Sc., Ph.D., Associate Professor, Stat-Math.
21. Shri B. P. Sinha, B.Sc., B.Tech., Computer Engineer.
22. Shri T. D. Gupta, M.A., D.B.M., M.B.A., D.L.L., joined the Delhi Centre as Special Officer (Finance & Administration). He was transferred to Calcutta and appointed to the post of Chief Administrative Officer-cum-Controller of Finance in May 1977 for one year, in place of Shri P. G. Sarkar, IA & AS, Adviser (Finance & Administration) who retired.
23. Shri P. K. Chatterjee, B.Com., F.C.A., joined as Senior Accounts Officer.
24. Shri Santanu Gengupta, B.Sc.(Hons), L.L.B., Cost and Works Accountancy, joined as Accounts Officer.

18.8. *Retirements* : The undermentioned senior members of the staff retired on superannuation during the year :

1. Professor M. Mukherjee, Head, National Income Research Unit, 18 October 1976.
2. Shri P. G. Sarkar, I.A. & A.S., Adviser (Finance & Administration), (reappointed for 3 months), 1 February 1977.
3. Shri A. Mahalanobis, B.A.(Hons), Executive Officer (reappointed for one year), 1 February 1977.

18.9. *Obituary* :

Shri Ajit Dasgupta

The Council, Indian Statistical Institute, and the Governing Body, Research and Training School, in a joint meeting held in New Delhi on 24 July 1976, mourned the death of Shri Ajit Dasgupta on 22 July 1976. Shri Dasgupta who had been earlier associated with the National Sample Survey Work of the Institute was one of its Vice-Chairmen until his death. The meeting recalled that Shri Dasgupta made significant contributions in the fields of demography, socio-economic survey and economic statistics.

It placed on record the valuable services rendered by Shri Dasgupta to the Institute and conveyed its deep sense of sorrow and sympathy to the members of the bereaved family.

18.10. *Land and Construction* :

Baranagar : In the previous year's Annual Report for 1975-76, the developments upto March 1976, regarding the construction of the composite library building were recorded.

1. The following are the main developments in the construction of the library building during the year 1976-77 :

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(i) Messrs. Braithwaite, Burn & Jessop Construction Co. Ltd., completed the pile foundation and miscellaneous work in September 1976.

(ii) Tenders for the reinforced concrete frame and general building works (ground, first and second floors) were invited for the library building. On the recommendation of the Baranagar Works Advisory Committee, the contract was awarded to Messrs. M. A. Dalmia & Co. Ltd., which started the work in June 1976. Most of their work for the library building have been completed.

(iii) The work of (a) providing the pump delivery pipe connection, water distribution grid, etc. and (b) sanitary and plumbing work for the library building were entrusted to Messrs. P. C. Dey and associates. The work mentioned in (a) above has already been completed and the installation of sanitary and plumbing work is in progress.

(iv) Tenders were invited for the electric installation for the library building. After processing by Messrs. Ballardie Thompson & Mathews Pvt. Ltd., (architect), the Baranagar Works Advisory Committee requested the administration to award the contract to Messrs. R. Roy & Son.

(v) The tenders for the third and fourth floors of the library building are being prepared by Messrs. Ballardie Thompson & Mathews.

(vi) After detailed discussions with the user departments, Messrs. Ballardie Thompson & Mathews are preparing a detailed lay-out and tender for the air-conditioning of the ground floor of the library building.

2. *Car shelter and car repairing stand* : The contract was awarded to Messrs. Das & Co. The construction upto the plinth and about 80 per cent of the steel fabrication work for the super structure have been completed.

3. *Tubewell* : The contract was awarded to Messrs. Imperial Tubewell Co. for boring, sinking and installation of 8" x 6" dia tubewell and the supply and installation of a pumping set in the ISI campus. The work has been completed.

4. *Overhead Reservoir* : The contract for construction was awarded to Shri Asok Bhatnagary. The wooden piling and R.C.C. foundation work of the overhead reservoir (6,000 gallons) in the Institute campus has been completed. The construction of the super-structure is in progress.

Delhi : The construction of four units on the south wing of the dormitory for research fellows by Messrs. Associated Builders and the kitchen block by Messrs. Consolidated Construction Co. was completed during the period.

