

### INDIAN STATISTICAL INSTITUTE

- 7.1 In early thirties, realising the necessity for advancement of theoretical and applied Statistics in India, the Indian Statistical Institute came into being with the pioneering initiative and efforts of Professor P.C. Mahalanobis. The Indian Statistical Institute was registered on 28<sup>th</sup> April, 1932 as a non-profit distributing learned society under the Societies Registration Act 1860. From the beginning, the Institute started showing its excellence in its own way. As the Institute expanded its research, teaching, training and project activities it started earning national/International recognition. For its substantial contribution to the quality of theoretical and applied statistical work, the Institute has been recognised as an "Institute of National Importance" by an Act of Parliament, known as "Indian Statistical Institute Act No.57 of 1959". The Act has conferred on the Institute the right to hold examinations and award degrees/diplomas in Statistics. Significantly, none other than Pandit Jawaharlal Nehru, the then Prime Minister himself piloted the Bill in the Parliament in 1959. As a result, degree courses leading to Bachelor of Statistics (B.Stat.) and Master of Statistics (M.Stat.) and postgraduate diplomas in SQC & OR and Computer Science were started from June, 1960. The Institute was also empowered to award Ph.D./D.Sc. Degree from the same year. Subsequently, Master of Technology courses in Computer Science and in Quality, Reliability and Operations Research were also started. Scope was further enlarged as the Institute was empowered to award degrees/diplomas in Statistics, Mathematics, Quantitative Economics, Computer Science and such other subjects related to Statistics by virtue of "Indian Statistical Institute (Amendment) Act, 1995, No.38 of 1995" by the Parliament effective from 18<sup>th</sup> September, 1995. Recognition of the Institute by Acts of Parliament, gave a greater encouragement to research activities not only in Statistics/ Mathematics but also in various branches of Natural and Social Sciences, Physics and Earth Sciences, Biological Sciences. Statistical Quality Control & Operations Research, Library and Information Sciences in a broader way.
- 7.2 Over the years, the Institute has been playing a key role in the development of statistical theory and methods in promoting research and practical applications in different areas of natural and social sciences. Sankhya - The Indian Journal of Statistics, being published by the Institute since 1933, is still considered as one of the leading Statistical journals of the world. Pioneering research activities were carried out in many areas of statistical theory, especially in the core areas of multivariate analysis, sampling surveys and design of experiments. Such activities were strengthened and new directions were opened up by Professor C. R. Rao and many others who joined the Institute in the forties and the tradition continues. Research in economics was greatly stimulated when in 1954 Prime Minister Jawaharlal Nehru entrusted the preparation of the draft Second Five-Year Plan of the country to Professor Mahalanobis and the Institute. The "Draft" submitted by Professor Mahalanobis and the planning models formulated by him in that connection have since been regarded as major contributions to economic planning in India. In the field of Computer Science, the Institute has a rich tradition. In 1953, a small analog computer was designed and built in the Institute. In 1956, the Institute acquired a HEC-2M machine from the UK, which was the first digital computer in India. In early sixties, the Institute, in collaboration with the Jadavpur University, undertook the design, development and fabrication of a fully transistorised digital computer, called ISIJU-1 which was commissioned in 1966 by Shri M.C. Chagla, the then Minister of Education, Government of India. High quality research and development in the field of computer science is being carried out by the internationally acclaimed scientists of

the Institute. The ISI also played a pioneering role in starting the Statistical Quality Control (SQC) movement in India by organising a visit of Professor W.A. Shewhart, the father of SQC, to India in November, 1947 and later by inviting other experts like W.E. Deming, Dr. Ellis R Ott, Dr. H.C. Tippet and Genichi Taguchi for the same purpose. SQC promotional work of the Institute then gradually spread all over the industrial centres in India under a comprehensive programme covering education and training, applied research and consultancy services. From the early days, the Institute has been interacting with many internationally reputed scientists in different disciplines from the world over. Some of these scientists have worked in the Institute for several months or even longer. Sir Ronald A. Fisher, a pioneer of modern statistics, was a regular visitor to the Institute and lent considerable support to its organization and development. Professor J.B.S. Haldane, a geneticist of international repute, was a member of the faculty for several years beginning from 1957. The celebrated mathematician, Norbert Wiener visited the Institute twice in 1954 and again in 1955-56 when he stayed for seven months and gave a course of 60 lectures. The other academic personalities whose longer visits influenced the development of the Institute include the statisticians Harold Hotelling, Frank Yeats, Herman Wold, Edwin Harper (jr.) and H.Cramer, the mathematicians A. N. Kolmogorov, Yu. V. Linnik, J.L. Doob and more recently Vaughan F.R. Jones, the experts in Statistical Quality Control Walter Shewhart and G. Taguchi, the Economists Simon Kuznets, Paul A. Baran, Joan Robinson, Jan Tinbergen, Nicholas Kaldor, R.M. Goodwin, David and Ruth Glass and J.K. Galbriath; the geologist Pamela Robinson; the biochemist N.W. Pirie and the linguist D. Kostic. All along the Institute has tried to live up to Ronald Fisher's dictum that Statistics is a "key Technology" of the century, in view of its intimate relevance to all scientific endeavours which involve experimentation, measurement and inference from sample to aggregate.

