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INDIAN STATISTICAL INSTITUTE

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3. ——— (with Sinha, B. P.) : 'A Model for Neuro-Computing'. *Proc. TENCON '90 IEEE Region 10 Conf. on Computers and Communic. Syst.*, Hong Kong during 24-27 September 1990.
4. Bhattacharya, U. (with Bhattacharya, B. B.) : 'Delay fault testing in combinational circuits : a survey.'. *Proc. Silver Jubilee Convention of CSI '90*, at Calcutta, 1990, 116-125.
5. Biswas, P. (with Mukhopadhyay, K. and Sinha, B. P.) : 'Real-time FFT processing by overlapping data acquisition and computation phases'. *Int. Conf. on Parallel Computing PARCOM '90*, at Pune, during 9-10 December 1990.
6. Das, D. K. (with Chakrabarty, S. K. and Bhattacharya, B.B.) : 'Logical redundancies in irredundant combinational networks'. *Proc. Silver Jubilee Convention of CSI '90*, Calcutta, 1990, 126-132.
7. Das, N. (with Bhattacharya, B. B. and Dattagupta, J.) : 'Analysis conflict graphs in multistage interconnection network'. *Proc. 'TENCON '90', IEEE Region 10 Conf. on Computer and Communic. Syst.* Hong Kong, during September 1990.

FIFTYNINTH ANNUAL REPORT : 1990-91

B. *Theoretical Physics*

1. Roychoudhury, R. K. : 'On Exact Solutions of some Quantum Mechanical Problems. A Supersymmetric Quantum Mechanics and Partial Algebraic Approach (invited paper)'. *Second Biennial Conf. of the Allahabad Math. Soc.*, Allahabad, during 7-9 April, 1990.

C. *Fluid Mechanics*

1. Ghosh, A. (with Chakraborty, T. and Kundu, R.) : 'Effect of strong vertical vortices on river bed'.
2. Mandal, B. N. : 'Some analytical methods in water wave problems'. *Int. Workshop on Applic. of Statist. methods in Theoretical Phys. and Fluid Mechanics*, at ISI, Calcutta during 8-15 January 1991.
3. ——— (with Banerjee, Sudeshna) : 'Solution of an integral equation arising in the linear water wave theory'. *Int. Conf. of the Theory of Differential Equation and Applications to Oceanography*, at University of Goa, during 17-21 December 1990.
4. ——— (—————) : 'The expansion method of solution to the problem of water wave diffraction by a submerged nearly vertical plate'. *Conf. on Trends in Math. Sci.*, at Calcutta Mathematical Society, during 26-27 January 1991.
5. ——— (—————) : 'On waves due to rolling of a submerged nearly vertical plate'. *18th CASAMCU-National Research Symposium*, at Calcutta University, During 27-28 March 1991.
6. ——— (—————) : 'Solution of a boundary value problem associated with diffraction of water waves by a submerged nearly vertical barrier'. *18th CASAMCU-National Research Symposium*, at Calcutta University, during 27-28 March 1991.
7. ——— (with Bharathi, Vijaya, Chakraborti, A. and Banerjee, S.) : 'Solution of the problem of scattering of water waves by a nearly vertical plate'. *18th CASAMCU-National Research Symposium*, at Calcutta University, during 27-28 March 1991.
8. Mazumdar, H. P. (with Ghosh, S. C.) : 'Study of a Homogeneous Turbulent Flow Possessing Helicity by Correlation Method'. *Int. Workshop on Applic. of Statist. Method in Theoretical Phys. and Fluid Mechanics*, at ISI, Calcutta during 6-8 January 1991.
9. ——— (with Islam, N. and Chanda, A.) : 'On some characteristics of a Two-Phase Turbulent Plume'. *Int. Workshop on Applic. of Statist. Methods in Theoretical Phys. and Fluid Mechanics*, at ISI, Calcutta during 6-8 January 1991.

INDIAN STATISTICAL INSTITUTE

Electronics and Communication Sciences

1. Dan, T. (with Datta, A. K. and Mukherjee, B.): 'Speech synthesis using signal concatenation'. *Proc. Workshop on Speech Technology for Man-Machine Interaction*, TIFR Bombay, December 1990.
2. Datta, A. K. (with Ganguli, N. R. and Mukherjee, B.): 'Intonation in segment-concatenated speech'. *Proc. ESCA Workshop on Speech Synthesis*, Autrans, France, during September 1990, 153-158.
3. De, A. K. (with Das, J. and Dutta Majumder, D.): 'Statistical studies on the tropospheric propagation for VHF/UHF and microwave link'. *Proc. 1st Group Monitoring Workshop in Atmospheric Science*, at IITM, Pune, during 17-19 December 1990, 116-120.
4. Ghosh, A. (with Pal, S. K.): 'Feature ranking using fuzzy correlation'. *Proc. Int. Conf. Fuzzy Logic and Neural Networks*, at Iizuka, Japan during 22-24 1990, 220-202.
5. ——— (—————): 'Self organization of neural network and object extraction'. *Proc. Workshop on Sig. Process., Communication and Networking*, Bangalore during July 1990, 241-246.
6. ——— (with Pal, S. K. and Pal, N. R.): 'Neural network, Gibb's distribution and object extraction'. *Proc. Int. Symp. on Intell. Robotics*, at Bangalore during January 1991, 05-106.
7. ——— (—————): 'Object extraction using a self-organizing neural network'. *Proc. Int. Symp. on Intell. Robotics*, at Bangalore during January 1991, 686-697.
8. Majumder, S. (with Datta, A. K.): 'Automatic recognition of isolated Bengali words'. *Proc. Workshop on Speech Technology for Man-Machine Interaction*, at Bombay during December 1990.
9. Mandal, D. P. (with Pal, S. K. and Murthy, C. A.): 'Formulation of a multi-valued linguistic recognition system'. *Proc. Int. Conf. Fuzzy Logic and Neural Networks*, at Iizuka, Japan, during 22-24 July 1990, 845-848.
10. ——— (—————): 'A multivalued pattern class determining procedure'. *Proc. Int. Conf. Fuzzy Logic and Neural Networks*, at Iizuka, Japan during 22-24 July 1990, 343-346.
11. Pal, S. K.: 'Fuzzy set theoretic measures for handling uncertainties in image analysis and vision problems'. *Proc. NAFIP-90*, at Toronto, during 6-8 June 1990, 79-82.
12. Pal, S. K.: 'Fuzzy geometry, entropy, and image information'. *NASA Conf. Publication 10061*, at Texas during February 1991, 211-232.
13. ——— (with Dasgupta, A.): 'A way to handle subjective uncertainties and a quantitative measure of the same'. *Proc. Int. Conf. Fuzzy Logic and Neural Networks*, at Iizuka, Japan during 22-24 July 1990, 299-302.

FIFTYNINTH ANNUAL REPORT : 1990-91

14. Parul, S. K. (with Banerjee, D. K.): 'Forming straight line edges in digital images through clustering'. *Proc. KBCS-90*, at Pune during December 1990.
15. ——— (with Banerjee, D. K. and Dutta Majumder, D.): 'Detection of curvilinear structure in IRS images'. *Proc. KBCS-90*, at Pune during December 1990.

Biological Sciences

Agricultural Science

1. Banik, P. (with Banerjee, R. N. and Bagchi, D. K.): Studies on increasing cropping intensities under dry farming system in Bihar plateau. *Indian Science Congress* at Indore, 1991.
2. Ghosal, P. (with Banerjee, R. N. and Bagchi, D. K.): Studies on the performance of phosphatic fertilizers on paddy based system: Residual *P*s. continuous application. *Indian Science Congress* at Indore, 1991.
3. Ghose, M. (with Bagchi, D. K.): Stomatal size and frequency in leaves of some cultivars of *Brassica campestris* and *Brassica juncea*. *Indian Science Congress* at Indore, 1991.

Anthropometry and Human Genetics

1. Basu, A.: Tribal demography and health: Some concepts, issues and observations. Invited paper presented at the *Seminar on Continuity and Change in Tribal Societies*, Indian Institute of Advanced Study, (Shimla), New Delhi, during 14-19 January 1991.
2. Das, K.: Non linear trend of association between inbreeding and homozygosity of a few polymorphic genic markers. *Annual Conference of the I.S.H.G.*, held at Tirupati during 1991.
3. Malhotra, K. C.: Status of Medical Genetics in India: An overview. *WHO Panel on Medical Genetics*, Fukui, Japan during 30 July to 4 August 1990.
4. ———: Genetic polymorphism in India: An overview. *Int. Conf. Hum. Biologists*, Fukui, Japan during 30 July to 4 August 1990.
5. ———: Village ecosystem in Misoram, India. *V Int. Cong. on Ecol.*, Yokohama, Japan, during 24-30 August 1990.
6. ———: Participatory management of forests in India. *V Int. Cong. Ecol.*, Yokohama, Japan, during 24-30 August 1990.
7. ———: Greening urban centers. *Int. Conf. Health Ecol. in Urban Centers*, Durham University, Durham, U.K. during 23-27 September 1990.
8. ——— (with Vasulu, T. S., Ohandra, S, Yadav, G. and Ahikari, A.): Joint management of forests in W. Bengal: A case study of Jamboni Range in Midnapore District. *Workshop on Sustainable Forestry*, New Delhi, during 10-13 September, 1990.

INDIAN STATISTICAL INSTITUTE

9. Malhotra, K. C.: Drinking water and Childhood mortality in India. *Max Mueller Bhawan*, Bombay, during 10-12 December 1990.
10. ———: Environmental movements and their impact on ecology in India. *Int. Workshop on Tropical Forests*, Paris, during 21-24 January 1991.
11. ———: Pattern of change among the Vandiwallas of Maharashtra. At Workshop on Cultural and Genetic Diversity in Indian Populations *Indian Institute of Science*, Bangalore, during 27-28 January, 1991.
12. ———: Peoples participation in the regeneration of Forest lands. *Workshop on Buffer Zone Management*, Dehradun, during 18-23 March 1991.
13. Majumder, P. P.: Statistical analysis of family data of multilocus recessive disorder. Invited talk at First Regional Conference of the Biometrics Society, Bangalore, during 10-11 May 1990.
14. ———: Statistical methods for mapping genes controlling quantitative traits. Invited talk, at Workshop on Biometrical Genetics, Mysore, during 7-8 September, 1990.
15. ———: Genetics of India's human populations: An overview. Invited talk. *Discussion Meeting on Genetic and Cultural Diversity in Indian Population*, Bangalore, during 28-30 January 1991.
16. Reddy, B. M. (with Krishna, T.): Principal component analysis of finger ridge counts: Their universality. *U.G.C. Seminar*, S. V. University, during 13-15 March, 1991.

Biochemistry

1. Ghosh, B. B.: Comparison of the effects of inorganic and organic tin on human chromosomes *in vitro*. *7th All India Congress of Cytology and Genetics*, University of Kalyani, Kalyani, during 22-26 December 1990.
2. ——— (with Talukder, G., Rao, A., Banerjee, A., De, M. and Sharma, A.): Study of chromosomal changes in Industrial workers. *7th All India Congress of Cytology and Genetics*, University of Kalyani, Kalyani, during 22-26 December, 1990.
3. ——— (with Talukder, G., Roy Chowdhury, A., Singhanis, L., Sen, S., Banerjee, P. Gajra, B., and Ghosh, P. K.): Some common disease states in man in the Eastern India. *Int. Symp. on Chromosome Research: from Microscope to Molecule*, Indian Institute of Chemical Biology, Calcutta, during 12-14 December 1990.

Leaf Protein

1. Barik, S.: Studies on the performance of four monogerm sugar beet (*Beta vulgaris L.*) cultivar to achieve maximum sugar and Leaf Protein (LP) Yields. Paper presented at the Agricultural Session of the 78th Science Congress, Indore, during 3-8 January 1991.

FIFTYNINTH ANNUAL REPORT : 1990-91

2. Chakrabarti, S. : Biochemical changes in aphid infested leaf gall tissues. Paper presented at International Symposium on "Aphids: Population tommolecules" held at Oklahoma State University, U.S.A., during 12-16 September 1990.