Messrs. Madann Mohita and Associates have been appointed to supervise the construction of staff quarters and compound wall, since Messrs. Kanvindo & Rai expressed their inability to do the same.

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XIX. LIST OF PRESIDENT, CHAIRMAN AND MEMBERS OF THE COUNCIL,
MEMBERS OF THE COMMITTEES OF THE COUNCIL
AND ACADEMIC COUNCIL

President : Shri Subimal Dutta, ICS (*Retd.*)

The Council

1. *Chairman* : Shri P. N. Haksar, M.Sc., Bar-at-Law, IFS (*Retd.*)

Members of the Council

Representatives of Government of India (4)

2. (i) Shri V. R. Rao, Director, Central Statistical Organisation and Additional Secretary, Department of Statistics.
3. (ii) Shri S. Vasudevan, Additional Secretary, Ministry of Finance (Department of Expenditure) and Financial Adviser to the Department of Statistics.
4. (iii) Dr. R. D. Deshpande, Director, Department of Science and Technology, Cabinet Secretariat.
5. (iv) Shri V. V. Divatia, Statistical Adviser, Department of Statistics, Reserve Bank of India.

Scientists not employed in the Institute (7)

Representative of ICSSR (1)

6. Shri Bhabatoah Dutta.

Representatives of INSA (4)

7. (i) Dr. B. R. Seth, Director, Birla Institute of Technology.
8. (ii) Professor V. S. Huzurbazar, FNA, Senior Professor & Head, Department of Statistics and Mathematics, University of Poona and Visiting Professor, Department of Statistics, University of Manitoba, Winnipeg, Canada.
9. (iii) Professor A. K. Sharma, FNA, Professor and Jawaharlal Nehru Fellow, Department of Botany, University of Calcutta.
10. (iv) Professor (Mrs.) Anima Chatterjee, FNA, Khaira Professor of Chemistry, Department of Pure Chemistry; Dean, Faculty of Science, University of Calcutta.

Scientists co-opted by the Council (2)

11. (i) Dr. S. S. Shrikhande, Head, Department of Mathematics, University of Bombay, (co-opted on 14.8.76).
12. (ii) Dr. M. G. K. Monon, FRS, Chairman, Electronics Commission; Secretary to the Government of India, Department of Electronics. (proposed on 14.8.76 and finalised on 25.10.76).

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Elected representatives of the Institute

Members not employed in the Institute (2)

13. (i) Dr. P. K. Bose, M.Sc., Ph.D., F.S.S.(Lond.), Head, Department of Statistics, University of Calcutta.
14. (ii) Dr. P. V. Sukhatme, M.A., Ph.D., FNA, Maharashtra Association for the Cultivation of Science.

Elected representatives of the employees of the Institute (2)

15. (i) Shri Tapan Basu Mallick, Senior Lecturer.
16. (ii) Shri Rakhal Chandra Paul, Senior Assistant.

Officers of the Institute (Ex-officio) (9)

17. (i) Dr. G. Kallianpur, Director.

Professors-in-Charge (5)

18. (ii) Dr. J. K. Ghosh, Theoretical Statistics and Mathematics Division. (In his absence Dr. B. P. Adhikari).
19. (iii) Dr. J. Roy, Applied Statistics, Surveys and Computing Division.
20. (iv) Dr. D. K. Bose, Social Sciences Division.
21. (v) Shri Asish Sen, Physical and Earth Sciences Division.
22. (vi) Professor S. K. Roy, Biological Sciences Division.
23. (vii) Dr. Asoke Maitra, Dean of Studies.
24. (viii) Shri S. M. Sundara Raju, Head, SQC & OR Division.
25. (ix) Dr. B. S. Minhas, Head, Delhi Centre.

Shri P. G. Sarkar and Shri T. D. Gupta, Principal Officers in Charge of Administration, acted as non-member Secretary in their respective terms.