- 7.3 Dr. Bimal Jalan, Governor, RBI, Prof. M.G.K. Menon, FRS and Prof. K.B. Sinha, Distinguished Scientist continued to act as the Chairman, the President and the Director of the Institute respectively during the year.
- 7.4 During the academic session 2000-2001, 8064 candidates applied for admission and were called for written selection tests for the various courses offered by the Institute, viz., B.Stat. (Hons.), M.Stat. (Math. and Stat. stream), M.S. in Quantitative Economics, M.Tech. in Computer Science, M.Tech. In Quality, Reliability and Operations Research, Two-year part-time Post-Graduate Diploma in SQC and OR (Chennai); Research Fellowships in Statistics, Mathematics, Economics, Computer & Communication Sciences, Theoretical Physics, and Applied Mathematics, Anthropology, Demography, Geology, Sociology, Psychometry, Biochemistry; Agricultural Sciences, Embryology and one year part time course in Statistical Methods and Applications. Admission tests were conducted at 24 different Centres all over the country. A total of 5689 candidates finally appeared at the admission tests and a total of 433 candidates who qualified in the written tests were called for interview. Based on the performance in the written tests, the interview and the academic record, 171 candidates were offered admission to various courses during the academic session under review. The annual examinations for all the regular courses were held in May/June, 2001. The 2001-2002 academic session commenced on 1<sup>st</sup> August, 2001. The Division has undertaken a project to develop multimedia based course material for an introductory course in Statistics at the 10+2 level. The Multimedia Laboratory was set up in 1999. The first of five proposed modules was developed during the previous academic session. The module would contain five parts. Several students from ISI and other Institutions/Universities received training in the Multimedia Laboratory.

## **Professional Examinations in Statistics**

- 7.5 The Examination Committee of the Institute conduct professional examinations for the Junior Diploma in Statistics and Senior Diploma in Statistics at Bangalore, Kolkata, Delhi, Mumbai, Hyderabad, and Chennai twice in a year usually in the month of April/May and November/December respectively. The cumulative total number of students who have qualified for award of the Diplomas in professional examinations in statistics are 288. The Government of India recognize the Junior Diploma in Statistics as equivalent to a Bachelor's degree in Statistics while Senior Diploma in Statistics to a Master's degree in Statistics.

## **International Statistical Education Centre (ISEC)**

- 7.6 The ISEC, which was opened in 1950, is operated jointly by the International Statistical Institute and the Indian Statistical Institute, under the auspices of the UNESCO and the Government of India. The Centre as an associated body of the Institute functions under a Joint Board of Director. The Directors represent International Statistical Institute, Indian Statistical Institute and the Govt. of India. Professor P.C. Mahalanobis was the Chairman of the Board of Directors since its inception in 1950 until his death in 1972. Since then, National Professor C.R. Rao, F.R.S., has been the Chairman of the Board. The Centre provides training in Theoretical, Applied Statistics at the various levels for selected participants from the countries in the Middle East, South and South-East Asia, the Far East and the Commonwealth countries in Africa, sponsored by respective Governments. Major training programme of the Centre is a 10-month regular course. In addition, special courses of varying durations are also organised. During the year the 10-month regular course (55<sup>th</sup> term) commenced on 1st June, 2001 with 24 trainees from sixteen countries comprising Srilanka, Maldives, Myanmar, Kenya, LAO PDR, Seychelles, Gambia, Kazakhstan, Oman, El Salvador, S.R. of Vietnam, Papua new Guinea, Mauritius, Iran, Bhutan and Zambia. A special course on Sampling and Data Analysis Techniques was conducted with nine trainees from four different countries.

## **Research Work**

- 7.7 The research activities of the Institute are grouped into the following Divisions: Theoretical Statistics and Mathematics; Applied Statistics; Physics and Earth Sciences; Computer and Communication Sciences; Biological Sciences; Social Sciences; Statistical Quality Control and Operations Research; and Library, Documentation and Information Sciences. In addition, the Computer and Statistical Services Centre (CSSC) have the responsibilities of the management of in-house computer system of the Institute and providing computing and statistical services to scientific workers.

