

13	Process monitoring	May 17, 03	Nuclear Fuel Complex, Hyderabad	22
14	Quality Function Deployment (QFD)	Aug.21-22,03	Engineering Staff College of India, Hyderabad.	6
15	Design & Analysis of Experiments for Product and process improvement	May 7-9 '03	Amararaja Batteries Ltd., Tirupati	25
16	Design & Analysis of Experiments for Product and process improvement	Nov.10-11, 24-25 & Dec 12 '03	Tecumseh India Ltd., Hyderabad	17
17	Executive briefing on Six Sigma	Aug. 28, 03	AVINEON India Technologies Ltd.	6
18	Six Sigma Black Belt training- Phase I (Define & Measure Phase)	Sept.15-16 & 18-19, 2003		16
19	Six Sigma Green Belt Training – Define & Measure Phase	25.9.03, 6 Nov. 03 & 8 Jan. '04		75
20	Six Sigma Green Belt Training – Analysis Phase	23-24 Dec. '03 Jan. 6 & 7 '04		66
21	SPC for Quality Improvement	Nov. 7, 2003	VST Industries Ltd.	20
22	Orientation talk on Six Sigma	Nov. 2, 2003	KLR Industries Ltd.	25
23	Statistical Techniques for ISO 9000/14000	Nov. 25,2003	Engineering Staff College of India	10
24	Six Sigma for Education Sector	Dec 15-16, 2003	Johnson Grammar School	19

#### Internally Funded (North East) Project:

A "Refresher Course / Workshop on Operations Research" for College and University teachers of North East region was conducted at Department of Statistics, Guwahati University, Guwahati during 28 Jan - 2 Feb. 2004.

Other assignments:

- Prof. P. Bhisankaram attended the "Symposium on the New Challenges in Mathematics, Statistics and Computer Science" held at Dr. C. R. Rao Advanced Institute of Mathematical and Computer Sciences, OU Campus, Hyderabad during 29 February – 01 March 2004 and gave an invited talk on "Statistical Education in India – Issues and suggestions".
- A 3-month intensive programme on "Quality Management – Strategies, Tools and Techniques" was conducted during May-August 2003 for the Quality Mission Executives of the Quality Mission Project. In all 16 participants were trained.
- S.M. Subhani was invited to participate in Solutions Clinic on ISO 9001:2000 organised by Mrs Loyds' Register Quality Assurance conducted on 21 April 2003.

#### SQC and OR Unit, Kolkata

##### Teaching and Training

Degree and Training Courses : The staff members of the unit provided faculty support to ISI's regular undergraduate and postgraduate programmes.

### Externally Funded In-Plant Training Programmes

Organization	Title	Number of participant
ITC ITD	Awareness Programme on Six Sigma	12
	Programme on Define & Measure Phases of Six Sigma	16
	Programme on Statistical Methodologies	12
Institute of India	Awareness Programme on ISO 9001 QMS	20
	Awareness Programme on ISO 14001 EMS	14
	Programme on Statistical Process Control	10
Tata Consultancy Services	Awareness Programme on ISO 9001 QMS	20
	Training Programme on Software Metrics	22
		Robert Bosch
Metricix Technologies Pvt. Ltd.	Training Programme on Six Sigma Methodology	30
		Prepron
Indian Chambers of Commerce	Training Programme on Statistical Process Control	25

#### General Training programmes

Statistical Tools for ISO 9000: 2000 – Enroute To Six Sigma\* was conducted jointly with QCI on 06 February 2004.

Six Sigma Quality Initiative\* in December 2003 at Park Hotel, Kolkata.

\*Software Metrics\* was conducted jointly with SPIN and NASSCOM.

A two-day (twelve hour) general training program on Statistical Process Control was conducted in collaboration with Indian Chamber of Commerce, Kolkata.

Research and other scientific activities

#### On Stone's Conjecture – research in mathematical programming

Some new matrix classes in the field of Linear Complementarity Problem, namely almost  $\bar{N}_*$ , almost fully copositive and almost fully semimonotone matrices, have been introduced apart from the study of existing classes of matrices. Almost  $\bar{N}_*$ , a subclass of almost  $N_*$ , has many properties which are not true for almost  $N_*$ . It has been shown that Stone's conjecture is true for almost fully copositive and almost fully semimonotone matrices and established the importance of those matrix classes in connection with principal pivot transform.

A. K. Das and S. K. Neogy

Study of prior distribution of process average in the context to Bayesian acceptance sampling plans.

Hadl using Beta and Gamma distribution developed the theory of optimal Bayesian single sampling plans for continuous prior distribution. It was noted that the beta density couldn't always fit other priors adequately. No practical production model has yet been suggested which leads to the use of the beta distribution. Hadl pointed out the difficulties related to non-availability of inspection data for study of prior distribution. To verify the limitations of the existing plans and to suggest possible modification to take care of a practical situation so as to establish a generalized model for Bayesian plans, a study has been undertaken.