LIST OF MEMBERS OF DIFFERENT COMMITTEES

1. Finance Committee of the Council

1. Director of the Indian Statistical Institute or his nominee (*ex-officio chairman*);
2. Dr. P. K. Bose, Head of Statistics Department, University of Calcutta; 3. Dr. Bhabatosh Dutta; 4. Dr. B. P. Adhikari; 5. Dr. J. Roy; 6. Shri S. M. Sundara Raju; 7. and 8. Two representatives nominated by the Government of India (Shri V. R. Rao, Director, CSO and Additional Secretary, Department of Statistics and Shri S. Vasudevan, Additional Secretary, Ministry of Finance, Department of Expenditure; 9. Shri P. K. Chatterjee, Senior Accounts Officer, Indian Statistical Institute (*Non-member Secretary*).

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2. Examinations Committee

1. Dr. P. K. Bose, Head, Department of Statistics, University of Calcutta; 2. Professor H. K. Nandi, Department of Statistics, University of Calcutta; 3. Dr. J. Roy; 4. Professor M. S. Abhadhani, University of Andhra; 5. Shri N. G. Sardana, Joint Director, C.S.O., Ministry of Planning, Government of India; 6. Dr. Asoko Maitra, Dean of Studies, Indian Statistical Institute; 7. Dr. S. D. Tendulkar, Department of Statistics; 8. Professor A. M. Goon, Presidency College, Calcutta; 9. Shri Taroo Maitra, *Conseuer*.

3. Journal Committee of the Institute

(i) Committee for *Sankhyā*, Series A :

1. Dr. R. R. Bahadur; 2. Dr. D. Basu; 3. Dr. V. S. Hazurbazar; 4. Dr. K. R. Parthasarathi; 5. Dr. S. S. Srikhande and 6. Dr. Moly Ghosh.

Co-editors : 1. Dr. B. V. Rao and 2. Dr. K. R. Parthasarathy.

(ii) Committee for *Sankhyā*, Series B :

1. Dr. T. V. Hanurav; 2. Dr. Sujit Kumar Mitra; 3. Shri K. G. Ramamurthi; 4. Dr. J. Roy and 5. Dr. Moly Ghosh.

Co-editors : 1. Dr. J. C. Gupta and 2. Dr. Sujit Kumar Mitra.

Advisers for Sankhyā, Series A and B :

1. Dr. R. R. Bahadur; 2. Dr. D. Basu; 3. Dr. V. S. Hazurbazar; 4. Dr. S. S. Srikhande; 5. Shri K. G. Ramamurthi; 6. Dr. J. Roy; and 7. Dr. J. Sethuraman.

(iii) Committee for *Sankhyā*, Series C—Parts 2 and 4 (*Quantitative Economics*) :

1. Professor V. M. Dandekar; 2. Dr. L. Hurwicz; 3. Dr. N. S. Iyengar; 4. Dr. B. S. Minhas; 5. Professor M. Mukherjee; 6. Dr. A. Rudra; 7. Dr. T. N. Srinivasan and 8. Dr. P. K. Bardhan.

Co-editors : 1. Professor A. L. Nayar and 2. Dr. N. Bhattacharyya.

Advisers : 1. Professor V. M. Dandekar; 2. Dr. L. Hurwicz; 3. Dr. N. S. Iyengar; 4. Dr. B. S. Minhas; 5. Professor M. Mukherjee and 6. Dr. A. Rudra.

(iv) Committee for Series C, Parts 1 & 3 (*Sample Survey; Theory and Practice*) :

1. Dr. D. Basu; 2. Professor T. Dalenious; 3. Professor M. H. Hansen; 4. Professor D. B. Lahiri; 5. Dr. M. N. Murthi; 6. Professor Des Raj; 7. Dr. J. N. K. Rao and 8. Dr. J. Roy.

Co-editors : 1. Dr. Doout Jam Lantoo and 2. Dr. J. Roy.

Advisers : 1. Dr. D. Basu; 2. Professor T. Dalenious; 3. Professor M. H. Hansen; 4. Professor D. B. Lahiri; 5. Dr. M. N. Murthi; 6. Professor Des Raj; 7. Dr. T. V. H. Hanurav; 8. Dr. J. N. K. Rao; and 9. Dr. Avijit Chowdhury.

Joint editors for all the series : 1. Dr. C. R. Rao and 2. Dr. G. Kallianpur.