Social Sciences

Economic Research

1. Ghosh, M. : Sub contracting, subsidized credit and the informal sector, presented at the seminar on Contemporary issues in Economic Development sponsored by Department of Economics, Jadavpur University, 23-24 February 1991.
2. Sarkar, A. : On the formation of agricultural prices. Contemporary issues in Economic Development. Sponsored by Department of Economics, Jadavpur University, 23-24 February 1991.
3. ——— (with Ghosh, M.) : A Model of the Informal Sector. Sixth World Congress of the Econometric Society, Barcelona, Spain, August 22-28, 1990.
4. ——— (with Ghosh, M.) : Industrial dualism, vertical specialisation and credit policy. Aspects of Economic Development held at Centre for Economic Studies, Presidency College, Calcutta, 16-17 February, 1991.

Economic Analysis (Bangalore)

1. Iyenger, N. S. : Concept of Forecasting and its uses in Planning. Seminar on *Emerging Economic Environment, Forecasting and Planning*, Bangalore, 17 August, 1990.

Planning (Delhi)

1. Ray, Debraj : The functioning of cooperative under renegotiation, *Game Theory Conference ISI, Delhi*, December 1990.
2. ——— (with Strenfert, P.) : Dynamic equilibria with unemployment due to undernourishment. *World Congress of the Econometric Society, Barcelona, August 1990.*
3. ——— (with Mookherjee, D.) : On the competitive pressure induced by the diffusion of innovations. *World Congress of the Econometric Society, Barcelona, August 1990.*
4. ——— (with Chatterjee, K, Dutta, B., and Sengupta, K.) : *World Congress of the Econometric Society, Barcelona, August 1990.*
5. ——— (with Esteban, J.) : *ISI Conference on Economic Theory, February 1991.*
6. ——— (with Mookherjee, D.) : Industrial Controls. *ISI Conference on Economic Theory, February 1991.*

INDIAN STATISTICAL INSTITUTE

7. Sen, Arunava : Implementing Social Choice Functions by Social Choice Correspondences : A General Formulation and A Limit Result. *World Congress of the Econometric Society*, Barcelona, September 1990.
8. ——— (with Subramanian, S.) : An Incentive based Argument for the Assignment of Rights. *Boeopus conference on Economic Design*, Turkey, July 1990.

Population Studies

1. Deb Roy, R. : A note on the records of micro-regional statistical surveys in India, 1800-1850 and their archival preservation. *Conference on Archival Sources and Demographic Research*, 23-26 April 1990, Triesto, Italy.
2. Guha Roy, S. : A perspective on the population ageing in India. *National Symposium on Quality Aging*, Bangalore University, Bangalore, 29-31 October 1990.
3. ——— : A perspective on the determinants of infant mortality in India. *National Seminar on Population Programme Towards 2001*, Annamalai University, 23-25 August, 1990.
4. ——— : Population—environment nexus : An Overview. *XIV IASPC Conference*, 27-29 December 1990.

Psychometry

1. Dutta Roy, D. : Relationship of Age, Education and tenure to Organisational Awareness. *78th Indian Science Congress*, Indore, 7.1.91.
2. ——— : A model of change in organizational health to improve quality of life. *First National Conference of Indian Academy of Health Psychology*, Cuttack, 26.2.91.
3. Ghosh, Anjali : A forced-choice scale for measuring manager's skill. *National Seminar on Intervention Strategies for Human Resource Development*, Department of Psychology, University of Bombay, Bombay 14-16.12.90.

Sociology

1. Bandyopadhyay, S. : American perceptions of sociology and study of Indian society : Observations of an Indian sociological researcher. *40th Anniversary of Fullbright Programme in India*, Organised by United States Education Foundation in India, Calcutta, at Taj Bengal, 19 January 1991.
2. ——— : Rural Urban Linkages and National Plans. *Third Session National Planning and Urbanisation*, Organised by Centre for Urban Economic Studies, Department of Economics, Calcutta University, 29-31 March 1991, Calcutta.

FIFTYNINTH ANNUAL REPORT : 1990-91

3. ——— : Potential of change in rainfed agriculture in Chhotanagpur plateau (with emphasis upon system evaluation, farmers' participation and sustainability). *North Bengal University*, Darjeeling, on 15 November 1990.
4. ——— : (with Maiti, Asok, Bagchi, Dipak K., and von Eschen, Donald) Grasping forward-moving changes at the grass-roots in rural backwaters. Seminar on *Reconstructing Theories of Modernisation and Development*, School of Social Sciences, Jawaharlal Nehru University, New Delhi, March 22-24, 1991.
5. Chakrabarti, P. : Are the old obsolete ? An exploratory study in rural Giridih, Bihar. Workshop on *The Aged and Aging in India*, Ranchi University, 18-20 August 1990.
6. Dasgupta, Atis : The Fakir and Santuyasi Uprisings : Organisational Aspects *Indian History Congress*, Calcutta, 22-26 December, 1990.
7. Maiti, A. K. : Prospects of agricultural development in North-Eastern India. *North East Indian Council of Social Science Research*, Shillong, July 1990.
8. ——— : Towards understanding agrarian questions and development issues and their relevance to emerging socio-political situation. Organized by Indian Institute of Advanced Studies, Simla. Venue New Delhi, January 1991.

Statistical Quality Control and Operations Research

1. Arthanari, T. S. : Optimization in Statistics—recent trends. Invited Paper at COMPSTAT-90 Dubrovnik, Yugoslavia.
2. Dutta, T. K. (with Banerjee, A.) : A personal computer based maintenance system. National conference on Operations Research in Maintenance Management, Calcutta, 1990.
3. ——— (with Mukherjee, S. P.) : Optimum Sampling Plan for Detection of Independent Defect categories in case of Defect interference. Indian Science Congress, Indore.
4. Handa, S. S. (with Neogy, S. K.) : Data Base Quality Control system in Bred Production. NIQR Conference, held in December 1990.
5. Iyer, V. Narayana : Quality Cost Analysis. One-day Seminar on Total Quality Control and Cost Effectiveness, organised by NIQR, Trivandrum Branch at Hotel Pankaj on 23 January 1991.
6. Lakshmanan, P. : Indian Industries can achieve the quality of ISO-9000 series. Seminar on Quality System, organised by Export Inspection Agency at Madras on 23 June 1990.
7. ——— : Quality Systems for Indian Organisations. Seminar organised by Institute of Standards Engineers on 15 September 1990 at Madras.

INDIAN STATISTICAL INSTITUTE

8. ——— : Quantitative Technique for Decision Making and Policy-Formulation. Asian Pacific Regional Organisation of the International Federation of Professional and Technical Employees, Singapore on 19 November 1990 at Thirupathur.
9. Majumdar, S. K., et al. : Study on the effects of welding parameters on C-Cr-Mo type hard surfacing system by submerged arc process using statistical methods. Proc. of the National Welding Seminar, No. 22-24 at Indian Institute of Welding, Bombay, during 1990.
10. Manna, D. K. (with Seth, A.) : Optimisation of Tractor Engine performance with respect to fuel injection system. ORSI Annual Convention 90 at New Delhi during 14-16 December 1990.
11. Mohan, S. R. (with Equamaram, N.) : On some classes of linear complementarity problem with matrices of order n and rank $(n-1)$. Journal Mathematics of Operations Research, 15, 243-257, 1990.
12. Narayana, V. : Quality Circles and Pharmaceuticals Industry. One-day seminar on Managing change in the Drugs and Pharmaceutical Industry organised A. P. Branch of Indian Pharmaceutical Association in Hyderabad on 6 October 1990.
13. Mukherjee, S. P. : Comparison of relative merits of different strategies in charging crystallizers. International Conference on Industrial and Applied Mathematics, Washington, organised by SIAM, during 1991.
14. Neogy, S. K. (with Handa, S. S.) : Data Base QC system in Bread Production. NIQR Convention 1990 held in December at Bangalore.
15. Ranga Rao, N. T. V. (with Ramesh, A. and Kishan, Rao, J.) : Training Needs for Effective Functioning of QC Circles. National Convention on Quality Circles, during 10-12 December 1990.
16. ——— (with Murthy, T. R. and Kishan Rao, J.) : A Quality Audit Approach for improving the performance of QC Circles.
17. ——— (with Suresh, A. and Rajendra Prasad.) : Personality traits of inspectors—A Principal components Analysis to rate performance and indentifying training needs.
18. ——— (with Suresh, A. and Rajendra Prasad.) : Better Quality of work life through productivity in small industry. Asian Productivity Organisation for 'Ishikawa Essay Contest'.
19. Ranganna, Y. : Systems approach in vendor relations and ratings. National Conference on Quality and Reliability (NCQR) conducted by IIT, Bombay during 3-6 December 1990.
20. Roy Chowdhury, A. : Abstract : Improving performance of wire cutting machine. 15th Annual Quality Congress of American Society for Quality Control, during 1991.

FIFTYNINTH ANNUAL REPORT : 1990-91

Library, Documentation and Information Sciences

1. Bhattacharyya, G. : Library and information service as a profession. (Invited paper), 14th National Seminar of IASLIC, Mysore, November 14-17, 1990. (Published in "Status and Authority of Library Profession In Library Management) IASLIC Special Publication-30, 1-11.
2. ——— : On teaching of library and information science. The keynote address delivered on the occasion of initiating the Refresher Course on the same topic in Bangalore on 17 December 1990.
3. ——— (with Bhattacharya, Maya) : Further specialization in areas forming part of a profession discipline : Guidelines for establishing its needs for L and IS. 8th National Seminar of IATLIS Bangalore, during 31 January—2 February, 1991.
4. Gopinath, M. A. : Knowledge-based information retrieval programs and models. (Paper presented at a Seminar), organized jointly by the Madras Library Association, University of Madras and Institute of Information Studies in Madras, June 1990.
5. ——— : Interdisciplinary approach towards specialization in library and information profession. (Paper presented at a Seminar, organized on the occasion of the Silver Jubilee Celebration of the Department of Library and Information Science, Karnataka University, in August 1990.
6. ——— : Use of thesaurus in online searches. Seminar on "Online Searches" organized by Information (India) Ltd., Bangalore, in October 1990.
7. Gopinath, M. A. : Information modelling. (Paper presented at a Symposium), organized by Madras Library Association (MALA) in Madras, in November 1990.
8. ——— : Interactive cooperation and programmes of research between publishers, book-sellers, and librarians Second Karnataka State Seminar, organized by the Federation of Publishers and Book-Sellers, in November 1990.
9. ——— : Perspectives of librarianship in library management. 14th National Seminar of IASLIC, Mysore, November 14-17, 1990.
10. ——— : Information economics : An area for specialization in research. 8th National Seminar of IATLIS. Bangalore, 31 January—2 February 1991. (Published in the Working Document entitled "Seminar on Specialization in Library and Information Science Education, as paper CE).
11. ——— : Seminar mnemonics and abstract classification. (Paper presented at a Symposium), organized by the Department of Library and Information Science, Jadavpur University, Calcutta, on 24 February 1991.
12. ——— : Absolute syntax and abstract classification. (Paper presented at a Symposium), organized by the Department of Library and Information Science, Jadavpur University Calcutta, on 26 February 1991.