#### Multi attribute Dodge and Romig acceptance sampling plans

The generalization of Dodge and Romig's plan for a multi attribute situation under the assumption of independence of defect occurrences of different types is in progress. Several acceptance criteria have

been considered. A number of results have been obtained which can provide guidelines for choosing an appropriate acceptance criterion. A comprehensive table is under preparation.

#### **Multi attribute Bayesian plans for continuous prior distribution**

Theory of acceptance sampling is being developed for continuous prior distribution of the process average.

Anup Majumdar

#### **Establishing optimum bleaching condition for whitening Canary wool**

Bleaching canary wool was a problem because of uneven pigmentation in the two halves of the fibre. Ineffective bleaching posed problems in subsequent processes of dyeing. Planned experiments were successfully conducted to establish an effective and economic method of whitening the canary wool by resorting to optimum scouring with non-ionic detergent, optimum mordanting and optimum activated peroxide bleaching. The work was done in the laboratory of the College of Textile Technology, Serampore.

Anup Ranjan Mukhopadhyay

#### **Reduction of Variability of PQRS Scores –Six sigma way**

This work was carried out at ITD division, ITC Limited, Kolkata. The PQRS (Product Quality Rating System) score variability was found to be mainly due to sporadic occurrence of low scores. Investigation revealed that this was due to sudden occurrence of faults like Loose End and Flat End, which were found to be primarily due to improper machine settings. The occurrence of loose and flat ends could be almost eliminated through experimentation. Measurement variability between inspectors also had an impact on low PQRS scores. Training / calibration was conducted for the inspectors to reduce this variability.

Ranjan Set

#### **Development of Process Capability Baseline**

Assessing the capability of a software organisation in terms of productivity, schedule slippage and rate of defects is important both from the perspective of marketing as well as estimation and control of performance. Models were developed for the assessment of capability and software tools were developed to facilitate implementation. A model was also developed to assess the level of difficulty of different projects so as to facilitate manpower allocation. This work was done at Skytech Solutions, Kolkata.

Amitava Banerjee

#### **Development of Brand Share Prediction Model for retail outlets**

A study has been undertaken in the areas of modelling for Brand Share Prediction using the retail audit data of FMCG products. The scope of the work includes a) identifying the variables of interest and their nature of relationship, b) Evaluation of established measures and possible modification, c) Proposing possible alternative models based upon data obtained from different sources and d) Propose algorithms, which will work on different scenarios, based on the interest of the user. Preliminary study indicated that the use of artificial neural network based algorithm to predict Brand share using past data of similar brands launched earlier might work well. These results have been well accepted by the AC Nielsen-ORG Marg. Further studies are under progress. Moreover a scoring method to verify the health of a newly launched brand is being developed.

Anup Majumdar, Amitava Banerjee and Ranjan Set

#### **Internally Funded (North East) Project:**

A four day workshop on Design of Experiments was organized for university and college teachers and, for scientists from research organizations by the SOC & OR Unit, Kolkata in collaboration with Guwahati University during 16-19 February at Guwahati.

#### **SQC - OR (T&P) Unit, Kolkata**

##### **Teaching and Training**

Teaching in M.Tech. (OROR) programme continued during the year. Bulk of the faculty support was provided to the programme by this unit. Faculty assistance was also provided to other academic programmes at ISI, Kolkata.

##### **Research Activities**

###### **Economic Design of Control Chart**

Theoretical research on economic design of control chart when process failure follows logarithmic series distribution is in progress. Deriving the control chart parameters by minimizing the loss function is being attempted. Preliminary results have been obtained. Further work in the area is continuing.

B. Pradhan

###### **Quality Adjusted Lifetime**

The general form of the distribution of quality adjusted lifetime (QAL) with  $k$  progressive health states has been derived under both dependent and independent health state distribution cases. Estimation of parameters and hence the distribution of QAL has been done by the method of MLE both in observed and unobserved cases of occurrence-time of health states. A comparative study between dependent and independent models to investigate the validity of the assumption of independence of health state distributions is in progress. A test for independence has also been derived.

B. Pradhan, A. Dewanji (ASU) and D. Sengupta (ASU)

###### **Reliability Analysis**

Change Point problem in the context of reliability analysis was under investigation. A simple procedure to test the null hypothesis of exponentiality against the alternative that it belong to the New Worse than Better than used in Expectation (NWBUE) family has been derived. This test has been proved to be consistent and the asymptotic distribution of the test statistic has been obtained. Further work is in progress.

###### **Inference**

Inference on the mean of the normal distribution when the coefficient of variation is known is under investigation. Two estimators have been proposed and their properties are being studied.