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4. Technical Advisory Committees

I. Theoretical Statistics and Mathematics Division

1. Director (Chairman); 2. Dr. S. S. Shrikhande, Head of Mathematics, University of Bombay; 3. Dr. K. R. Parthasarathy, Professor, Department of Mathematics, Indian Institute of Technology, New Delhi; 4. Dr. R. P. Bombah, Centre for Advanced Study in Mathematics, Punjab University; 5. (i) Dr. V. S. Huzurbazar, Professor and Head, Department of Mathematics and Statistics, University of Pune; (ii) Visiting Professor, Department of Mathematics, University of Manitoba, Winnipeg, Canada (upto 31 May 1977); 6. Professor-in-Charge (Convenor), Dr. B. P. Adhikari, Research Professor, Indian Statistical Institute (in place of Dr. J. K. Ghosh, Professor, on leave).

II. Applied Statistics, Surveys and Computing Division

1. Director (Chairman); 2. Dr. H. K. Nandi, Professor, Department of Statistics, University of Calcutta; 3. Dr. P. V. Sukhatme, Honorary Professor of Biometry, Maharashtra Association for the Cultivation of Science; 4. Dr. V. Bajaranan, Head, Computer Centre, Indian Institute of Technology, Kanpur; 5. Dr. K. C. Seal, Adviser, Planning Commission; 6. Professor-in-Charge (Convenor), Dr. J. Roy, Research Professor, Computer Science Unit, Indian Statistical Institute.

III. Social Sciences Division

1. Director (Chairman); 2. Dr. A. R. Desai, Professor of Sociology, University of Bombay; 3. Dr. Raj Krishna, Agro-Economic Research Centre, University of Delhi; 4. Dr. A. Mitra, Professor, Jawaharlal Nehru University, Centre of Regional Development; 5. Dr. Shub Kumar Mitra, Joint Director, National Council of Educational Research and Training; 6. Professor-in-Charge (Convenor), Dr. D. K. Bose, Professor, Economic Research Unit, Indian Statistical Institute.

IV. Physical and Earth Sciences Division

1. Director (Chairman); 2. Dr. K. R. Surange, Director, Birbal Sahani Institute of Palaeobotany; 3. Dr. P. K. Ghosh, Coal Controller, Government of India; 4. Dr. Biswanjan Nag, Jawaharlal Nehru Fellow, Institute of Radio Physics, University College of Science, Calcutta; 5. Dr. R. Narasimhan, Head, Computer Group, Tata Institute of Fundamental Research, Bombay (resigned); 6. Professor-in-Charge (Convenor), Shri Ashis Sen, Computer System Engineer, Electronics Division, Indian Statistical Institute.

V. Biological Sciences Division

1. Director (Chairman); 2. Dr. A. K. Sharma, Professor and Head, Department of Botany, University of Calcutta; 3. Dr. L. D. Sanghvi, Dean, Cancer Research Institute, Tata Memorial Centre, Bombay; 4. Dr. J. J. Ghosh, Centenary Professor and Head, Department of Biochemistry, University of Calcutta; 5. Dr. Sibatoosh Mukherjee Professor and Head, Life Science Centre, Jawaharlal Nehru University; 6. Professor-in-Charge (Convenor), Professor S. K. Roy, Professor and Head, Botany Research Unit, Indian Statistical Institute.

VI. Statistical Quality Control and Operations Research Division

1. Director (Chairman); 2. Dr. V. Krishnamurthy, Chairman, Bharat Heavy Electricals Ltd.; 3. Dr. H. Bhaya, Chairman, Hindusthan Steel Ltd.; 4. Dr. N. K. Jaiswal, Deputy

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Director, Co-ordination, Government of India, Ministry of Defence, Research and Development Organisation; 5. Head SQO and OR (Convenor), Shri S. M. Sundara Raju, Senior Technical Officer, SQO and OR, Indian Statistical Institute.

VII. *Library, Documentation and Information Science Division*

1. Director (Chairman); 2. Shri H. D. Sharma, Librarian, Banaras Hindu University Library; 3. Dr. A. K. Ohdedar, Chief Librarian and Head of Department of Library Science, Jadavpur University Library; 4. Dr. V. A. Kamat, Head, Library and Information Services, Bhabha Atomic Research Centre; 5. Chief Librarian (Convenor), Dr. J. Mishra, Indian Statistical Institute.