INDIAN STATISTICAL INSTITUTE

13. ——— : Development of indigenous data bases in medical sciences in India. *National Workshop of the Scientific Advisory Group of the NIC-BIBLIONIC Centre, New Delhi, in March 1991.*
14. ——— : Development in the use of CDS/ISIS in automated library management. *Users' Meet of CDS/ISIS Users on Microcomputers, organized jointly by NISSAT (DSIR) and DESIDOC, New Delhi, March 8-9, 1991.*
15. Gopinath, M. A. : Common communication format: Prospects and Programmes. *UGC Workshop on Bibliographic Record Format, organized by the University of Madras, March 20-29, 1991.*
16. ——— : International programmes on bibliographic record format. *UGC Workshop on Bibliographic Record Format, organized by University of Madras, March, 20-29, 1991.*
17. ——— (with Meera, B. K.) : Informetrics and its use in library management as an area of specialization. *8th National Seminar of IATLIS, Bangalore, 31 January—2 February 1991.* (Published in the volume of the Working Document entitled Seminar on Specialization in Library and Information Science Education, Paper BG).
18. ——— (with Patil, M. D.) : Interdisciplinary nature of information science and technology (ISI): An enumerative analysis. *8th National Seminar of IATLIS, Bangalore, 31 January—2 February 1991.* (Published in the Working Document entitled Seminar on Specialization in Library and Information Science Education Paper BJ).
19. Meera, B. M. : Statistical Quality Control in Information Systems: A new dimension approach. *UGC Seminar—New Dimensions in Library and Information Science, University of Mysore, 30-31 March, 1991.*
20. Prasad, A. R. D. : A case for artificial intelligence in library and information science curriculum. *8th National Seminar of IATLIS, Bangalore, 31 January—2 February, 1991.*
21. ——— : The second computer revolution and the future of library and information science. *National Conference on Librarianship in Developing Countries, organized by S. V. University, Tirupati, 20-28 March, 1991.*
22. Ravichandra Rao, I. K. : Library automation: Problems and Prospects. *Seminar on New Dimensions of Library and Information Services, sponsored by UGC, organized by the Department of Library and Information Science, University of Mysore, Mysore, 30-31 March, 1991.*
23. Seetharam, S. : Information consolidation activities and services: Keys to health information. *Sixth International Congress on Medical Librarianship, New Delhi, September 1990.*

FIFTYNINTH ANNUAL REPORT : 1990-91

24. ——— : Towards establishing concordance among medical classification systems. *Second International Congress on Terminology and Knowledge Engineering*, Trier, Federal Republic of Germany, 2-4 October, 1990.
25. ——— : Industrial Systems and Services : A course module. *8th National Seminar of IATLIS*, Bangalore, 31 January-2 February, 1991.
26. ——— : International information systems : INIS, AGRIS, DEVSIS. *Refresher Seminar for Degree College Librarians*, sponsored by UGC, organized by Osmania University, Hyderabad, March 1991.
27. ——— : Planning and management of information centres. *Workshop on Planning and Management*, organized by the Departments of Library and Information Science, Madurai Kamaraj University, Madurai, 28 February-1 March, 1991.
28. ——— : Towards an information centred society in developing countries. *Seminar on Librarianship in Developing Countries*, sponsored by UGC, organized by the S. V. University, Tirupati, 28-30 March, 1991.
29. ——— : Information marketing. A new dimension in library and information services. *Seminar on New Dimensions in Library and Information Services*, sponsored by UGC, organized by the Departments of Library and Information Science, University of Mysore, Mysore, 30-31 March, 1991.

PROJECT REPORT SUBMITTED

Biological Sciences

Anthropometry and Human Genetics

Professor K. C. Malhotra, submitted the following project reports :

1. Role of Voluntary Organizations in the Joint Management of Forests in West Bengal, submitted to the World Bank (32 pages).
2. Implications of Non Timber Forest Produce in sustaining regenerations of Forests in West Bengal, submitted to the World Bank (48 pages).
3. Participation of Tribes and Scheduled Castes in the Joint Management of Forests in South West Bengal, submitted to the World Bank (66 pages).

TECHNICAL REPORTS

Theoretical Statistics and Mathematics

Calcutta

1. Bhandari, S. : Least favourable configuration and asymptotic efficiency of multinomial ranking procedure, Tech. Rep. No. 9/90.
2. Das, A. : E - and MV -optimal orthogonal block designs, Tech. Rep. No. 7/90.

INDIAN STATISTICAL INSTITUTE

3. Das, Ashish : E -optimal block and row-column designs with unequal number of replicates, Tech. Rep. No. 3/91.
4. Das, A. (with Shah, K. R.) : Binary designs are not the best, Tech. Rep. No. 1/91.
5. Ghosh, J. K. : Characterization of a stopping time through distribution of sequential likelihood ratio statistics, Tech. Rep. No. 2/91.
6. Mukherjee, Gautam (with Mukherjee, A.) : Equivariant cohomology theory, Tech. Rep. No. 10/90.
7. Mukherjee, K. K. : Coincidences of Holomorphic maps, Tech. Rep. No. 13/90.
8. Purkayastha, S. : A definition of sample circular median, Tech. Rep. No. 14/90.
9. ——— : A Bahadur-type representation of circular median and an application, Tech. Rep. No. 15/90.
10. Rajeev, B. : On asymptotics of a class of 1-dimensional diffusions, Tech. Rep. No. 4/91.
11. Rao, A. R. (with Murthy, A. S. M.) : Two approximations related to compound interest, Tech. Rep. No. 12/90.
12. Sinha, Sagnik (with Dutta, S.) : Coalition proof correlated Nash equilibrium, Tech. Rep. No. 11/90.
13. Tripathi, T. P. (with Bahl, Shashi) : Estimation of mean using double sampling for stratification and multivariate auxiliary information, Tech. Rep. No. 8/90.

Bangalore

1. Datta, Basudev : On two dimensional totally real submanifolds of S^4 .
2. Sitaram, Alladi (with Willis, G. A.) : L^p -functions satisfying the mean value property on homogeneous spaces.

Applied Statistics, Surveys and Computing

1. Basu, Tapas Kumar (with Sarkar, Samir Kumar) : Comparative growth pattern of IMC seeds reared in cemented hatchery and in improvised pits.
2. Mukherjee, Biswa Nath : A Simple iterative procedure for the analysis of correlation structures, Tech. Report No. ASC/90/2, 1990.
3. Mukhopadhyay, P. (with Vijayan, K.) : On non-negative unbiased estimation of quadratic forms in finite population sampling. University of Western Australia.
4. Sengupta, Debasis (with Deshpande, J. V.) : A new goodness of fit test for the proportional hazards model. University of California, Santa Barbara.

FIFTYNINTH ANNUAL REPORT: 1990-91

The Computer and Statistical Service Centre (CSSC)

1. Dutta, A. (with Parui, S. K. and Dutta Majumder, D.): A parallel algorithm for handwritten numeral recognition.
2. Roy, D.: On the questionnaires for admission to B. Stat, M. Stat and M. Tech. courses at ISI during the session 1990-91.

Physical and Earth Sciences

Electronics and Communication Sciences

1. Biswas, S. N. (with Choudhury, S. and Dutta Majumder, D.): Some proposals for 3-D shape extraction using machine vision algorithms, 17.
2. Kundu, M. K.: Range measurement from focussing: A survey TR/ECSU/0001/90.
3. ——— (with Eappen, B. K.): Processing of finger print images, TR/ECSU/0002/90.
4. ——— (with Bhai, B. N.): Development of image printing software on LN03-plus laser printer in microvax cluster working under ULTRIX-3.2, TR/ECSU/0003/91.
5. Majumder, S. (with Datta, A. K.): Intonation in segment-concatenated speech and rule based approach to manners labelling of speech signal, 1990.

Social Sciences

Economic Research

1. Bhattacharya, N. (with Coondoo, D., Maiti, P.): Level of living in rural India. Tech. Report No. 9/90.
2. Chakravarti, S. (with Budra, A.): Wither industrial retardation. Tech. Report No. 5/90.
3. Dasgupta, Dipankar (with Itaya Jun-ichi): Comparative statics for the provision of public goods in a conjectural variations model with heterogeneous agents.
4. Ghosh, Malabika: Subcontractings, subsidized credit and the informal sector. Tech. Report No. 1/91.
5. Mazumdar, K.: An alternative methodology of measuring inter-state disparity in per capita state domestic product. Tech. Report No. 4/90.
6. Misra, Meenakshi: Role of money as a medium of exchange in a competitive system with training cost.
7. Rao, Kavita: A unifying framework for dual economy models. Tech. Report No. 9/90.

INDIAN STATISTICAL INSTITUTE

8. Sarkar, N.: An estimator combining the ridge regression and the restricted least squares: Methods of estimation. Tech. Report No. 6/90.

Planning (Delhi)

1. Kanwal, S. M.: A Note on the Reliability and Consistency of the New Series of National Accounts Statistics. (To be presented in the forthcoming seminar of the Indian Association for Research in National Income and Wealth).
2. Mookherjee, D.: The Economics of Enforcement.
3. ——— : Market Failure and Information, mines.
4. ——— (with Melumad, N. and Reichelstein, S.): Hierarchical Decentralization of Incentive Contracts (revised December 1990).
5. ——— (with Melumad, N. and Reichelstein, S.): A Theory of Responsibility Centers (revised November 1990).
6. ——— (with Reichelstein, S.): The Revelation Approach to Nash Implementation (revised October 1990).
7. ——— (with Reichelstein, S.): Dominant Strategy Implementation of Bayesian Incentive Compatible Allocation Rules (revised October 1990).
8. ——— (with Png, Ivan): Monitoring Versus Investigation in Law Enforcement and Regulation (revised July, 1990).
9. ——— (with Png, Ivan, mines): Should Law Enforcers be Paid More to Reduce Corruption.
10. ——— (with Moral Hazard and Kahn, Charles): Decentralized Exchange and Efficiency (revised December 1990).
11. ——— (with Kahn, Charles): Optimal Insurance with Unobservable side Trades.
12. ——— (with Kahn, Charles): A Game Theoretic Approach to Decentralized Trading with Moral Hazard.
13. ——— (with Kahn, Charles): Coalition Proof Nash Equilibrium in an Adverse Selection Economy.
14. ——— (with Asilis, C. and Kahn, Charles): A Unified Approach to Renegotiation-Proof Equilibrium (revised November 1990).
15. ——— (with Ray, Debraj): Returns to Scale and the Stability of Price-Setting Cartels.
16. ——— (with Ray, Debraj): Learning By Doing and Industrial Market Structures: A Survey.
17. Mukherji, P. N.: Social Constraints on Rural Labour: A Report on the Pilot Study of 27 villages of Meerut, Varanasi, Palamau, Ranohi and Karnal (submitted to National Commission on Rural Labour, Govt. of India, July 1990).

FIFTYNINTH ANNUAL REPORT : 1990-91

18. Mukherji, P. N. : Interim Report of the Study Group on Social Constraints on Rural Labour (submitted to *National Commission on Rural Labour*, Govt. of India, Feb. 1991).
19. Ramaswamy, Bharat : Crop Insurance Input Use and the Maximization of Expected Income, *Mimeo*, May, 1991.
20. Saluja, M. R. (with Sarma, Atul and in collaboration with Dept. of Economics, Gauhati University) The structure of Assam's Economy (1982-83) and A Perspective Plan of Assam upto 2000 AD.

Linguistic

1. Debnath, Sukesh : Evidence of Vocabulary Balance in Tagore's Galpaguocha. Tech. Report No. LRU/SD/1/91.
2. ——— : A Comparative Study of Initial Graphemes in 14 Novels of Bankim Chandra and Rabindranath's 'Galpaguocha'. Tech. Report No. LRU/SD/3/91.
3. ——— (with Choudhry, A. and Bandyopadhyay, D.) : 'You' 'and' 'I' Just Mingling. Tech. Report No. LRU/SD/2/91.

Statistical Quality Control and Operations Research

1. Arthanari, T. S. : Some special cases of $(n/3/H/Fared)$ problem.
2. ——— : A note on $(n/2/F/Furex)$ problem.
3. ——— (with Manna, D. K.) : When scheduling problem is no problem.
4. Biswas, A. K. (with Manna, D. K.) : Renewal Thuretic look at spares consumption process.
5. Chakraborty, A. K. : Software Reliability—State of the art.
6. Ghosh, D. T. : An evaluation of optimum CSP plans with respect to different performance characteristics.
7. Goel, Rajiv : An algorithm to find weighted majority representation of a simple game.
8. Lakshminathan, P. R. (with Das, A.) : Optimisation of process Parameters for Piston Machining Operations. No. SQC-OR 1/90 dated 25.9.90.
9. ——— (—————) : Control of Rejection of Chrome Plating.
10. Murthy, G. S. R. (with Manna, D. K.) : Critical value for process capability ratio.
11. Pandey, B. J. : Top management appreciation programme on Quality Control for NCCO. (prepared. course manual).

INDIAN STATISTICAL INSTITUTE

18. Pandey, R. J. : Introductory Executive Development programme on Statistical Techniques of Quality Control for Union Carbide. (prepared course manual).
19. SQC-OR Unit, Bombay : Manual on Orthogonal Array Methods of Experimentation.
14. ——— : Manual on Case Studies and other material for Top Management Seminar on Taguchi Methods.
15. ——— : Manual on Basic Statistical Tools for Process capability studies for NCCI.
16. ——— : Manual on TQM for SAIL : Rourkela Steel Plant.
17. ——— : Manual on Basic Statistical Tools for Process Capability Studies for TISCO, Jamshedpur.
18. ——— : Manual on Basic Statistical Tools for Process Capability Studies for Gajra Bevel Gears Ltd., Dewas.
19. SQC-OR Unit, Hyderabad : Manual on Statistical Process Control (SPC) for SPC Programme at HCL.
20. ——— : Manual on SPC for SPC.
21. ——— : Manual on Simple Tools for Programme on Simple Tools.
22. ——— : Manual on SQC for Part-Time Certificate Course in SQC.
23. ——— : Manual on SPC for SPC at APPM.
24. ——— : Manual on Sampling, Inspection and Testing for Workshop.
25. ——— : Manual on Sampling and Progress Control for ECLL.
26. ——— : Manual on Vendor Quality Management for Vendor Quality Management.