M. Z. Anis

###### **Software Reliability:**

i) Work on estimation of reliability of the software used for controlling the flight path of rockets at the cryo-stage, when the number of failures of the software during testing is very low, was undertaken. Based on the available data, a logistic regression model was developed for estimating the reliability of the software. Further work is in progress. This project has been taken up by ASU for ISRO, Trivandrum.

ii) A Bayesian model for optimum release time of the flight control software incorporating the specific pattern of testing and debugging followed by ISRO has been developed. The results obtained have

been further simplified by using reasonable assumptions. The simplified rule for stopping can easily be used for decision making. The probability of no bugs obtained in the posterior distribution after deciding to release the software, gave an estimate of the reliability of the released software. Further work on this project of ASU for ISRO, Trivandrum, is in progress.

ii) In an empirical research on performance evaluation of different categories of models for software reliability prediction, well known software reliability data were analyzed through (1) Non-parametric smoothing (2) Neural network (3) Fourier series and (4) Bayesian methods. Some interesting results have been obtained to suggest the method that should be used both for model fitting and predictor, depending on the nature of data.

A. K. Chakraborty

#### **Visual Cryptographic Scheme for General Access Structure**

A simple construction of visual cryptographic scheme for general access structure is being attempted for monochromatic images. Exploiting the construction procedure of fractional factorial designs the basis matrices could be constructed. Parameter combinations leading to optimal pixel expansion and relative contrast had been identified. For other situations, further work is in progress to improve upon the procedure for a better relative contrast and reduced pixel expansion as compared to the existing schemes.

A. Adhikari, B. K. Roy and T. K. Datta

#### **Externally Funded / Consultancy Projects**

##### **Process Capability Study for Reduction of Heat Failure at SMS**

The objective of this study was to assess the process capability of SMS with respect to the incidence of heat failure and reduce the rate of heat failure by detecting root causes. Statistical analysis showed there was a need for reduction of process variation and proper centering of the process averages. Suitable process control scheme including control charts has been recommended for implementation.

##### **Process Capability Study for Reduction in Rejection by Control of ESR Process**

The objective of this study was to assess the process capability of ESR process and identify the factors for control and improvement. Data analysis showed that the process was having statistical stability with respect to only 3 parameters. A functional relationship was worked out between before and after levels of chemical compositions that could be used for process control.

##### **Process Capability Study for Reduction in Rejection in Cartridge Case**

The objective of this study was to assess the process capability of cartridge case process with respect to rejection / rework level and identify the factors for improvement. Data analysis identified the main reasons for rejection. Process Capabilities were assessed for the dimensional characteristics. Recommendations have been given for using appropriate process control method and implementing remedial measures.

##### **Feasibility of Sampling Inspection via-à-vis Vendor Performance**

The objective was to assess the scope of implementing sampling inspection at 100% inspection stage of Steel blank to start with. Data analysis revealed that the average quality level differs significantly among the suppliers. Also the quality levels were not stable. A trial to adopt sampling inspection with AOQL at 2.5% led to rejection of all the lots. Process improvement and vendor development for improving the quality of the steel blank has been recommended.

##### **Process Capability Study for Control of Defects (Piping in M. P. Section)**

A study was undertaken to assess the process capability with respect to the incidence of piping problem and identify the factors for improvement. Standardization of inspection, changing the extrusion parameters and monitoring the cleaning process for moulds resulted in a reduction in the level of rejection. Further studies have been suggested at the extrusion stage.

S. C. Chakraverty and B. Pradhan

### Improving Continuous Availability of Cigarettes using Six Sigma Methodology

The management of ITC was facing the problem of inadequate availability of cigarettes leading to consumer dissatisfaction and loss of potential markets. To start with, a specific geographical area was considered and Six Sigma Methodology was adopted for resolving the problem. A large volume of field data, collected at sampled retail outlets, revealed the existing status of availability of different brands of cigarettes along with their freshness. Root causes of the problem were identified through process FMEA and accordingly appropriate corrective actions were proposed and were validated through planned data collection.

A. Majumdar, P. Das, N. Das and S. K. Gauri

### Externally Funded In-plant Training Programme

Sl. No	Title of the programme	Dates	Organization	No. of Participants
1	Experiments with Mixture Designs	19 - 20 Aug. 2003	ECS Ltd., Mumbai	17
2	Statistical Quality Control Techniques	20 - 28 Nov. 2003	Gun and Shell Factory, Cossipore	29

### Internally Funded (North East) Project

A four-day training cum awareness programme on "Total Customer Satisfaction Through Quality Management" was conducted at Tripura Engineering College, Tripura during 30 Dec. 2003 – 02 Jan. 2004. About 50 students from different branches of engineering and several faculty members attended the programme.

A four-day training cum awareness programme on "Statistical Quality Control and Allied Techniques" was conducted at Assam Engineering College, Guwahati during 17 – 20 Feb. 2004 for the final year students from different branches of the college.

### SQC & OR Unit, Mumbai

#### Scientific Activities

Consultancy services were extended to HDFC Ltd., Wimco Ltd., Larsen & Toubro and Huber Chemicals and projects were carried out in the area of ISO 9000 and Six Sigma Implementation during the current year. Consultation services were also provided to Reliance Industries Ltd., affiliated to the SQC and OR Unit, Bangalore on implementing six sigma. It involved training programme for Black Belt, Green belt and project guidance. Around 18 projects were guided and had been logically concluded.