5 (a) *Works Advisory Committees for construction, Baranagar, Calcutta*

1. Dr. P. K. Bose (Chairman); 2. Dr. J. Roy; 3. Shri S. Bandopadhyay (outside Expert); 4. Dr. J. Mishra; 5. Dr. D. K. Bose; 6. Shri R. K. Lahiri; 7. Shri V. S. Bhat; 8. Shri R. N. Bhattacharya; 9. Shri Sanjoy Sinha; 10. Shri P. K. Mitra (outside Expert); 11. Shri Biman Bose (Convenor).

(b) *Works Advisory Committee for construction, Delhi*

1. Dr. Jagjit Singh (Chairman); 2. Shri B. K. Sarkar; 3. Shri R. S. Paneswar (coopted member); 4. Dr. Sujit Kumar Mitra; 5. Dr. V. K. Shetty; 6. Dr. S. D. Tendulkar (Convenor).

6 (a) *Joint Consultative Committees for non-scientific workers*

1. Director (Chairman); 2. Professor T. N. Srinivasan; 3. Dr. J. Misra; 4. Shri C. R. Chatterji; (representatives of the Administration as selected by the Director); 5. Shri P. G. Sarkar, Principal Officer-in-charge of General Administration and Common Services; 6. President of ISIWO; 7. Secretary of ISIWO; 8. Vice-President or Treasurer of ISIWO; 9. Assistant Secretary of ISIWO (representatives of ISIWO).

Shri P. G. Sarkar and Shri T. D. Gupta, Principal Officers in charge of Administration acted as Member-Secretary of the Committee in their respective terms.

6 (b) *Joint Consultative Committee for scientific workers*

1. Director (Chairman); 2. Dr. D. K. Bose; 3. Dr. D. Dutta Mazumdar (scientist nominated by the Director); 4. President or Vice-President of the ISIWO; 5. Secretary or Assistant Secretary of ISIWO (representatives of the ISIWO).

Dr. D. Dutta Mazumdar acted as Member-Secretary of the Committee.

Academic Council

Research Professors and Distinguished Scientists. The Academic Council consists of all Professors.

1. Dr. G. Kallianpur, Director, (Chairman)

(i) *Theoretical Statistics and Mathematics Division* : 2. Dr. B. P. Adhikari; 3. Dr. J. K. Ghosh; 4. Dr. A. Mitra; 5. Dr. E. M. Paul; 6. Dr. A. K. Ghosh; 7. Dr. Moly Ghosh.

Elected Representatives : 8. Dr. J. C. Gupta; 9. Dr. B. V. Rao.

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(ii) *Applied Statistics, Surveys and Computing* : 10. Dr. J. Roy; 11. Dr. B. C. Das; 12. Dr. T. V. Hanurav.

Elected Representatives : 13. Shri A. K. Halder; 14. Dr. T. Krishnan.

(iii) *Social Sciences* : 15. Dr. D. K. Bose; 16. Dr. N. Bhattacharya; 17. Dr. S. Chatterjee; 18. Dr. R. K. Mukherjee; 19. Dr. A. Rudra; 20. Dr. A. Mitra.

Elected Representatives : 21. Shri C. R. Malakar; 22. Shrimati A. Mitter.

(iv) *Physical and Earth Sciences* : 23. Shri Ashish Sen; 24. Dr. Ambarish Ghosh; 25. Dr. S. L. Jain; 26. Dr. D. Dutta Mazumdar; 27. Dr. T. Roychoudhury; 28. Dr. Supriya Sengupta.

Elected Representatives : 29. Shri P. Bandyopadhyay; 30. Shri A. B. Gupta.

(v) *Biological Sciences* : 31. Professor S. K. Roy; 32. Dr. T. A. Davis.

Elected Representatives : 33. Dr. P. R. Pal; 34. Dr. K. B. Pakrasi.

(vi) *SQC* : 35. Shri S. M. S. Raju; 36. Shri R. G. Narasimhan; 37. Shri C. R. Prasad; 38. Shri K. G. Ramamurthy; 39. Shri B. K. Sarkar; 40. Shri C. A. Sotty.