Library, Documentation and Information Sciences

D R T C (Bangalore)

1. Bhattacharya, G. : Abstract and abstracting for Information Service Professionals. Sept. 1990. DRTC Tech. Report No. GB-3.
2. ——— : Guidelines for writing a research proposal. Tech. Report No. DRTC/GB-1, 1990.
3. ——— : Reprography for information service professionals : A selective overview. Tech. Report No. DRTC/GB-2, 1990.

FIFTYNINTH ANNUAL REPORT : 1990-91

6. PH.D./D.Sc. DEGREES

1. Ph.D./D.Sc. Degrees Awarded

The following is the list of Ph.D. degrees obtained by the Research Fellows, Research Associates and Project Assistants of the Institute.

1. Shri M. Vijaya Kumar : "Biological Composition of the three isolates of Sirdis of Karnataka : A Hybrid African-Indian Population", degree awarded by the University of Calcutta.
Supervisor : Professor K. C. Malhotra
2. Sm. Jayalakshmi Jayaraman : "Disparities in Development—A case study of Karnataka (India)", degree awarded by the Indian Statistical Institute.
Supervisor : Professor L. S. Bhat
3. Shri N. Egambaran : "Some contributions to Generalized inverses and the linear Complementarity problem", degree awarded by the Indian Statistical Institute.
Supervisor : Dr. S. B. Mohan
4. Shri Tapas Samanta : "Some contributions to the asymptotic theory of estimation in Non-regular case", degree awarded by the Indian Statistical Institute.
Supervisor : Dr K. K. Roy
5. Shri Bhaskaran Rajeev : "Semi-Martingales associated with crossings", degree awarded by the Indian Statistical Institute.
Supervisor : Professor B. V. Rao
6. Shri Sagnik Sinha : "A contribution to the theory of Stochastic Games", degree awarded by the Indian Statistical Institute.
Supervisor : Professor T. Parthasarathy
7. Shri Amitabh Tiwari : "Curvatures of left-invariant metrics on lie groups and parametric Homotopy principle for a class of partial Differential Relations on closed Manifolds", degree awarded by the Indian Statistical Institute.
Supervisor : Professor Amiya Mukherjee

INDIAN STATISTICAL INSTITUTE

8. Shri Basanta Kumar Pradhan : "Public policy and the Dynamics of development : A Macro-economic Theory for Developing Economies", degree awarded by the Indian Statistical Institute.
Supervisor : Professor V. K. Chetty
9. Sm. Padmaja Pal : "Studies on Level of Living and Poverty in Rural India". degree awarded by the Indian Statistical Institute.
Supervisor : Professor N. Bhattacharya
10. Shri Kashinath Chatterjee : "Search Designs and other Topics in Fractional, Reproduction". degree awarded by the Indian Statistical Institute.
Supervisor : Professor Bahul Mukherjee

The following is the list of Ph.D. degrees obtained by the members of the staff of the Institute.

Applied Statistics, Survey and Computing Division

Biometry Research Unit

1. Shri Sanjib Kumar Gupta : "Dietary Influence on cholesterol Metabolism", degree awarded by the University of Calcutta.
Supervisor : Late Professor A. — Chowdhuri

Computer Science Unit

2. Shri Debasis Sengupta : "Statistical Inference on Discrete Life-History Data and some Reliability Problems", degree awarded by the University of California, Santa Barbara.
Supervisor : Dr. S. R. Jammalamadaka

Physical and Earth Sciences Division

Electronics and Communication Sciences Unit

3. Shri Nikhil Ranjan Pal : "On image information measures and object extraction", degree awarded by the Indian Statistical Institute.
Supervisor : Dr. Sankar K. Pal

FIFTYNINTH ANNUAL REPORT: 1990-91

Biological Sciences Division

Anthropometry and Human Genetics Unit

4. Shri Subrata K. Roy : "Health and Labour Productivity", degree awarded by the University of Calcutta.
Supervisor : Professor A. Beau
5. Shri Parashmoni Das Gupta : "Growth at Adolescence: A study of the Bengali School going Boys", degree awarded by the University of Calcutta.
Supervisor : Professor K. C. Malhotra

Social Sciences Division

Economic Research Unit

6. Shri Chiranjib Neogi : "Changes in concentration and structure: An Empirical Analysis of the Indian Corporate Sector 1961-1990", degree awarded by the Kalyani University.
Supervisor : Professor J. B. Chakraborty

Economic Analysis Unit

7. Shri Periaswamy Gajapathi : "The Economics of Ricardo: A reworking", degree awarded by the Indian Statistical Institute.
Supervisor : Professor Sanjit Bose

Statistical Quality Control and Operations Research

8. Sri S. P. Mukherjee : "Some Problems of Optimum decisions in Geological Exploration and Mining Investment", degree awarded by the University of Calcutta.
Supervisor : Prof. A. K. Saha.

The following is the list of Ph.D. thesis submitted by the Research Fellows, Research Assistants and Project Assistants of the Institute.

1. Shri D. P. Sengupta : "New amphibians (*Labyrinthodontia Temnospondyli*) from the late Triassic Maleri Formation of Deccan India: Their significance in geology and palaeontology", University of Calcutta.
Supervisor : Professor T. Roy Chowdhury

INDIAN STATISTICAL INSTITUTE

2. Mrs. Sasmita Bandyopadhyay : "Maternal Working Status and Health of Mother and Child", University of Calcutta.
Supervisor : Professor A. Basu
3. Shri J. Bhanja : "Contributions to the Neyman-Scott and mixture problems", Indian Statistical Institute.
Supervisor : Professor J. K. Ghosh
4. Shri Pradipta Bandyopadhyay : "The Masur intersection property in Banach spaces and related topics", Indian Statistical Institute.
Supervisor : Professor A. K. Roy

The following is the list of Ph.D. thesis submitted by the members of the staff of the Institute.

Social Sciences Division

Economic Research Unit

1. Shri Kunal Chattopadhyay : "Some Economic Aspects of Tourism Development in Developing Countries with reference to India", University of Kalyani.
Supervisor : Professor Amitabha Sen

The following is the list of Ph.D. degree obtained by the persons not engaged in Indian Statistical Institute but who had worked under the guidance of the faculty of the Institute.

1. Shri Prasanta Kumar Mahato : "Some Geometrical Aspects of $N = 1$ Supergravity", degree awarded by the University of Calcutta.
Supervisor : Professor P. Bandyopadhyay
2. Shri Pradip Kumar Ghosh : "Stochastic Quantization and Some Aspects of Supersymmetry", degree awarded by the University of Calcutta.
Supervisor : Professor P. Bandyopadhyay
3. Shri Chittaranjan Chakraborty : "Some Theoretical and Applied Problems of Turbulent Flow", degree awarded by the University of Jadavpur.
Supervisor : Dr. Himadri Pal Mazumdar
4. Shri Prabir Kumar Kundu : "On Some Water Wave Problems and Associated Mathematical Methods", degree awarded by the University of Calcutta.
Supervisor : Professor B. N. Mandal

FIFTYNINTH ANNUAL REPORT : 1900-01

8. Ma. Chumki Mahinder : "A Comparative Ethno-Biological Study of Some Communities of Different Origin Inhabiting Similar Eco-Systems", degree awarded by the University of Calcutta.
Supervisor : Professor A. Ban

The following is the list of Ph.D. thesis submitted by the persons not engaged in Indian Statistical Institute but who had worked under the guidance of the faculty of the Institute.

1. Shri Ananda Ghosh : "Studies on some problems in income inequality and industrial concentration", University of Calcutta.
Supervisor : Dr. S. R. Chakraborty
2. Shri S. S. Maiti : "On some problems in analysing of covariance structures", Indian Statistical Institute.
Supervisor : Professor B. N. Mukherjee

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

7. TWENTYFIFTH CONVOCATION

The Indian Statistical Institute held its Twentyfifth Convocation for awarding the Ph.D., M. Tech. (Computer Science), M.Stat. and B.Stat. (Hons.) degrees, Post-Graduate Diplomas in Applied Statistics and Diploma in Statistics on 23 February 1991. Shri P. N. Haksar, Chairman of the Council of the Institute, presided over the Convocation function. Professor J. K. Ghosh, Director of the Institute, welcomed the guests and presented the annual review of research, teaching and training activities of the Institute. Dr. A. P. Mitra, F.R.S., Director General, Council of Scientific and Industrial Research and Secretary, Department of Scientific and Industrial Research, Government of India, delivered the Convocation Address entitled, "Changing Concepts of Atmospheric Environment".

The number of candidates who were awarded degree and diplomas at this Convocation is given below.

Degree/Diploma	Number of candidates
Doctor of Philosophy (Ph.D.)	11
Master of Technology in Computer Science (M.Tech.)	14
Master of Statistics (M.Stat.)	24
Bachelor of Statistics (Hons.) [B.Stat. (Hons.)]	21
Post-graduate Diplomas in Applied Statistics :	
A. Post-graduate Diploma in	
(i) Statistical Quality Control and Operations Research, Calcutta	10
(ii) Statistical Quality Control and Operations Research, Delhi	3
B. Part-time Diploma in	
(i) Statistical Quality Control and Operations Research, Bombay	1
(ii) Statistical Quality Control and Operations Research, Madras	4
Diploma in Operation and Programming of Automatic Data Processing Equipment	4
Associatehip in Documentation and Information Science, Bangalore	7
Professional Examinations in Statistics :	
(i) Junior Diploma in Statistics	5
Total :	104

8. VISITING SCIENTISTS

A number of distinguished scientists from abroad and India participated in the research, training and other scientific activities to the Institute during the year. Some of them came to the Institute on invitation and spent fairly long period at the Institute to assist in the regular research and teaching programme while others came for short periods and gave lectures and seminars. Most of them were available for consultations by the faculty members of the Institute.

1. Professor P. K. Sen, University of North Carolina, Chapel Hill, U.S.A. (17.12.90 to 19.12.90) delivered two lectures entitled (i) CNP optionality and admissibility multivariate estimators, and (ii) Sequential methods in statistics.
2. Professor T. E. S. Raghavan, University of Illinois at Chigago, U.S.A. (6.12.90 to 8.12.90) delivered two lectures entitled (i) Existence of correlated stationary equilibria for discounted stochastic games in arbitrary state spaces, and (ii) Algorithms for stochastic games.
3. Dr. Dityan Majumdar, University of Illinois at Chicago, U.S.A. (12.12.90 to 14.12.90) delivered three lectures entitled (i) Optimal designs for test vs. control treatments, (ii) Combinations of experiments, and (iii) Trade-off theory with applications in sampling.
4. Professor G. Tolland, University of Washington, U.S.A. (26.9.90 to 12.12.90) visited ISI, Calcutta, Bangalore and Delhi and delivered a series of lectures entitled 'wavelets and their applications' and 'Meta Heisenberg group'.
5. Professor S. R. Jammalamadaka, University of California, Santa Barbara, U.S.A. (20.11.90 to 29.11.90) delivered two lectures entitled (i) Non-parametric inference based on spacings, and (ii) Some aspects of analysis of directional data.
6. Professor S. P. Mukherjee, Department of Statistics, Calcutta University, India (19.11.90) delivered a lecture entitled 'Some aspects of total positivity'.
7. Professor Renu Laskar, Cleason University, U.S.A. (31.10.90 to Middle of December) delivered three lectures entitled (i) Domination, (ii) Fractional parameters, and (iii) Coloring problems with applications to Broadcasting.
8. Professor Arunava Mukherjee, University of South Florida, Tampa, Florida (12.11.90) delivered one lecture entitled 'Random matrices and fractals'.
9. Professor H. Toutenberg, University of Rogenaburg, West Germany (15.9.90 to 27.9.90) visited ISI, Calcutta and Delhi and lecture entitled 'Meanquare error superiority—An overview.'
10. Dr. Tapan Nayak, George Washington University, Washington D. C. (24.9.90) delivered a lecture entitled 'Estimating the number of component processes of superimposed process' (with applications in software reliability).