#### Externally Funded / Consultancy Projects

##### Improving First Pass Yield of Assembling Process of electromechanical relays

First pass yield (FPY) of an Electromechanical Relay was 85% because of high number of product being reworked and retested. The main reasons for low FPY were identified through systematic study, planned data collection and proper analysis of data. Shann technique was applied to solve some of the problems. Appropriate actions including new control limits were suggested. 33 contractors who assembled using these limits passed the computerised testing.

##### Improvement of First Pass Yield of an Overload Tripping Device

First Time Yield (FTY) of an Overload Tripping Device was 45.5% because of rework and calibration. Six Sigma methodologies were used to increase the FTY to 100%. Following systematic investigation two major defects were identified leading to a change in assembling method, an improvement in

Inspection process and changes in embossing. Finally a change in design was also recommended. The bottom line improvement was cost saving.

#### To reduce product change over time

The plant was having single line equipments to manufacture silica and silicates. Switching from one category of product to another (product changeover time) required lots of flushing jobs and sanitization. The product change over process was analysed through deployment flow chart and non-value activities were identified. They were either eliminated or controlled to reduce their contribution. Optimum time was defined for all activities and process was monitored against this optimum. This resulted in a reduction of 264 hrs of non-productive time.

#### Improving accuracy of Bag filling process

Bag filling machines were having weight accuracy problems due to high variability of the filling process. An FMEA study was carried out, which resulted in identifying 5 key process input variables (KPIV). Various statistical analyses were performed on data collected to validate the KPIV. Consequently two major changes were introduced in the filling process and the weight accuracy of the machine was brought well within the required limits.

#### Improving throughput of milling process

This project focused on increasing the productivity (mill throughput). Milling system was shared by different products and created a bottleneck. On applying the Six Sigma roadmap with a focus on mill optimization, the average production rate could be increased from 1.5 TPH to 1.9 TPH. An annual saving of Rs. 2.10 lakhs on a budgeted 3972 MT of the product was expected.

#### Evolving marketing strategy through the concepts of design of experiments

The "Conjoint Analysis" approach was taken to locate critical attributes of an existing electrical device so as to identify the features requiring change/modification for improved customer satisfaction. During data collection the market was stratified and analysed. Based on the analysis the marketing strategy was formulated.

#### Reduction in "Less than C10 Contents" in Domestic Grade LAB through Six Sigma Methodology

A study to improve the product performance was carried out using Six Sigma methodology; process analysis; innovation and improvement. The root cause search brought out the direction for process improvement. The findings of the study were implemented after risk analysis was carried out for the solutions.

Ashok Sarkar

#### Externally Funded In-Plant Training Programme

Title of the Programme	Organization	Duration	No. of Participants
Green Belt Programme	Reliance Industries	Apr. 16-17, Jul. 29-30 2003 Mar 22-23, Mar. 28-29 2004	120
	L&T, Faridabad	Jul. 3-4, 2003	12
	Larsen & Toubro, Faridabad	Aug 4-5, 2003	12
	Huber Chemicals Pvt. Ltd.	Dec 7-9, 2003 Jan 2-3, 2004	20
Design for Six Sigma	Larsen & Toubro	Apr. 23-24, 2003	25
Black Belt Programme	HDFC Ltd.	May 17-18, Jun. 28-29 2003 Feb. 28-29, 2004	36

	Reliance Industries	Jul. 9-11, 2003 Mar. 26-27, 2004	60
	L&T, Ahmednagar	Sept 15-16, 2003 Jan 11-13, 2004	24
	Huber Chemicals	Mar 1-3, 2004	10
ISO 9000	HDFC Ltd.	Jun. 18, 2003	12
ISO 9000 (Internal Audit)	Wimco Ltd.	Jul. 8, 2003	10
Master Black Belt Programme	Larsen & Toubro, Powai	Aug 1-5, 2003	12
Design of Experiments	Larsen & Toubro, Nasik / Powai	Sept 20, 2003 / Nov 27-29, 2003	28
SPC Training Programme	Ordnance Factory, Nagpur	Dec 10, 2003	30
	Everest Industries, Nasik	Feb 5-7, 2004	21
OFD & FMEA	Tractor Engrs, L&T	Mar 24-25	12

### **SQC & OR Unit, Pune**

#### **Externally Funded Consultancy Project (Non-income Sharing)**

Sl. No.	Name of the Funding Agency	Nature of Assignment
1	Reliance Industries Ltd., Hazira	Six Sigma Implementation
2	HEG Ltd., Bhopal	Six Sigma Implementation
3	Tech Nova Imaging Systems Ltd., Talaja	Implementing Quality management System in line with ISO-9001:2000
4	Johnson & Johnson Ethicon Div., Asia Pacific	Six Sigma Survey
5	L & T, Heavy Engg. Div., Hazira	Six Sigma Survey