Elected Representatives : 41. Shri S. P. Mukherjee; 42. Shri N. Srinivasan.

(vii) *Library & Documentation* : 43. Professor A. Neelamoghan.

Chief Librarian : 44. Dr. J. Misra.

(viii) *Head, SQC T & P Unit* : 45. Shri R. J. Pandey.

(ix) *Secretary, Examinations Committee* : 46. Shri T. Maitra.

(x) *Member-Secretary, ISEC, Calcutta* : 47. Dr. N. Bhattacharya.

(xi) *Dean of Studies* : 48. Dr. A. Maitra.

(xii) *Delhi Centre* : 49. Dr. Sujit Kumar Mitra; 50. Dr. C. R. Rao; 51. Dr. B. S. Minhas; 52. Dr. L. S. Bhat; 53. Dr. K. S. Parikh; 54. Dr. V. K. Chetty; 55. Dr. K. R. Parthasarathy; 56. Dr. B. Ramchandran; 57. Dr. B. L. S. Prakasa Rao; 58. Dr. T. N. Srinivasan; 59. Dr. S. D. Tendulkar.

KARNATAKA BRANCH : 1976-77

The Executive Committee :

Chairman : Shri C. S. Sehadri.

Vice Chairman : Shri P. S. Narayana; and Shri H. C. Ramanna.

Secretary : Professor Srinagabhushana.

Joint Secretary : Shri C. A. Sotty.

Treasurer : Dr. K. P. Srinath.

Members : 1. Shri K. G. Katway; 2. Shri B. V. S. Rao; 3. Shri S. K. Iyengar; 4. Shri K. M. Shanmugam; 5. Shri N. Chandrasekhara Raju; 6. Shri M. B. Nanjappa, (Director, Bureau of Economics and Statistics).

INDIAN STATISTICAL INSTITUTE

PART IV

Statement of Accounts and Auditors' Report for the year 1976-77

AUDITORS' REPORT

We report that we have audited the Balance Sheet as at 31st March, 1977 signed by us under reference to this report, of

- (a) Indian Statistical Institute and
- (b) Other Funds

and the annexed Income and Expenditure Accounts for the year ended on that date with the books and records maintained by the Institute and produced to us and information and explanations given and, subject to and read with the notes appearing thereon and also subject to the remarks given below have found them to be in accordance therewith.

The remarks referred to above are :

1. Though National Sample Survey Unit has been separated from the Institute with effect from 1st June 1972, the consequential changes with regard to assets and liabilities have not taken place as yet. As such, both the Income and Expenditure Account for the year ended 31st March 1977 and the Balance Sheet as at that date do not give a true and fair view to the extent of this unworked out position.

[It is a fact that authentic report on the assets taken away by NSSO does not exist. This is the main reason why there is a vast difference in the book balance and the ground balance of stock shown in the report of Messrs. S. N. Guha & Co. There is no way out now to ascertain the actual stock taken over by NSSO. Our efforts in that direction in the past have not brought any fruit. It is, therefore, proposed that the difference between the book balance and the ground balance reflected in the report of Messrs. S. N. Guha & Co. may be charged off as assets taken over by NSSO. Incidentally, in the record note of discussions of Section S(1) Committee they have, when apprised of the above situation, already opined that ISI may take the present ground balance as their stock on 1.4.77 and implement proper inventory control].

2. Fixed Assets :

(a) Asset Registers were not maintained for Land/Land Development indicating the break up of the constituent expenses in connection with the same.

Register for other fixed assets are stated to be under preparation. Further, an appropriate committee set up to make a detailed report regarding the obsolete/damaged/discarded assets, for taking appropriate written off action submitted a report on which no action has been taken as yet.

[Noted]

- (i) Value of fixed assets acquired on dates prior to 31st March 1952 were taken from those appearing in the inventories prepared as on that date.

[The observation is self-explanatory. Nothing can be done at this stage. However, the existing position may be accepted].

- (ii) No physical verification of Fixed Assets were carried out during the year under audit.

Italicized portion in brackets are the comments of the Administration on the observations made by the Auditors.

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[There is no provision in the Institute rules about yearly physical verification of fixed assets. However, it may be implemented from the succeeding year].