INDIAN STATISTICAL INSTITUTE

11. Dr. P. Lahiri, University of Nebraska, Lincoln, U.S.A. (30.8.90 to 28.8.90) delivered two lectures entitled (i) Small area estimation, and (ii) Robust empirical Bayes estimation in finite population sampling.
12. Dr. Sitadri N. Bagehi, University of Nevada Reno (16.8.90) delivered a lecture entitled 'Theory of multivalued random variables'.
13. Dr. Jyotirmay Sarkar, The University of Michigan, Ann Arbor (8.8.90) delivered a lecture entitled 'Bandit problems with covariates : Sequential allocation of Experiments'.
14. Dr. Pali Sen, University of North Florida (18.7.90) delivered a lecture entitled 'Kinetic model of calcium absorption'.
15. Professor R. N. Bhattacharya, Indiana University, Bloomington, U.S.A. (18.8.90 to 20.8.90) delivered two lectures entitled 'Asymptotics of a class of PDE analysed by probabilistic methods—I and II'.
16. Dr. D. Miklos, Hungarian Academy of Sciences, Budapest (18.8.90 to 25.8.90) visited ISI, Calcutta and Delhi and delivered two lectures entitled (i) Intersecting linear binary codes, and (ii) The Shannon capacity via association schemes.
17. Professor Sudhin Mukhopadhyay, University of Kalyani, Nadia, India (11.5.90) delivered a lecture entitled 'Research project on differential impact of rice technology—background, progress and programme'.
18. Dr. Kalyan Das, University of Calcutta, Calcutta, India (2.4.90) delivered a lecture entitled 'Nonnegative estimation of the ratio of variance components'.
19. Dr. L. K. Raut, Department of Economics, Doos University of California, San Diego, La Jolla, California, U.S.A. (12.7.90 to 12.9.90).
20. Professor K. R. Shah, University of Waterloo, Canada (24.10.90 to 31.12.90) delivered a lecture entitled 'On the structure and optimality of row column designs'.
21. Mr. J. Fujii, Osaka City University, Osaka, Japan (12.12.90 to 17.12.90 and 4.1.91 to 19.1.91).
22. Professor N. Mukhopadhyay, University of Connecticut, Storrs, U.S.A. (December 90 to 10.1.91) delivered a lecture entitled 'Sequential and related methodologies in linear models'.
23. Professor C. R. Rao, Penn. State University, State College, USA (29.12.90 to 30.12.90) delivered two lectures entitled (i) Some problems in robust inference for linear models, and (ii) Professor R. A. Fisher and the Indian Statistical Institute.
24. Dr. M. N. Mishra, Sambalpur University, Orissa (15.6.90 to 30.6.90) to work with Professor B.L.S. Prakasa Rao.
25. Dr. M. I. Bog, University of Hyderabad, Hyderabad (4.6.90 to 14.6.90) to work with Dr. K. Balasubramaniam.

FIFTYNINTH ANNUAL REPORT : 1990-91

26. Dr. H. L. Manocha is presently visiting Delhi Centre since July 1990 for one year. He has published two papers : (i) On models of irreducible q -representations of $sl(3, C)$. *Applicable Analysis*, 37, 19-48 (1990), and (ii) (with Sahai, Vivek) on models of irreducible representations of compact Lie group $SU(2)$ involving special functions. *J. Pure and Applied Math.*, 21(12), 1059-1071 (1990). One paper of Dr. Manocha (with Govil, N. K.) has been accepted for publication in the *J. Math. Analysis Applic.*
Under Dr. Manocha's guidance Shri Vivek Sahai completed his Ph.D. thesis.
27. Dr. L. R. Vermaui, Department of Mathematics, Kurukshetra University (10.7.90 to 23.7.90).
28. Dr. Michael Vitto, CTF, Marseille, France (15.7.90 to 21.7.90).
29. Professor P. C. Consul, Department of Mathematics and Statistics, University of Calgary (1.9.90 to 30.11.90).
30. Professor E. Balslev, University of Aarhus, Denmark (17.8.90).
31. Dr. A. V. Nageev, Institute of Mathematics, Uzbekistan (19.9.90 to 21.9.90).
32. Professor Andrzej Wiczorek, Institute of Computer Science, Polish Academy of Sciences (5.12.90 to 20.12.90).
33. Professor Adam Idzik, Institute of Computer Science, Polish Academy of Sciences (5.12.90 to 20.12.90).
34. Professor Stef Tijs, Department of Mathematics, Catholic University, Netherlands (9.12.90 to 16.12.90).
35. Professor Simo Puntanen, Department of Mathematics Sciences, University of Tampere, Finland (14.12.90 to 23.12.90).
36. Professor C. R. Rao, Eberly Professor, Departments of Mathematics and Statistics, University of Pennsylvania, USA (21.12.90 to 26.12.90).
37. Professor J. Horowitz, Department of Mathematics and Statistics, University of Massachusetts (25.12.90 to 17.1.91).
38. Professor K. R. Shah, Department of Statistics, University of Waterloo (15.12.90 to 30.12.90).
39. (i) Professor L. V. Denisov, V. A. Steklov Mathematical Institute, Moscow, (ii) Professor V. Sidoravicius, Lithuanian Academy of Sciences, USSR, (iii) Professor V. P. Belavkin, MIEM Applied Math Department, USSR, (iv) Professor A. M. Chebotarev, MIEM - Applied Math Department, USSR, (v) Professor J. Martin Lindsay, University of Nottingham, U.K., (vi) Professor Robin L. Hudson, University of Nottingham, U.K., (vii) Professor R. Speicher, University of Heidelberg, Germany, and (viii) Professor G. C. Emch, University of Florida, USA, visited ISI Delhi Centre to participate in the International Workshop on Quantum Probability and its Applications held at Delhi Centre during 31.12.90 to 4.1.91 and extended their stay for a period of one week to 3 months and also gave seminars at Delhi Centre.

INDIAN STATISTICAL INSTITUTE

40. Professor Chandler Davis, University of Toronto, Canada (14.4.90 to 19.4.90) delivered a lecture entitled 'History and News of Spectral Perturbation'.
41. Professor M. S. Raghunathan, TIFR, Bombay (8.8.90) delivered a lecture entitled 'Arithmetic Groups'.
42. Professor Raja Velu, University of Wisconsin, Whitewater (5.7.90 to 8.7.90) delivered two lectures entitled (i) Reduced Rank Regression with two sets of regressors, and (ii) Analysis of familial data.
43. Professor V. Ramaswami, Bell Labs, U.S.A. (9.7.90 to 11.7.90) delivered a lecture entitled 'Some recent advances in algorithmic methods'.
44. Dr. S. Thangavelu, TIFR centre, Bangalore (July to August 90) delivered a series of lectures entitled 'Harmonic Analysis on Heisenberg Groups'. He also gave a talk entitled 'Restriction Theorems' on 9 August 1990.
45. Dr. Giriah Aras, University of California, Santa Barbara, U.S.A. (10.8.90) delivered a lecture entitled 'Moments of randomly stopped averages and their applications to sequential estimation'.
46. Professor K. B. Athreya, Iowa State University, Ames, Iowa, U.S.A. (16.8.90) delivered a lecture entitled 'Bootstrapping the empirical distribution function'.
47. Professor Anand Srivastav, Rheinische Friedrich-Wilhelms Universität, Bonn, Germany (26.9.90 to 29.9.90) delivered a lecture entitled 'Radon-Nikodym theorems in C^* - and W^* -algebras'.
48. Dr. Vinod Sharma, Department of Electrical Engineering, I.I.Sc., Bangalore (8.11.90) delivered a talk entitled 'Stability of Communication Networks'.
49. Dr. Dale Husemoller, Haverford College, Philadelphia, U.S.A. (7.1.91 to 8.1.91) delivered a lecture entitled 'Kohn-Drinfel'd Monodromy Theorem'.
50. Dr. Debasis Kundu, I.I.T., Kanpur (27.2.91) delivered a talk entitled 'Estimating the parameters of an exponential signal'.
51. Dr. Debasis Sengupta, University of California, Santa Barbara, U.S.A. (April to May, 90).
52. Dr. H. Stenger, University of Mannheim, Germany (10.12.90 to 21.12.90).
53. Dr. Subir Bandyopadhyaya, University of Windsor, Canada (July 1990).
54. Dr. S. K. Dey, Eastern Illinois University, U.S.A. (July 1990).
55. Professor L. M. Brown, North Western University, Illinois, U.S.A. (1.3.91 to 7.3.91) delivered several lectures.
56. Professor A. Chakrabarti, Department of Mathematics, Indian Institute of Science, Bangalore (25.1.91 to 3.2.91) delivered three lectures entitled (i) Wiener Hoff Technique in diffusion problem I and II, (ii) Complex variable method in water wave problems, and (iii) A method for solving wedge diffraction problems. Professor Chakrabarti also interacted with the research workers of the Institute in discussing problems of mutual interest.

FIFTYNINTH ANNUAL REPORT : 1990-91

57. Professor Sankar Chatterjee, Texas Tech University, Lubbock, U.S.A. (5.1.91 to 30.3.91) participated in a field work programme together with the members of the Geological Studies Unit at Ariyalur (Tiruchirappalli District, Tamil Nadu), Bombay, Ahmedabad and Jabbalpur. The programme is related to the K-T extinction and the Deccan volcanism problem undertaken by the Geological Studies Unit as a project. Professor Chatterjee also gave a seminar talk on 28th March 1991 in the Institute, entitled 'Impact, Volcanism and Dinosaur Extinction'.
58. Professor P. Nute, USA (December 1990) and gave seminars.
59. Professor M. H. Crawford, USA (December 1990) and gave seminars.
60. Professor Y. Takumi, Japan (January 1991) and gave seminars.
61. Professor R. M. Pitchappan, Madurai (December 1990) and gave seminar.
62. Dr. T. Ishida, Japan (January 1991) and participated in discussion.
63. Professor Ashok Rudra, Visva Bharati, Santiniketan continued as a Visiting Professor of the Institute. The Institute is extending all facilities to Professor Rudra for the work undertaken by him to write a biography of Professor P. C. Mahalanobis as an ICSSR project. This biography is expected to be completed and released during the birth Centenary of Professor P. C. Mahalanobis in 1993.
64. Professor Amitabha Bose, Indian Institute of Management, Calcutta continued as a Visiting Professor of the Institute. Dr. Bose is regularly participating in the academic programme of Economic Research Unit.
65. Dr. D. S. P. Rao, University of New England, Australia (11.2.91 to 31.3.91) and addressed a seminar.
66. Dr. Ira N. Gang, Rutgers University, U.S.A. (18.7.90 to January 1991). His research interest is on Analysis of Small Industries in India.
67. Dr. B. R. Arif, Indira Gandhi Institute of Development Research, Bombay (26.4.90) and gave a seminar entitled 'Macro-Econometrics modelling at IGIDR'.
68. Dr. M. Mohandas, Kerala Agricultural University, Trichur, Kerala (16.10.90) and participating in discussions.
69. Dr. Ian Preston, Nuffield College, Oxford (7.9.90) delivered lectures entitled 'The Treatment of Income and Consumption in the measurement of Household Welfare'.
70. Dr. V. N. Pandit, D.S.E., Delhi (24.5.90).
71. Dr. Mihir Rakshit, Presidency College, Calcutta (23.5.90).
72. Dr. Bipul K. Bhattacharyya, I.A.S., Commissioner and Secretary, Department of Planning, Government of Karnataka (29.8.90).
73. Dr. J. P. Sharma, I.A.S., Chairman and Managing Director, Hutti Gold Mines, Government of Karnataka (29.8.90).

INDIAN STATISTICAL INSTITUTE

74. Dr. Parosh Chattopadhyay, University of Quebec, Montreal, Canada (14.8.90).
75. Dr. S. Shivakumar, University of Madras, Madras (26.12.90 to 30.12.90).
76. Dr. Vatsala Narasimhan, Central University, Hyderabad (4.3.91 to 12.3.91).
77. Dr. David R. Phillips, Director of the Institute of Population Studies, University of Exeter, U.K. (February 1991).
78. Mr. Gatachew Birru, University Library, University of Addis Ababa, Addis Ababa, Ethiopia (5.7.90) and participated a seminar entitled 'Current Trends in the Development of Education and Training for Library and Information Science'.
79. A Chinese Delegation from China Society for Scientific and Technical Information (CSSTI), Beijing, consisting of six scientists, namely (i) Mr. Liu Yi, Project Officer, Division of International Region and Cooperation, China, (ii) Mr. Gao Qingheng, Director of Office and Researcher, China, (iii) Mr. Ting-Jiong Wang, Researcher and Senior Engineer, China, (iv) Mr. Li Chao, Deputy Research Fellow, Changsha, China, (v) Mr. Liang Zhiyao, Associate Professor, and (vi) Mr. Ye Tieshu, Professor, under the leadership of Mr. Ting-Jiong Wang visited DRTC on 6 September 1990 for the purpose of knowing in detail the objectives, functions and achievements of DRTC.
80. Dr. N. R. Achuthan, school of Mathematics and Statistics, Curtin University of Technology, Bentley, Australia, visited Madras SQC Unit and SQC T & P Unit during January, 1991, and gave seminars on project scheduling problems, net work scheduling problems and routing problems.
81. Dr. Yoshio Knodo, Professor Emeritus, Kyoto University, Japan visited SQC Bangalore Unit on 11 January, 1991.