#### **Externally Funded In-Plant / General Training Programme**

Sl. No.	Title of the Programme	Funding Agency	Duration	No. of Participants
1	Two-day workshop on Standardized Design Practices	Kirloskar Power Engine Ltd., Pune	16 -18 Sept., 2003	15
2	Programme on Six Sigma	General training programme (organized by PHD CCI, Bhopal)	11-12 Dec., 2003	23

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

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

##### **Research Activities**

The main areas of research in which the different members of the DRTC Faculty were engaged during the period are :

- (i) study of various methods of knowledge representation, such as, semantic nets, frames, and predicate calculus, etc., (ii) The application of the "Modern scientific management techniques to the

planning and management of information system, centers and services, (iii) The study of Internet technology and its applications, (iv) The development of bibliometric and scientometric measures for evaluating the use of library and information services and scientific output respectively and (v) The development of guidelines and software for library house keeping operations, such as, circulation control, service control, acquisition control, etc.

Mr. Aditya Tripathi, SRF, is carrying out his research under the guidance of Dr. A.R.D. Prasad. He registered in the Doctoral degree Programme in Pune University. He has submitted the synopsis entitled "Design and Development of Multilingual Information Retrieval System with Numeric MARC".

A study has been carried out to identify the fields which require machine translation and which can be codified. Numeric codes have been developed for the fields which are identified for codification. For this purpose detailed literature search has been done to identify the available codes for subfield. Standard codes were assigned to the records, same done based on OCLC record. Translation of the codes has been done in Telugu, Hindi, Bangla and Kannada.

Programs have been written to retrieve multilingual records from Z 39.50 Zebra server. Module is written for data retrieval using codes in the desired language of output. Transliteration program has been modified to handle the exceptions and this module has been attached to the original data retrieval program.

Mr. Bibhuti Bhusan Sahoo, SRF, is carrying out his research work under the guidance of Dr. I. K. Ravichandra Rao. He registered in the Doctoral degree Programme in Pune University. He submitted the synopsis entitled "Scientometric study of Software study in India with comparison to the world literature".

Ms. Dimple Patel, SRF, is carrying out her research work under the guidance of Dr. Devika P. Madai. She has registered in the Doctoral degree programme in Vidyasagar University, Medinipur. She submitted the synopsis entitled "Development of algorithms for indexing and searching with special reference to Telugu documents in Unicode." An extensive literature search has been done in relevant areas such as study of character representation codes such as Unicode, ASCII, ITRANS etc.

### ***Library (Kolkata)***

The Central Library of ISI is located in Kolkata with a network extending to other locations at Delhi and Bangalore. Over the years, the Library has occupied a unique place in providing information sources for academic and research activities of the Institute and attained the distinction of being one of the richest libraries of the country, particularly in the field of Statistics, Mathematics, Economics, Computer Science and related disciplines. The Library has also been the Eastern Regional Center Library of National Board for Higher Mathematics (NBHM) since 1989. It also receives grant from the NBHM, Department of Atomic Energy, Government of India.

It is an automated library having an excellent collection of books, journals, reports and large number of electronic journals and databases. The Library remains open throughout the year (except on national holidays) and the library staff aims to provide optimum services to the faculty members, scholars, students and visiting scientists.

To achieve the goal of the Library, following activities were undertaken during the year under report -

**Collection:** The Library maintains excellent collection of books, journals, reports, rare books, government publications, data-books, occasional papers and other documents/ materials in print and electronic formats. During the year under report the library accessioned 1491 books out of which 1240 were purchased (including 125 from NBHM grant) and 191 books were received on complimentary basis. The Library also accessioned 1100 bound volumes of journals and subscribes to 472 scholarly journal titles in print. It maintains the publication exchange programme of 'Sankhya- the Indian Journal of Statistics' with national and international institutions/organizations through which the library has got 100 titles in this period. More than 35 titles were received on complimentary basis. Currently the library

is holding books, bound volumes of journals, reports & records/data-books totalling 223573. The library classified and catalogued 1849 new books and filed 6700 computer printed catalogue cards during the year. It also processed 1450 titles on government reports/data-books etc.

Besides print collection the Library has a good collection of electronic resources, such as CD, Floppy, and online journals/databases. During the year under report the library added 53 CDs & floppies, 25 CDs on statistical data and thus the total collection of CDs has risen to 690. The library has provided online access to more than 300 full-text journals. It has renewed the online databases like MathSciNet, EconLit and ScienceDirect through consortia and subscribed to IEL Online of the IEEE/IEE publications, Current Index to Statistics (CIS) on Web, IndiaStat. It has also subscribed to few statistical data sources available in CDs such as Census of India, National Sample Survey (NSS) data, Central Statistical Organization (CSO) data, etc.