(b) Land : In respect of the following lands, possession certificates and/or grant certificates for items (I) to (VIII) were produced before us for the purpose of verification. In respect of items (IX) & (X) certified copies of the plan showing the area were produced, as the original possession and/or grant certificates were not available with the Institute.

- (i) 156, 160, 165 & 166/1, Gopal Lal Tagore Road
- (ii) 205 B. T. Road
- (iii) 206 B. T. Road
- (iv) Delhi
- (v) 202 B. T. Road
- (vi) In "Village Makatpur," Giridih
- (vii) Farm Land, Giridih
- (viii) Bangalor
- (ix) 203 B. T. Road
- (x) 153 Gopal Lal Tagore Road

[The position is self-explanatory. Original documents are not traceable inspite of our best efforts].

- (c) Library Building at Baranagar : Rs. 49,84,656.07 (including materials at site)

The building is actually in progress and not completed within the stipulated time as per original agreement. Whether this non-completion in time attracts any penal provision may be looked into.

[This aspect of bill in completion of the building will be looked into at the time of final payment.]

- (i) The above payments includes Rs. 37,000.00 paid to Prof. A. K. Banerjee as architect's fee and Rs. 2,040.00 paid as against law charges which should have been shown under the head Advance Account. The issue relating to the amount paid or payable to Prof. A. K. Banerjee should be settled at the earliest.

[Prof. A. K. Banerjee was appointed architect for ISI buildings. He did some work and on account payment of Rs. 37,000/- plus Rs. 2,000/- towards law charges was made to him. These payments were made against his total architect's fees at second stage of work for Rs. 79,934.00. Later on, his contract was terminated without completion of his work. Since the services for the amount already paid have already been received by the Institute, this amount may be treated as final payment from this end. Council may approve this position.]

- (ii) Cost of library building also includes Rs. 18,202.22 being short realisation from contractor during the year against building materials supplied to them by the Institute, at a lower rate than the cost of the materials purchased by the Institute.

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[Cost of the materials could be realised from the contractors at the rate agreed upon at the time of finalising the contract. Increases in price have to be borne by the Institute. This is in order.]

(iii) No separate register indicating the Receipt and Issue of Library Building materials has been maintained by the Institute.

[Separate register for receipt and issue of building materials will now be maintained.]

(d) Buildings at New Delhi :

(i) The total amount realisable from the contractors has not yet been ascertained nor accounted for, although the construction work was completed long before.

[The contractor has gone in dispute and his final bill is not yet paid. Delhi Branch will make necessary recoveries while making final payment.]

(ii) An advance of Rs. 32,215.56 was paid to M/s. Bharat Overseas (P) Ltd. for supply of cement in the year 1975-76. It is observed that neither cement has been supplied nor the amount realised. This matter may be looked into.

[Action has already been taken. However, recovery cannot be made since the seized books of Bharat Overseas Pvt. Ltd. have not been released by the Central Government till this date. Messrs. Jaipur Udyog Ltd. has taken over the liabilities of the Company and therefore payment would be realised.]

(e) Water supply arrangement at Baranagar : Rs. 2,22,821.60.

This project is also under construction. Hence, it should have been shown as capital work-in-progress.

[Noted for future guidance]

(f) Sheds & Structures :

(i) The written down value of sheds & structures Rs. 63,452.79 on 203, B. T. Road and 153, Gopal Lal Tagore Road, do not give a true and fair view as at 31st March 1977 as the values of the sheds and structures demolished are not according to the values ascertained by the management. Steps, if any, taken by the management to ascertain the value of the demolished structures, was not, however, explained to us.

[The objection is purely technical since assets utilised in the new structure have not been charged. Accounting entries, consulting old records will be done in the succeeding year.]

(ii) The sheds and structures for UNTAA works at 5 R. N. Tagore Road (written down value as on 31.3.1977 : Rs. 1,69,708.26) have been constructed on the land possessed under rent requisition order.

[The sheds we have constructed for shifting the Institute's Workshop and proper utilisation of the premises. This building acquired at a monthly rent of about Rs. 460/- while the market rent is around Rs. 5,000/- per month. The investment made has already been made good by economy in the rent. However, Government has been requested to acquire these premises on permanent basis. Hence the investment is useful.]