9. HONOURS, AWARDS AND SPECIAL ASSIGNMENTS

Professor J. K. Ghosh (Stat-Math) has been elected the President-Elect of the International Statistical Institute for the years 1991-93 and President for the 1993-95. He was also been elected as the President, Statistics Section of the 78th Indian Science Congress held at Indore from 3-7 January 1991.

Professor B. K. Sinha (Stat-Math) was elected to act as the 'Recorder' of the Statistics Section of the Indian Science Congress held at Indore from 3-7 January 1991.

Professor Alladi Sitaram (Stat-Math, Bangalore) has been elected Fellow of the Indian Academy of Sciences, Bangalore.

Dr. Rajendra Bhasia (Stat-Math, Delhi) (i) appointed National Lecturer (1990-91) by the University Grants Committee. (ii) Worked as Associate Editor, Linear Algebra and its Applications, North Holland, New York, (iii) Served as Member, Editorial Board, Linear and Multilinear Algebra, Gordon and Breach, New York.

FIFTYNINTH ANNUAL REPORT : 1990-91

Dr. B. L. S. Prakesh Rao (Stat-Math, Delhi) (i) Elected Editor of Publications for Physical Sciences, Indian National Science Academy. As part of editorial responsibilities appointed Editor of Indian Journal of Pure and Applied Mathematics and Proceedings of the Indian National Science Academy, Part A, Physical Sciences. (ii) Worked as a member of team of course writers for a course in Statistics to be conducted by the Indira Gandhi National Open University. (iii) Worked as a member of Mathematics and Statistics Research Committee of CSIR. (iv) Served as Convener, Sectional Committee I of Indian National Science Academy.

Dr. Kalyan B. Sinha (Stat-Math, Delhi) was awarded C. V. Raman Centenary Gold Medal in Basic Sciences by the Jagdish Bose Science Talent Search, Calcutta, December 1990.

Dr. A. K. Adhikari (Applied Statistics, Surveys and Computing) served as a member of (i) Standing Committee of the Central and State Statistical Organisations. (ii) Committee on Utilization of NICNET for Statistical Data Processing set up by the Department of Statistics, Ministry of Planning, and (iii) Technical Methodological Working Group set up by the Department of Culture, Ministry of Human Resource Development, Government of India.

Professor Biswa Nath Mukherjee (Applied Statistics, Surveys and Computing) continued to serve as a member of (i) The Scientific Advisory Committee of the Institute for Research in Medical Statistics of both (a) New Delhi and (b) Madras chapters; (ii) The Educational Research and Innovation Committee (ERIC) of NCERT; and (iii) The Project Screening Committee of ERIC.

Dr. Debasia Sengupta (Applied Statistics, Surveys and Computing) received the Young Scientist award in Statistics from the Indian Science Congress Association for his paper entitled "How to take a new observation in a linear model".

Professor P. Bandyopadhyay (Electronics) has been selected as the Chief Editor of a new International Journal 'Communication in Theoretical Physics' for which an International Editorial Board has been constituted.

Professor D. Dutta Majumder (Electronics and Communication Sciences) continued to serve as Member: (i) Board of Directors—World Organisation of Systems and Cybernetics, Hunter College City University of New York, USA, 11-14 June 1990. (ii) Governing Board of IAPR and also member of Technical Committee on 'Statistical Pattern Recognition' of IAPR (Continuation). (iii) Sectional Committee of INSA, New Delhi. (iv) Apex Committee of KBCS Programme of Electronics Commission, New Delhi (Continuation). (v) Technical Advisory Board of CSIR, New Delhi. (vi) Research Committee of JNU, New Delhi. (vii) Research Council of CFRI, Dhanbad. (viii) Research Council of Centre for Mathematical Modelling (under CSI) NAL, Bangalore. (ix) Scientific Advisory Committee of BITM, Calcutta. (x) Member, Editorial Board of PRL. (xi) Guest Editor, JIETE. (xii) Indian Journal of Pure and Applied Mathematics. (xiii) Member of Council of WBAST. (xiv) Member, Editorial Board, SCIMA, New Delhi.

INDIAN STATISTICAL INSTITUTE

Professor S. K. Pal (Electronics and Communication Sciences) received the 1990 Shanti Swarup Bhatnagar Prize in Engineering Sciences for contribution in the field of Pattern Recognition and Image Processing.

Dr. D. Saha (Geological Studies) continued as one of the Editors of the Indian Journal of Geology published by the Geological, Mining and Metallurgical Society of India, Calcutta.

Professor A. B. Gupta (Physics) has been made a member of the CEI (Confederation of Engineering Industry) National Technical Committee on Engineering Education.

Professor K. O. Malhotra (Anthropometry and Human Genetics) served as (i) member of the Expert Committee on Applications of Science and Technology for the Development of weaker section of the society of DST ; (ii) Chairman of the monitoring Committee to evaluate core support to SRI, Ranohi and CTD Delhi, constituted by DST ; (iii) Chairman to evaluate DST sponsored projects : (a) iodine deficiency in Visakhapatnam, A.P. ; (b) tribal development in Koli hills of Tamil Nadu ; delivered L.D. Sanghvi oration at the XVI annual conference of the Indian Society of Human Genetics (ISHG), 19 January 1991 at Tirupati ; Presided over the inaugural function of XVI Annual Conference of ISHG, 18-20 January 1991, at Tirupati ; delivered a series of UGC National lectures at Shivaji University, Kolhapur (24-28 February 1991) ; S. V. University, Tirupati (11-16 March 1991) and Sagar University, Sagar (24-28 March, 1991) ; (iv) member, panel on tribal studies constituted by ICSSR ; (v) member Expert Committee for selection of Fulbright Fellowships, USEFI ; delivered validity address at the UGC National Seminar on Recent Trends in Anthropogenetics, held at S. V. University, Tirupati, 12-14 March 1991 ; (vi) appointed member People Commission on Environment, India Chapter ; (vii) member panel on Ranthambore National Park ; (viii) Visiting Professor at the National Institute of Genetics, Mishima, Japan from 5-22 August, 1990 ; (ix) appointed short term consultant with the World Bank, October 1990-January 1991 on West Bengal Forestry Projects ; (x) member, Editorial Board, Indian Anthropologist ; (xi) member, Board of Studies of the Universities of Tirupati and JNU, Shillong ; (xii) Editor, Ecology and people of the Western Ghats ; (xiii) participated as a member of the editorial board of the Journal Human Biology, at Fukui, Japan, 3 August 1990.

Professor N. Bhattacharya (Economic Research) served as Chairman of a Sub-Working Group and as a member of a Working Group set up by the Governing Council of NSSO, Government of India, in connection with the 47th Round Survey on disability.

Professor Bhattacharya was also nominated as the Institute's representative on the Governing Council of NSSO, Government of India from January 1991.

Professor Robin Mukherjee (Economic Research) continued as the Institute's representative on the Governing Council of NSSO, Government of India till December 1990.

FIFTYNINTH ANNUAL REPORT : 1990-91

Dr. D. Coondoo (Economic Research) served as Chairman of a Committee for examining the pricing of industrial spirit set up by the Government of West Bengal.

Dr. M. Chattopadhyay (Economic Research) continued as a member and consultant to the Study Group on Social Constraints of Rural Labour set up by the National Commission on Rural Labour (NCRL), Ministry of Labour, Government of India. Dr. Chattopadhyay also assisted the Commission by rendering technical advice in the preparation of the Draft Chapter on Agricultural Labour for the final report of the NCRL.

Dr. Atul Sarma (Planning) served as member, Indo-Soviet Joint Commission.

Professor P. N. Mukherji (Planning) served as (i) Executive member, Indian Association of Social Science Institution. (ii) Member, Group of Convenors of Workshop in India on Social Movements, State and Democracy, organised by the Swedish research collective AKUT and African and South East Asian scholar. (iii) Member, Joint Indo-Social Research group on Social Mobility and Development, sponsored by Indo-Soviet Joint Commission for Cooperation in Social Sciences, March, 1991. (iv) Member, Board of Studies, Department of Sociology, Jamia Millia Islamia University, New Delhi, Course Director on Agrarian Movements and Social Change, Indira Gandhi Open University New Delhi.

Shri Amitav Choudhry (Linguistics) was one of two Indians nominated to IGSLSVL (International Group for the Study of Language Standardization and the Vernacularization of Literacy).

Dr. B. N. Bhattacharya (Population Studies) continued to serve as a member of the Project Advisory Committee on Children Study at the Bhopal Gas Disaster Research Centre of the Indian Council of Medical Research.

Dr. S. Bandyopadhyay (Sociology) acted (i) as External Member, Board of Post-Graduate Studies in Sociology, Kalyani University. (ii) Member, Board of Post-Graduate Studies in Sociology, in Burdwan University. (iii) Member, Ph.D. Committee in Anthropology, in Calcutta University.

Shri N. T. V. Ranga Rao (SQC & OR) was awarded 3rd prize of US 1000 for his essay 'Improving Quality of Work Life through productivity in Small Industry'. The award was given by A.P.O. Tokyo, Japan in connection with Oshikawa Essay Contest ISSO held during February to May 1990. The result was communicated on 8 January 1991.

S/Shri S. C. Chakravarty, Rajiv Goel and Dr. S. B. Mohan (SQC & OR) worked on the Postal Project.

Shri P. R. Lakshminathan (SQC & OR) presided over the QC circle function in M/s. Samtel (I) Ltd., and currently serving as an expert working group member on Planning, Data Management and Analysis in the project titled 'Pavement Performance Study' conducted by Central Road Research Institute, New Delhi. (ii) Presided over the QC Circle function in M/s. Samtel (I) Ltd.

INDIAN STATISTICAL INSTITUTE

Shri B. Majumdar (SQC & OR) acted as a member in a subcommittee constituted by DG, BIS, New Delhi.

Shri S. C. Chakravarty (SQC & OR) assisted J. K. Synthetics, Kote in the final selection of Divisional and Individual winners for CAQ award on 12th March 1991.

Shri B. K. Pal (SQC & OR) elected member of Executive Council of NIQR National Body for April 1990 to March 1992 and NIQR Bangalore Branch Council for the same period. (ii) Convener, Finance Committee of the National Convention 1990 of the National Institution for Quality and Reliability at Bangalor.

Shri C. A. Setty (SQC & OR) (i) Hony. Secretary of Karnataka Branch of Indian Statistical Institute (1990 and 1991), (ii) Hony. Treasurer of NIQR Bangalore Branch 1990-92, (iii) Chaired a session in the National Convention of NIQR at Bangalore (December 1990), (iv) Head of Centre for Specialist Development (January 1991) and (v) Judge at the NIQR Quality Circle presentation contest.

Shri B. Anantha Rao (SQC & OR) (i) Chairman, Education and Training Committee of the NIQR Bangalore Branch. (ii) Member, Editorial Board of NIQR Quality and Reliability Journal. (iii) Convener, Editorial Committee of the National Convention of NIQR Bangalore (December 1990). (iv) Elected member, NIQR National Body and Member BIQR Bangalore Branch Executive Committee. (v) Executive Secretary, Karnataka Branch of Indian Statistical Institute (1991). (vi) Member, NIQR CQRE Examination Board. (vii) Judge at NIQR Quality Circle Contest (part of Quality) Month Celebrations in April 1990. (viii) Judge at NIQR Quality Circle Contest (Conducted for QCFT) in August 1990.

Shri A. K. Chaudhuri (SQC & OR) (i) Hony. Secretary, of NIQR Bangalore Branch (1990-92). (ii) Organising Secretary, of NIQR National Convention 1990 held in Bangalore in December 1990. (iii) Member, Editorial Board of NIQR Quality and Reliability Journal.