**Membership:** Membership of the ISI-Library is generally restricted to persons with post-graduate or equivalent academic qualification, interested in the objectives of the Institute. Faculty members, research scholars, students, research associates, visiting scientists, ISEC trainee, project-linked staff, ISI-employees, outside students and the Institute members are eligible for the membership of the Institute Library. However, they have to apply for the membership by filling up the Membership form and receive a bar-coded "Library Card". During this period library membership was given to 527 persons and 952 readers were given special permission to use the library for a short period. Currently the total library membership stands at 3126.

**Services:** The ISI-Library, since its inception has been providing a variety of library & information services to its users. The service presently being provided includes :

**Web-OPAC -** Members use this facility to browse and search the database to see the status of a document including their own transactions.

**Circulation Service:** During this period 117279 books and other documents were issued to the users on loan and reference. 1233 titles on Govt. and other reports and data CDs, were issued to users on reference. The library introduced the email-based services like 7-day advance alert, long overdue notice and check-in information.

**Inter-library loan:** 8 books and journals were borrowed from other libraries and 20 books and journals were lent to other libraries.

**Current Awareness Service:** 12 monthly lists of current additions to the library were made available online.

**Self-Photocopying Service:** The library has started the Self-photocopying service from June, 2003 in its journal section and made this service available throughout the library hours and 24468 pages were photocopied from the journals.

**Electronic Document Delivery Service:** Full-text articles and/or bibliographical data were provided through email from online resources.

**Online Full-Text Access to Journals/ Databases:** During the period under review, the library has provided services from more than 300 online journals and five major databases like Mathscinet, Econlit, ScienceDirect, IEL Online, CIS on Web. The online access is available through campus-wide network.

**Reprographic & Photographic Services:** During this period about 5564 requisitions for various kinds of works were received. In course of execution of these jobs, it produced around 4.5 lakhs photocopies, over 1 lakh offset prints, 1500 photographic prints, 3000 frames of photo exposures, around 2500 color and black and white digital prints, 262 pieces of graphical design and 400 pieces of lamination of different kinds of documents

**Documentation Service:** It prepared a searchable bibliographic database on scientific contributions made by the ISI scientists on all subject fields since 1934.

#### **General Enquiry Assistance and Consultation Service**

##### **Special Initiatives:**

**Consortia arrangements:** During the year under report, the Library has initiated 3 different consortia to enhance the electronic collection and to cope with the increasing subscription cost and diminishing budget.

**Procurement of back volumes of journals:** The Library has acquired a large number of back volumes from 7 mathematics and economics titles and downloaded in CDs the gap issues from 31 Elsevier journals.

**Preservation and conservation:** In this period a total of 2281 books, 1100 journals and 266 reports were bound. Lamination and de-acidification of 12 rare books and 10 bound volumes of journals, fumigation of 363 books and photocopying of 4 rare and out-of-print books were made during the period.

#### ***Library (Delhi)***

The ISI Delhi Centre maintains an academic library, which aims to be a leading library in the field of mathematics, statistics, economics, operations research and statistical quality control. The library acts as the regional library of the National Board for Higher Mathematics (NBHM), Dept. of Atomic Energy, Govt. of India to serve the academic users of the northern region. It caters mainly to the needs of students, scholars and staff of the Institute. However, it is also open for reference to academic and research users of other educational and scientific institutions of the city and its neighbouring regions. During the period under review, following were the activities of the library.

**Collections:** The library purchased 584 books. It received 50 books on complimentary basis and added 548 bound volumes of journals to the collection, thus raising the total collection to 40478 volumes. It renewed the subscription to 254 titles of journals and received 9 titles in exchange of "Sankhya". 15 journals, both foreign as well as Indian were received in the library as gift. Approximately 120 technical Reports / Discussion papers in economics were received in exchange of 'Discussion Papers in Economics' of ISI Delhi.

The library has more than 200 electronic journals with direct access to the full-text articles. It has renewed the consortium for the MathSciNet and the academic membership of SIAM and gets unlimited access to the Elsevier journals through the ScienceDirect consortia among the three centres of ISI.

**Membership:** During this period, 158 members availed of the lending facilities as permanent members of the library and 745 members took the temporary membership for reference facilities.

**Services:** The library is providing the following services to its users.

**Web-OPAC:** The users have been given an access to the complete catalogue of the library holdings through the OPAC.

**Circulation service:** During this period, more than 2650 publications have been circulated among the members. The library also maintains contact with other research libraries for inter-library loan transactions. Two publications were borrowed on ILL and 20 were lent out to other institutes under this program. Bar-coding of all books has been completed during this year.

**Reprographic service:** More than 45338 pages have been Xeroxed and made available to the temporary and permanent members.

**Current Awareness Service:** The library issued twelve issues of 'Current Contents' to inform the members about the contents of the latest journals. The print copy as well as the electronic copy of the quarterly issue of 'Newsletter', containing the recently added books to the library, was circulated.