## **Statistical Quality Control and Operations Research**

- 7.8 The Statistical Quality Control (SQC) and Operations Research (OR) Division set up in 1953, now operates with 10 units located at Bangalore, Baroda, Calcutta (2 Units), Hyderabad, New Delhi, Mumbai, Coimbatore, Chennai, Pune. During the last four decades of its existence, the Division provided consultancy on the application of Quality Management system, concepts and tools to over one thousand establishments. The basic objective of the Division is to propagate the use of SQC & OR and allied management techniques for improving quality, enhancing productivity, reduce manufacturing cost and losses in industries. This is realized through academic programmes, consultancy services, inplant and general training course for industrial personnel, systems and software development, organizing conference, seminars and

research in the methods and procedures of quality control, operational research and allied techniques. The Institute which was made a permanent member of the Quality Council of India in recognition of its pioneering role and rich contributions in country wide quality movement is also representing in the National Accreditation Board for Auditing and Training (NABAT).

- 7.9 The Division is running a two-year professional programme like M.Tech. (QC and OR), at ISI, Calcutta and Part-time certificate course in SQC at Bangalore, Hyderabad and Chennai; Part-time evening course in Statistical Methods and Applications at New Delhi and Calcutta and training programme conducted by International Statistical Education Centre. The Division also offers a Specialist Development Programme (SDP) to provide career in industry through on the job training and guided development.
- 7.10 The SQC movement in India dates back to November, 1947 when Prof. Walter Shewhart, father of SQC, visited India at the invitation of Prof. P. C. Mahalanobis and conducted a large number of training programmes in industry and top management awareness programmes throughout India. Significantly ISI was made a permanent member of the "Quality Council" by Government of India in August, 1998.
- 7.11 The research activities of the Division covered areas like Reliability Analysis (with reference to warranty cost estimation), Process Capability indices (including non-normal processes), Order Statistics, Generalized Stochastic Games, Linear Complementarity Problem (LCP), Assignment and Scheduling problems, Study of non-smooth functions, Regularisation of PO functions, Special classes of matrices useful in LCP, Construction of Designs, Fuzzy sets applications, Group Testing, Measurement System Analysis, Problem solving Techniques and Taguchi Methods, Gauge R & R studies.
- 7.12 The division has earned a reputation for providing consultancy services to 150 organisations throughout the country in all areas of Quality Management and Productivity through its network across the country. Besides, the division has assisted a good number of organizations in developing and implementing quality system based on ISO 9000 series and ISO 9000 management standard and ISO 4000 environmental management standard. The division has embarked on promoting Quality Management and related activities in neighbouring countries, promotional visits for participants of 19 organisations, business contacts were made with Mauritius Export Processing Zone (MEPZA) and MADCO group of industries. Promotional visits were also made to Bangladesh at the invitation of Rapport Bangladesh who have confirmed the work proposals to work for one organisation for implementation of Indian Statistical Institute 9000 and to conduct a training programme. Correspondence with organisations of Thailand, Columbia and Singapore are being made.

### **7.13 Millennium Measure**

The division has identified the following focus areas for the new millennium:

- a) to expand its activities in the Software and IT Industries. A research project on 'Developing a measure for overall performance quality of a software industry' is already on.
- b) to apply modern management techniques in service sector for measuring and improving its performance.

- c) to popularize the use of statistical concepts of design of experiments in CSIR laboratories for conducting laboratory and plant scale experiments.
- d) to extend the activities of the Institute in relatively neglected North Eastern regions and to conduct collaborative studies with different universities and agencies in the region.

### **Library, Documentation and Information Sciences Division, Central Library**

- 7.14 The Institute maintains a central research Library at Calcutta with a holding of above 2 Lakh volumes of books and bound periodicals. It has a good collection of microfiches, microfilms and photo films. It renders regular documentation service to the Institute Scientists. It has also a well equipped Reprography and Photography Unit with facilities for all modern copying arrangement.
- 7.15 The reading room of the Library has accommodation for about 200 readers. The services of the Library are extended to bonafide students, scholars and academic staff members of educational and scientific Institutions of the city and its neighbouring regions.
- 7.16 The Library maintains contacts with research Libraries of the country through inter-library loan transactions. The Library has also an excellent collection of rare and out of print books, official reports and data books of various governments and international agencies and Russian language publications. A separate collection of books and journals is being developed for a Regional Library for Eastern Zone as "NBHM collection" funded by National Board of Higher Mathematics, Dept. of Atomic Energy, Govt. of India. To provide information support and increase efficiency of library services, the Central Library at Calcutta has started the process of providing computerised library services. Apart from Central Library at Kolkata, Library at Delhi and Bangalore also caters the similar services. National Board of Higher Mathematics, Department of Atomic Energy, Govt. of India has recognised Indian Statistical Institute, Delhi Centre Library as the Regional Library to serve the Northern Region.