Shri K. N. Anand (SQC & OR) (i) Convener, Tutorial Committee of NIQR National Convention 1990 held in Bangalore in December 1990. (ii) Chairman, Inplant Training Programme Committee of NIQR Bangalore Branch.

Dr. K. G. Ramamurthy (SQC & OR) chaired a session in the NIQR National Convention 1990.

Dr. V. Rajendra Prasad (SQC & OR) chaired a session of International on Game Theory and its applications held in New Delhi, in December 1990.

Shri S. S. Handa (SQC & OR) Member of Committee constituted by Director General, Bureau of Indian Standards to decide procedure for National Quality Award. (ii) Acted as member of Jury to evaluate the students papers presented at Annual OR Convention during 14-16 December 1990. (iii) Chaired a session on 'Waiting Line Models' at Annual OR Convention organised by Operations Research Society of India in Delhi during 14-16 December 1990.

FIFTYNINTH ANNUAL REPORT : 1990-91

Dr. S. K. Majumdar (SQC & OR) was nominated to act as a member of metallurgy and materials science sub-committee, Institution of Engineers (India) W. B. State Centre during 1990-91 and 1991-92.

Shri V. Narayana (SQC & OR) functioned as Convener for the Committee set up by ISI Council for Development Activities of Hyderabad IIL.

Dr. B. J. Pandey (SQC & OR) (i) Senior Member of OR Society of India. (ii) Member of Governing Body of Calcutta Productivity Committee. (iii) Member of Bureau of Indian Standards, Sectional Committee on Sampling Inspection SMDM. (iv) Member of Board of Studies of IAPQR. (v) Member of State level operating committee on Quality Control set up by the Government of West Bengal. (vi) Moderator for P. G. Diploma IAPQR. (vii) Member of Board of Examiners, Calcutta University.

10. SCIENTIFIC TOURS AND ASSIGNMENTS ABROAD

Dr. Rana Barua (Stat-Math) attended the College on Recent Developments and Applications in Mathematics and Computer Science, held at ICTP, Trieste during 7 May-1 June 1990 and presented a talk entitled "The difference Hierarchy of rational languages".

Professor J. K. Ghosh (Stat-Math) visited the Purdue University from August to December 1990 and delivered a series of lectures.

Dr. K. K. Mukherjee (Stat-Math) attended the Pre-Congress Topology Conference at the University of Hawaii, Honolulu, USA from 11 to 18 August 1990 and presented a paper. He also visited the University of California, USA during the period 21 to 30 August 1990 and 6 to 14 November 1990 and delivered lectures.

Professor T. J. Rao (Stat-Math) visited the University of California, USA till June 14, 1991.

Professor G. M. Saha (Stat-Math) visited the University of Guelph, Canada during May-July, 1990 and worked with Professor H. Pesotan on (1) Strongly threshold orthogonal matrices—properties and constructions and (2) Connections between various kinds of balanced designs. He also gave a seminar talk in the Department on 'Designs for group testing experiments'.

Professor Bikas Kumar Sinha (Stat-Math) visited the Department of Statistics and Actuarial Science, University of Waterloo, Canada and interacted with Professor K. R. Shah and written a research paper jointly with him.

Dr. T. P. Tripathi (Stat-Math) visited the Department of Mathematics and Statistics, Concordia University, Canada from 1 September to 31 December, 1990 as a Visiting Research Professor. He taught a course in Probability and Mathematical Statistics. He also did joint research work with Professor Y. P. Chaube and written

INDIAN STATISTICAL INSTITUTE

two research papers with him. During this period Dr. Tripathi delivered lectures at Carleton University, Ottawa, McGill University, Montreal, Quebec University, Montreal, besides the Concordia University.

Professor S. K. Mitra (Stat-Math) invited speaker at the International Workshop on Linear Models, Experimental Designs and Related Matrix Theory organised by the University of Tampere, Finland 6-8 August 1990.

Professor Mitra also gave an invited talk on Outer inverses a richer source for developing matrix partial orders. Organised a session on "Matrix Theory for Linear Models".

Professor T. Parthasarathy (Stat-Math) gave a talk on "Minimax value and Q-matrices", international Conference on Game Theory at State University of New York, Stonybrook, USA, July 7-30, 1990.

Dr. Rahul Roy (Stat-Math) attended IIInd World Congress of the Bernoulli Society, Uppsala, Sweden and presented a paper.

—— (Stat-Math) also visited (i) The 2nd World Congress of the Bernoulli Society, Sweden from 13.8.90 to 18.8.90 (ii) the University of Barcelona, Spain from 20.8.90 to 20.10.90 (iii) the TUDelft University, Holland from 22.10.90 to 27.10.90 (iv) II university of Rome, Rome Italy and gave a seminar during October 28-November 4, 1990.

Dr. R. L. Karandikar (Stat-Math) attended symposium on "Stochastic Analysis" at Banach Center, Warsaw, 16-26 June 1990.

—— (Stat-Math) also visited the University of North Carolina, USA from 1 April to 15 June 1990.

Dr. Rajendra Bhatia (Stat-Math) visited the Kuwait University from 3 May to 18 May 1990. He also visited the Technical University, Eindhoven and Vrije University, Amsterdam in the last week of May 1990 and delivered lectures.

Dr. Bhatia also visited the University of Bielefeld, Germany for one month in June 1990; continued earlier collaborative work with L. Elsner and gave a few lectures.

Dr. C. G. Bhattacharya (Stat-Math) visited University of Waterloo, Canada as a Visiting Associate Professor, participated in a one month research programme with Professor K. R. Shah in July 1990.

Dr. T. Parthasarathy visited mathematics and Statistics Department of University of Kentucky and gave a talk on "Stochastic Games" from 15 July to 22 July 1990. He also visited the University of Maryland July 22-29, 1990.

Professor V. S. Sunder (Stat-Math) attended the International Congress of Mathematicians at Kyoto, Japan in August 1990. He also attended the conference on "Current Trends in Operator Algebras" at Nara, Japan in August 1990. His visit was sponsored by the National Board for Higher Mathematics.

FIFTYNINTH ANNUAL REPORT : 1990-91

Professor Alladi Sitaram (Stat-Math) visited the Department of Mathematics at Australian National University and the University of New South Wales during April-June 1990. He is currently visiting the Department of Mathematics, University of Washington, Seattle, USA since 1 January 1991.

Dr. T. S. S. R. K. Rao is currently visiting the Department of Mathematics, Free University of Berlin, Germany, since 1 January 1991.

Professor K. P. S. Bhaskara Rao was with the Department of Mathematics, Wesleyan University, U.S.A. as Van Vleck Visiting Professor for the whole year 1990-91.

Dr. A. K. Adhikari (Applied Statistics, Surveys and Computing) visited Statistical Institute for Asia and Pacific, Brunei Darussalam, during 30 May to 24 June 1990 for teaching in "Control of Errors in Surveys and Censuses".

Dr. Tapas Kumar Basu (Applied Statistics, Surveys and Computing) visited Wuhan University of Hydraulic and Electric Engineering, Wuhan China Institute of Hydrobiology, Academic Sinica, Wugan, Hubei 430072, China during 20-23 September 1990 and presented a paper in the International Conference on Refined Flow Modelling at Wuhan.

Dr. Arjit Chaudhuri (Applied Statistics, Surveys and Computing) visited Department of Statistics, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, USA as a visiting professor during 16 August, 1989 to 16 May 1990.

Dr. Chaudhuri was also visited Departments of Statistics, University of Mannheim during 1 May to 14 September 1990 as a Visiting Professor.

Dr. Anup Dewanji (Applied Statistics, Surveys and Computing) visited (i) Fred Hutchinson Cancer Research Centre, Seattle, WA, USA during 22 April to 30 June 1990; (ii) Environmental Health Directorate of Health and Welfare, Canada, Ottawa, Canada during 1-31 July 1990.

Dr. T. Krishnan (Applied Statistics, Surveys and Computing) visited (i) University of Queensland, St. Lucia, Australia, during 1-12 September 1990; (ii) Curtin University of Technology, Australia during 1 October to 28 November 1990.

Dr. Krishnan also attended the Third International Conference on Teaching Statistics, during 19-24 August 1990 at Dunedin, New Zealand.

Dr. P. Mukhopadhyaya (Applied Statistics, Surveys and Computing) visited Moi University, Kenya during December 1989 to July 1990.

Dr. Aash Sengupta (Applied Statistics, Surveys and Computing) visited the Department of Statistics and Application, University of California, Santa Barbara, USA as a Visiting Associate Professor during 1989-1990.

INDIAN STATISTICAL INSTITUTE

Dr. Shibdas Bandyopadhyay (Applied Statistics, Surveys and Computing) attended the Third International Conference on Teaching Statistics, Dunedin, New Zealand, during 18-24 August 1990.

Dr. Bandyopadhyay also gave talks on (i) "the effort of sample selection probabilities on estimates" at the Department of Statistics, Wellington, New Zealand, during 25-28 August 1990; (ii) "the use of selection probabilities for estimating ratios" at the University of Waikato, Hamilton, New Zealand, during 28-31 August 1990; (iii) "the effect of sample selection probabilities on efficiency of estimators" at the University of Auckland, Auckland, New Zealand during 31 August to 4 September 1990; (iv) "the quicker method of estimation when sampling schemes are symmetric" at the Australian National University, Canberra, Australia during 4-7 September 1990.

Shri Tareo Maitra (Applied Statistics, Surveys and Computing) visited Stat. Division of ESCAP United Nations of Bangkok, during 17 May 1990 to 16 November 1990.

Dr. T. Samanta (Applied Statistics, Surveys and Computing) is visiting Purdue University USA from 1 January 1991.

Dr. N. Das (Electronics) attended the TENCON '90 Region 10 Conference on Computers and Communication Systems, held at Hong Kong during 24-27 September 1990 and presented paper.

Shri Sitir Roy (Electronics) attended (i) 2nd World Congress of Bernoulli Society at Uppsala, Sweden during 13-18 August 1990 and delivered one lecture; (ii) 11th International Conference of Information Theory at Prague, C.S.F.R., during 27-31 August 1990; (iii) 19th International Conference on Stochastic Processes and their Applications, Jena, GDR, during 3-8 September 1990 and delivered one lecture.

Shri Roy visited department of Physics, University of Turku, Finland for three days by the invitation of Prof. P. J. Lathi, during 19-22 August 1990. He also visited the Institute Henri Poincare, Paris during 8-16 September 1990.

Dr. H. P. Mazumder (Electronics) visited the University of Rome, Italy as a Visiting Professor during May and June 1990. He also worked as a Visiting Professor at the University of Trondheim, Norway during July 1990.

Prof. B. B. Chaudhuri (Electronics and Communication Sciences) visited GSF, Institut für Strahlenschutz during October 1990 to January 1991 under the Indo-German Scientific collaboration to study and then to generate algorithm for finding Gabriel and relative neighborhood graphs which might be useful in automatic diagnosis of different cell tumors.

Prof. Chaudhuri also performed short visits to deliver invited talks (i) at Technical University-Hannover; Academy of Science, Berlin, Technical University-Jena, and Medical University, Dresden, during 5-12 November 1990; (ii) at Institute of Cybernetics-Napoli, Medical University, Basel, and Ecole Polytechnique-Lausanne during 15-22 December 1990.

FIFTYNINTH ANNUAL REPORT : 1990-91

Mr. M. K. Kundu (Electronics and Communication Sciences) attended summer school on 'Computer Treatment of Complex Documents, at Nios, France during 25 June to 7 July 1990, the summer school was organized by International Centre for Pure and Applied Mathematics. Mr. Kundu also as an invitee, visited Computer Vision Laboratory, INRIA Sophia-Antipolis on 8 July 1990.

Prof. D. Dutta Majumder (Electronics and Communication Sciences) performed tremendously hectic but extremely useful study/industrial tour at Canada, USA and UK sponsored by UNDP during 1st June 1990 to 2nd August 1990. His activities were as follows :

(a) At the invitation of Alberta Research Council (ARC), Calgeri which is technology development organisation coordinating between Government and Industries, Prof. Dutta Majumder gave a seminar talk on 'KBSC applications in industries' on 4.8.90. He visited Coles Gilbert Associates Ltd., Technica Petroleum Consultant Group Ltd., Intern Technologies Ltd., and D and S Petroleum Services Ltd., during 4-5 June and tried to understand the state-of-the-art on applications of remote sensing, pattern recognition techniques and expert systems in Oil and Gas exploration.