### ***Library (Bangalore)***

The Bangalore center library is one of the distinguished libraries in the fields of mathematics, economics, statistical quality control and library and information science. The library caters to the information needs of users including students, teachers, research scholars, visiting scientists, researchers from other institution and employees of the Institute.

The activities of the library during the period of report include :

**Collection:** In this year a total of 1318 books were purchased and added to the collection. 49 books were purchased from other grants and 54 were received on complimentary basis. 475 bound volumes of journals were accessioned. The library subscribed to 304 journal titles in this period. Subscription to JSTOR, the archival database for 29 titles in mathematics and statistics was initiated. Full-text online access to the ScienceDirect and to the journals in mathematics, statistics and library and information science has been provided.

**Membership:** 123 registered users availed of the library facilities during this year.

**Services:**

**Circulation:** Around 4200 books and journals were circulated and 6700 in house use of books and journals were recorded. About 60 inter library loan transactions were made. 1300 books were technically processed during this period.

**Reprographic services:** The library provided 158000 photocopies to the users of the library and outside members.

**Current Awareness service:** The following publications were brought out from the library: i) Bimonthly list of books, ii) Monthly list of current periodicals, iii) Current content of journals.

**Documentation:** List of books authored by Dr. Ranganathan and preserved in the library as special collection, was compiled.

### ***Prasanta Chandra Mahalanobis Memorial Museum and Archives***

The Museum and Archives is located in the 'Amrapali' building at the Headquarters in Kolkata. It has a rich collection of photographs, letters and other archival materials. It carried out regular maintenance programme for the large collection. During the period under report, the Museum was visited by more than 100 persons including visiting scientists, students of schools, colleges and universities from different national and foreign institutions and organizations. During the Convocation on 27<sup>th</sup> February 2004, the Hon'ble President of India, Dr. A. P. J. Abdul Kalam and Governor of West Bengal Shri V. J. Shah visited the museum.

Among the archival collections 250 letters were accessioned, 200 miscellaneous documents were sorted, listed and filed and 50 items including letters, files, reports, paper cuttings etc. were treated for preservation. The renovation work of the museum building has been started in this year.

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

CSSC manages central computing facilities of ISI, Kolkata. It serves about 600 users, comprising of scientific workers, research scholars, regular students and project trainees. The service is provided using SUN Enterprise server, DEC Alpha 4100 server, IBM AS400 server and SUN Blade

workstations. In addition, the centre provides 65 PCs for users. Standard compilers are available for program development. Special packages like ARC-GIS, BMDP, Matlab, Mathematica, SAS, SHAZAM, S-Plus and TSP are available for users.

CSSC manages internet facilities at ISI, Kolkata. It liaisons with BSNL and VSNL to provide internet browsing and e-mail facilities to users.

CSSC manages the campus-wide network at ISI, Kolkata. The network is being expanded to cover the new academic building and the new hostels during the current year. This is expected to be completed by the next financial year.

CSSC provides Statistical and Computational consultancy to users, both from within and outside ISI. During this year, (a) three non-ISI scientists, (b) four ISI research scholars and (c) three ISI scientists were helped by Debashis Roy.

CSSC personnel take part in teaching different courses at ISI, Kolkata. They supervise projects of U Tech. students (both CS and QOR). They also act as Project Guide to B. Tech., M. Tech. and MCA students of other institutions. This year, Debashis Roy acted as Project Guide to two MCA (IGNOU) students.

North-East Project - CSSC regularly conducts North-Eastern projects.

## 4. INTERNALLY/EXTERNALLY FUNDED PROJECTS

### INTERNALLY FUNDED PROJECTS

#### Ongoing

1. Name of the project : Bayesian analysis of SODAR data  
Project leader : A. Pal  
Unit involved : ASU
2. Name of the project : Air pollution modelling  
Project leader : R. Roychowdhury  
Unit involved : ASU
3. Name of the project : Approximation to high-dimensional model selection criteria and evaluation of performance.  
Project leader : T. Samanta  
Unit involved : ASU
4. Name of the project : Construction of Boolean functions of cryptographic importance  
Project leader : B. Roy  
Unit involved : ASU
5. Name of the project : Implementation of provably secured public key protocols  
Project leader : P. Sarkar  
Unit involved : ASU
6. Name of the project : Robust estimation and goodness of fit tests for circular models  
Project leader : A. SenGupta  
Unit involved : ASU
7. Name of the project : Studies of algebraic properties of 2D-cellular automata  
Project leader : P. Pal Chowdhury  
Unit involved : ASU
8. Name of the project : Facility Location Problem  
Principal investigators : S. C. Nandy and S. Das  
Unit involved : ACMU
9. Name of the project : Multi-layer VLSI Routing  
Principal investigator : S. Sur-Kolay  
Unit involved : ACMU
10. Name of the project : Checkpointing in Distributed Systems  
Principal investigator : K. Mukhopadhyaya  
Unit involved : ACMU
11. Name of the project : Wireless Networks and Mobile Computing  
Principal investigators : B. P. Sinha, J. Dattagupta and N. Das  
Unit involved : ACMU
12. Name of the project : Document Analysis  
Principal investigator : U. Pal  
Unit involved : CVPRU