### **Documentation Research and Training Centre (DRTC)**

- 7.17 The Study of various methods of knowledge representation, such as, semantic nets, frames and predicate calculus etc; The application of the modern scientific management techniques to the planning and management of information system, centers and services. The Study of Internet Technology and its Applications; The development of bibliometric and scientometric measures for evaluating the use of Library and information services and scientific output respectively; The development of guidelines and software for Library house keeping operations, such as, circulation control service and acquisition control.
- 7.18 DRTC also conducts a course of 24 months duration leading to the award of "Associateship in Documentation and Information Science" (ADIS) under "Education and Training Programme" which is recognized by Government of India as equivalent to a Master's Degree in Library and Information Science.

### **Computer and Statistical Services Centre (CSSC)**

- 7.19 The Centre manages the central computing facility of the Institute at Calcutta. It serves about 600 users-students, research scholars and scientific workers - with the in-house computer system consisting of SUN Enterprise 3000 server, Six SUN ULTRA 30 workstations, DEC Alpha 4100 server and IBM AS-400 server and 55 PCs. BMDP, NAG, SAS, IMSL, SHAZAM softwares are available on VAX 8650. SAS and MATLAB- Base and Mathematic .E-mail, Internet and Fax **facilities of the**

Institute are maintained by the Centre. Statistical and computational consultancy services are also provided by CSSC. The staff members of CSSC also served as faculty in various courses of the Institute and guided projects carried out by students. They also conducted research in the areas of Database and knowledge base, Image Processing, Computational geometry, Data Mining, VLSI and Cryptology.

### **Project Work**

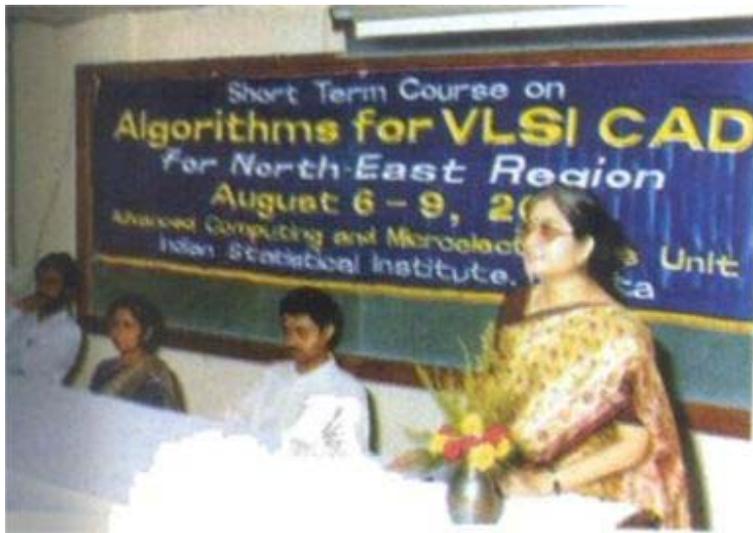
- 7.20 Apart from theoretical and experimental plan research, the Institute also undertook a variety of 50 externally funded projects from different Government and non-Government organisations like Dept. of Science and Technology (DST); Food Corporation of India (FCI); NEI; Oil and Natural Gas Commission (ONGC); ORG Marg Research Ltd.; VS Ltd.; National Board for Higher Mathematics (NBHM); NSF; Indian National Science Academy (INSA); Indo-French Centre for the Promotion of Advanced Research; Govt. of West Bengal; Ministry of Defence, Govt. of India; Doordarshan Kendra, Kolkata; Ministry of Information Technology; European Commission; C-DAC; Reserve Bank of India (RBI); Defence Research Development Organisation (DRDO); Govt. of West Bengal (GoWB); Indo-French Centre for the Promotion of Advanced Research, New Delhi; Intel Corporation, USA; Labour Department, Govt. of West Bengal; West Bengal Women's Commission; Central Scientific and Industrial Research (CSIR); Rabindra Bharati University; Indian Council of Social Sciences Research (ICSSR), New Delhi; Ministry of Welfare, Govt. of India ; International Rice Research Institute (IRRI); Department. of Biotechnology (DBT); Indian Council of Agricultural Research; Indian Council of Medical Research; WBPCB; UNU/IAS, Tokyo; IGIDR; Calcutta University;

### **Seminars, Workshops, Conferences, Symposia etc.**

- 7.21 A number of Seminars, Workshops, Conferences, Symposia, Summer Schools, Winter Schools, Training Programmes etc. were organised by the Institute during the period at Kolkata, Delhi, Pune, Manipur, Mizoram etc.