(b) Dr. Gregg Van Volkenburgh, President of SBG Services Inc. Toronto arranged a meeting on 6.6.90 with him and 3 top technologists of Dofasco Steel Mill, one of the biggest steel industry in Canada to discuss about diverse aspects of computer vision based inspection system for Cold and Hot Rolling steel mills. He participated during 7-9 June 1990 in the conference of North American Fuzzy information Processing Society (NAFIPS '90) and had the benefit of indepth discussion about prospects and direction of research and application in fuzzy mathematics for the development of expert control systems for applications in industries.

(c) He participated in 8th World Congress of Cybernetics and Systems at Hunter college of New York University during 11-15 June 1990 and delivered a special talk on 'Uncertainty management and fuzzy mathematics' in this Congress covering diverse aspects of computer communication and control sciences. He also delivered a special seminar lecture on 'Shape analysis problems and Indian KBSC project' at the invitation of AI Research Group of IBM Yorktown Heights on 14.6.90.

(d) During 16-21 June 1990 at Atlantic City he participated in the 10th International Conference on Pattern Recognition, in which he chaired the Technical Session on Image Processing Methods and Applications and also presented 2 papers on 'A consistent estimation of classes in R^n in context of cluster analysis' and on 'A semantic net approach to knowledge representation problems for computer vision.

(e) At the invitation of NASA Houston he visited and delivered seminar talk on 'KBSC approach to shape analysis problems' to the scientists of that world famous organization during 24-26 June 1990.

INDIAN STATISTICAL INSTITUTE

(f) Prof. J. K. Aggarwal, Director, University of Texas, Austin invited him to visit Computer and Vision Research Centre of that University. He visited and delivered a seminar lecture there on 'Some aspects of National knowledge based computer science project in India' on 28.6.90. On 30.6.90 he delivered a seminar lecture and also studied different experiments at the Computer Vision Lab of Prof's R. M. Haralick and Linda Shapiro in University of Washington, Seattle. Both Prof. Aggarwal and Prof. Haralick agreed to accept NCKBCS trainees under UNDP programme and also promised to send experts including themselves to Calcutta through UNDP programme.

(g) Prof. Dutta Majumder delivered an invited talk and visited some of research projects IBM Almadin Research Centre, Sanjose on 5th July 1990 on from Dr. Wayne Black, Head of the Machine Vision Group. Both the IBM Research Centre group (T. J. Watson and Almadin) expressed their desire to establish some collaborative tie with Indian KBCS.

(h) Prof. Dutta Majumder had a group meeting with senior scientists including Prof. Arvind and several others at MIT Centre for Advanced Engineering Study, Boston on 9.7.90 and it was organised by Prof. Paul Brown, Director, Advanced Study Programme, MIT. Prof. Dutta Majumder also visited its AI Lab and Vision Lab.

(i) At the invitation of Prof. Raj Reddy, Director, Robotics Institute, Pittsburgh, Prof. Dutta Majumder visited Carnegie Mellon University, University of Pittsburgh and also delivered a seminar lecture at the Robotics Institute which was attended by scientists from both the University. Prof. Reddy agreed to accept trainees from KBCS Programme and arrange experts from CMU, to visit KBCS Nodal Centres. Prof. Dutta Majumder stayed Pittsburgh during 10-19 July, 1990.

(j) Prof. Dutta Majumder participated and presented a paper on (KBCS approach to data analysis) in 12th International Colata Conference at Ohio State University, Columbus on 14.7.90. And at the invitation of Prof. B. Chaudrasekheran spent a day at the AI Lab and Vision Lab at the University.

(k) At the trailing edge of his journey Prof. Dutta Majumder visited Imperial College and the University of London Image Processing and Computer Vision Labs on 25-26 July 1990.

Prof. Sankar K. Pal (Electronics and Communication Sciences) participated the following : (i) The Second International Joint Workshop on Neural Network and Fuzzy Logic, NASA, Johnson Space Centre, Houston, Texas, USA during 11-13 April 1990 as an invited speaker ; (ii) The NAFIPS' 90 Conference, Toronto University, Canada during 6-8 June 1990 as a speaker ; (iii) The International Conference on Fuzzy Logic and Neural Networks (IIZUKA '90), Iizuka, Fukuoka, Japan during

FIFTYNINTH ANNUAL REPORT : 1990-91

20-24 July 1990 as a Member of the Programme Committee and as a speaker ; (iv) The First CLIPS Conference, NASA Johnson Space Centre, Houston, Texas, USA during 13-16 August 1990 as Chairman of two sessions ; and (v) The JAIPCC '91 (Joint Applications in Instrumentation Process and Computer Control) Symposium, University of Houston, Clear Lake, Texas, USA on 21 March 1991 as Chairman of a session.

Prof. Pal also delivered (i) a series of lectures at Fukuoka, Japan, in Special Seminar for Industrialists and Engineers who want to apply fuzzy set theory, on July 25, 1990 ; (ii) an Invited talk at Texas Tech University, Electrical Engineering Department, Lubbock, USA, on 11 October 1990 and visited the Computer Vision Lab.

Professor K. C. Malhotra (Anthropometry and Human Genetics), participated in the following conferences : (i) 'Tropical Forests and Deforestation' at Paris, organized by UNESCO and ENDA, Europe during 19-23 April 1990, and presented an invited paper and was a panelist on future prospects of tropical forests ; (ii) 'Conference of International Association of Human Biologists', at Fukui, Japan during 30 July-2nd August 1990 and presented an invited paper and co-chaired a session ; (iii) 'Annual Conference of the Japan Society of Human Genetics' at Fukui, Japan during 3-4 August 1990 ; (iv) was a member of the 'International Panel on Status of Medical Genetics', organized by WHO, at Fukui, Japan on 4 August 1990 ; (v) 'Meeting of the IUAES Commission on Medical Anthropology and Epidemiology' at Fukui, Japan on 2 August 1990 ; (vi) 'V International Congress of Ecology' at Yokohama, Japan during 22-28 August 1990 and presented 2 papers ; (viii) 'Conference on Urban Health and Ecology' at Durham, U. K., during 24-27 September 1990 and presented an invited paper.

Professor Malhotra also was a visiting professor at the National Institute of Genetics, Mishima, Japan, he gave seminars and held discussions, during 5-22 August 1990. He also visited the Department of Anthropology, Tokyo University, Laboratory of Forensic Anthropology, Medical College, Tokyo and HLA laboratory, Tokyo University, and held discussion and gave seminar talks during his stay at Japan.

Professor Malhotra also visited the Department of Biological Anthropology, Oxford University and held discussion with the scientists.

Dr. P. P. Majumder (Anthropometry and Human Genetics) visited the Western Psychiatric Institute and Clinic, University of Pittsburgh, USA during 22 October-23 November 1990. Dr. Majumder served as a Genetics Consultant he delivered lectures.

Prof. N. Bhattacharya (Economic Research) directed and taught the following courses at the invitation of the Statistical Institute for Asia and Pacific (SIAP), Tokyo : (a) Country Course on Analysis of Income and Expenditure Data at Islamabad, Pakistan, during 13-24 May 1990 ; (b) Country Course on Sampling Methods and Household Surveys at Kathmandu, Nepal, during 28 May-16 June 1990.

INDIAN STATISTICAL INSTITUTE

Prof. Robin Mukherjee (Economic Research) on invitation of the SIAP, Tokyo, directed and taught on Advanced Workshop/Seminar on "Statistics relating to Small-Scale Industries, the Informal Sector and Household Economic Activities" at Kuala Lumpur, Malaysia, during 6-24 August 1990.

Dr. D. Coondoo (Economic Research) served as a UNDP consultant and taught the Country Courses of the SIAP at Islamabad, Pakistan and Kathmandu, Nepal, during 13-24 May and 28 May-15 June 1990.

Dr. D. Daagupta (Economic Research) on invitation, accepted a visiting professorship for one year at the Otaru University of Commerce, Hokkaido, Japan in September 1990.

Dr. S. R. Chakravarty (Economic Research) attended the Fifth Karlsruhe International Symposium on Models and Measurement of Welfare and Inequality, during 12-19 August 1990. He also addressed seminars and delivered lectures at Hebrew University, Jerusalem, Israel and Centre for Economic Research, Tilburg University, Netherlands during the period.

Dr. A. Sankar (Economic Research) attended the 6th World Congress of the Econometric Society held at Barcelona, Spain, during 22-28 August 1990 and presented a paper.

Dr. Atul Sarma (Planning) as a Visiting Professor (i) gave a seminar on India's external Debt, at the Economic and Social Institute and Faculty of Economics and Econometric, Free University of Amsterdam, on 7 May 1990; (ii) gave a seminar on Import Intensities of Indian Manufacturing Industries, at the Centre of Development Planning, Erasmus University, on 4 June 1990; (iii) worked as a consultant to the FAO of U.N. during 28 October-22 December 1990.

Dr. Bhaskar Dutta (Planning) attended (i) 5th Karlsruhe Conference on Measurement and Economics, in Karlsruhe, during 13-19 August 1990; (ii) 6th World Congress of Econometric Society, in Barcelona, during 22-28 August 1990.

Dr. D. Mookherjee (Planning) attended World Congress of the Econometric Society, at Barcelona, held in August 1990 and presented papers.

Dr. Parkash Chandor (Planning) as a visiting professor visited (i) Instituto De Analisis Economico, Barcelona, during May and June 1990; (ii) CORE, Universite Catholique de Louvain, Belgium, during February and March 1991; (iii) participated in the 1990 World Congress of the Econometric Society, held in Barcelona, Spain during 23-30 August 1990 and presented a paper; (iv) Incentive in Public Good Economics, presented at University of East Anglia, Norwich, on 14 February 1991; (v) gave three lectures at Universidad de Alicante, Spain, during 7-18 March 1991, the topic of the lectures was 'Dynamic Approaches in Public Good Economics'; (vi) Strategically stable cost-sharing in an Economic-Ecological Negotiation Process presented at the meeting of Task Force 3 of the European Science Foundation Program on Environment, Science and Society, held in Seville, Spain, during 22-29 February 1991.

FIFTYNINTH ANNUAL REPORT : 1990-91

Dr. N. S. S. Narayana (Economic Analysis) visited Centre for World Food Studies, Amsterdam and Ministry of Budget and Planning, Government of Nigeria, Lagos (Nigeria) during 29 October to 28 December 1990 under United Nations assignment.

Dr. K. Surekha Rao (Economic Analysis) visited the Department of Mathematics, at Wesleyan University, U.S.A. during the current period and delivered advanced seminars. She also taught at University of Hartford in the Department of Economics during the Summer of 1990. Held Honorary visiting position in the University of Connecticut, Storrs during 1989-90.

Dr. Alokannanda Mitter (Linguistic) visited Belgrade, on the invitation of the Institute for Experimental Phonetics and Speech Pathology, Belgrade, between September to November 1990, to carry on collaborative research in the areas of Speech Pathology and also the Belgrade Institute's project on "Speech Habilitation of the Pre-School Age Hearing Impaired Child with Kostio Methodology and Instrumentation". Some preliminary research was also carried out by her on the Supra-segmentals of Slavic languages. She also worked with Professor Kostio on the other Plan projects of the Unit.

Shri Amitav Choudhry (Linguistic) visited York University, U.K., on a Nuffield Fellowship between December 1990 and March 1991. At the Department of Language and Linguistic Science, University of York, he carried out collaborative research with the Department on the Gujarati ethnic minority in Britain from a sociology of language perspective. During the period of the Fellowship he was one of the resource persons and course speakers for the following courses conducted by the Department of Language and Linguistic Science, University of York, 'Community Languages in the National Curriculum' during 25-28 March 1991.

Mrs. R. Deb Roy (Population Studies) visited Trieste, Italy during 23-26 April 1990 in connection with a conference on archival sources and demographic research. She also visited U.K. and collected materials on East India Company in Bengal from the India Office Library there for three weeks in April-May, 1990.

Prof. M. A. Gopinath (DRTO) attended an International Conference on "Tools for Knowledge Organisation and the Human Interface" and chaired one of the technical sessions and also acted as a panel member of the concluding session of the conference for drafting its recommendations, as specially invited by the President of the conference. The conference was organised by the Technische Hochschule, Darmstadt, West Germany during the period 14-17 August 1990. He also contributed a paper entitled "Information Processing Language". Professor Gopinath attended the conference as an official delegate sponsored by ISI. He left for West Germany on 12th August 1990. He was in West Germany upto 20th August 1990.