### **Publications**

- 7.22 Founded and edited by Professor P.C. Mahalanobis in 1933, 'Sankhya', the Indian Journal of Statistics and the official organ of the Indian Statistical Institute is now published bi-monthly in two series - Sr. A on Probability and Mathematical Statistics, and Sr. B on Statistical Methodology and Applications including Sample Surveys and Quantitative Economics. Since its inception, eminent scholars all over the World have been contributing research articles for publication in Sankhya, one of the most prestigious and internationally renowned journals. Sankhya office takes care of publication of Sankhya (A&B) with the assistance of Publication and Printing Unit. Details regarding Sankhya are also available on the Website: [www.isical.ac.in/sankhya](http://www.isical.ac.in/sankhya)



*Dr. Susmita Sur Kolay, Course Coordinator is seen in delivering her speech during the inaugural session of the short term courses on "Algorithms of VLSI CAD" for North-East Region held at the Institute during August 6-9, 2001. Others are (R to L) : Dr. Krishnendu Mukhopadhyay, Prof. J. Dutagupta and Prof. N.R. Pal (Professor Incharge, Computer and Communications Sciences Division)*

*Prof. (Dr.) Bhaskar Roy Chaudhury, former President, Indian Medical Association and Vice-Chancellor, University of Calcutta delivering his speech at the inaugural ceremony of the Dissemination Seminar on "Health Sector Reforms in India Impact on Vulnerable Poverty" held at the Institute during October 4-5, 2001. Others are (R to L) : Prof. K.B. Sinha (Director, Indian Statistical Institute), Abir Lal Mukherjee (Eminent Physician), Kasturi Sen (Cambridge University) and Prof. S.R. Chakraborty (Professor in-charge, Social Sciences Division)*



*Prof. R. Balasubramanian, is delivering his speech at the inaugural ceremony of the "National Workshop on Cryptology" held during October 10-12, 2001 at the Institute. Others are (L to R) : Prof. K.B. Sinha (Director, Indian Statistical Institute), Prof. K.S. Vijayan (Head, Applied Statistics Unit), and Prof. Bimal Roy (Professor-in-charge Applied Statistics Division)*

**The following issues were published during the year:**

**Sankhya Sr.A: Volume 62, part 2 & 3 and Volume 63, Part 1.**

**Sankhya Sr.B: Volume 62, part 1, 2 and 3.**

### **Scientific Papers and Publication**

7.23 During the year about 200 scientific papers were published and about 150 papers were accepted for publication in different journals of national and international importance.

### **Scientific Assignments Abroad**

7.24 About seventy scientists of the Institute visited a number of foreign countries either on invitation or under cultural exchange programme to attend International Seminars and Conferences. Most of them presented scientific papers and delivered lectures in those Seminars and Conferences. Countries visited by ISI faculty members were USA, Czech Republic, Singapore, SEOUL, UK, Switzerland, France, Portugal, Taiwan, Italy, Germany, Canada, Australia, Nepal, China, Spain, Japan, Philippines, South Africa, Brazil, Republic of South Korea, Netherlands, Vietnam, Norway, Peru, Belgium etc.

### **Visiting Scientists**

7.25 **About fifty distinguished scientists from U.S.A., New Zealand, U.K., Bangladesh, Italy, Canada, Japan, France, Paris, Canada etc.** visited the Institute to attend various Workshops, Conferences, Seminars etc. and also to participate in collaborative research, teaching, and other scientific activities of the Institute. Several scientists from Indian Academic Institutions also visited the Institute in connection with the same.

### **Recognition to ISI Scientists**

7.26 In appreciation and recognition of the high standards of research and scientific excellence maintained by the researchers of the Institute, several faculty members received laurels in the forms of Awards, Fellowship from organisation of national and International importance like ISCA, IEEE, INSA, etc. Several faculty members served as visiting scientist, honorary professor, visiting professor, Visiting Professor in various universities in US and Europe; Indian Council of Social Sciences Research (ICSSR); Indian National Science Academy etc. Besides, many faculty members were invited by national and International Institute/bodies to act as Chairman, member, chief editor, editor for their several committees/editorial boards etc.