13. Name of the project : Handwritten Character Recognition  
Principal investigator : U. Bhattacharya  
Unit involved : CVPRU
14. Name of the project : Natural Language Processing  
Principal investigator : B.B. Chaudhuri  
Unit involved : CVPRU
15. Name of the project : Speech Analysis and Synthesis  
Principal investigator : B.B. Chaudhuri  
Unit involved : CVPRU
16. Name of the project : Digital Data Compression and Security  
Principal investigator : U. Garain  
Unit involved : CVPRU
17. Name of the project : Information Retrieval  
Principal investigator : M. Mitra  
Unit involved : CVPRU
18. Name of the project : Early Detection of Breast Cancer from Digital Mammogram using AI Tools  
Principal investigator : S. Pal  
Unit involved : ECSU
19. Name of the project : Multi-scale image segmentation, representation and storage for Content Based Image Retrieval (CBIR)  
Principal investigator : M. K. Kundu  
Units involved : MIU and ACMU
20. Name of the project : Digital watermarking and image/video compression using wavelets and fractals  
Principal investigator : M. K. Kundu  
Unit involved : MIU
21. Name of the project : VC dimension, neural networks and wavelets  
Principal investigators : C. A. Murthy and S. K. Pal  
Unit involved : MIU
22. Name of the project : Integration of spline and neural network methodologies for multi-resolution classification  
Principal investigator : S. N. Biswas  
Unit involved : MIU
23. Name of the project : Discovering patterns from large, complex data with applications to bioinformatics  
Principal investigator : S. Bandyopadhyay  
Unit involved : MIU
24. Name of the project : Hybridization of knowledge-based and case-based reasoning in neuro-fuzzy framework for pattern recognition problems  
Principal Investigators : S. K. Pal and R. K. Das  
Unit involved : MIU
25. Name of the project : Soft computing approach to protein folding  
Project coordinator : A. Ghosh  
Unit involved : MIU

26. Name of the project : Evolution of the Nallamala fold belt – fault reactivation and kinematics in an intracratonic fold belt  
Project coordinator : D. Saha  
Unit involved : GSU
27. Name of the project : Precambrian geodynamics in east Indian shield : structural, petrological and geochronological constraints  
Project coordinator : S. Bhattacharya  
Unit involved : GSU
28. Name of the project : Mesozoic tetrapod faunas from the Satpura basin and Pranhita-Godavari basin of India.  
Project coordinators : S. Bandyopadhyay and D.P. Sengupta  
Unit involved : GSU
29. Name of the project : Sedimentology and Palaeoclimatology of the Upper Gondwana Succession in Satpura Basin.  
Project coordinators : S.N. Sarkar, P.S. Ghosh and P. K. Maulik  
Unit involved : GSU
30. Name of the project : River Dynamics of the Sub-Himalayan Alluvial Plain in Northeastern India : A Study of Interaction between Tectonics and Climate in a Foreland Setting  
Project coordinators : P. S. Ghosh and T. Chakraborty  
Unit involved : GSU
31. Name of the project : Physicochemical Studies of Self-organised systems using Surfactant(s)/Cosurfactant(s)/Oils(s)/Polar Solvents (aqueous and non-aqueous)  
Project coordinator : B. K. Paul  
Unit involved : GSU
32. Name of the project : Application of Symmetry Algebras to some problems of Quantum Physics  
Principal investigator : P. Roy  
Co-investigators : B. Roy and R. Roychoudhury  
Unit involved : PAMU
33. Name of the project : Interacting Fock Space  
Principal investigator : P. K. Das  
Co-investigators : Luigi Accardi and Marcolino Nhani, Rome, Italy  
Unit involved : PAMU
34. Name of the project : Wave Scattering & Associated Mathematical Techniques  
Principal investigator : B. N. Mandal  
Unit involved : PAMU
35. Name of the project : The Status of QGP in High Energy Nuclear Physics : Past, Present & Future  
Principal investigator : S. Bhattacharyya  
Unit involved : PAMU
36. Name of the project : Interaction of flow and sediment suspension over bedform structures : experimental and theoretical studies  
Principal investigator : B. S. Mazumder  
Co-Investigators : J.K. Ghosh and Chandan Chakraborty  
Units involved: PAMU, SMU and GSU

37. Name of the project : Waves on thin conducting liquid film flowing down an inclined plane (North-East project)  
Principal Investigator : B. S. Dandapat  
Co-Investigators : A.K. Borikakati, Ashim Mukhopadhyay and Bhim Prasad Sarmati  
Unit involved : PAMU
38. Name of the project : Studies on sustainability criteria in rainfed eastern plateau area  
Principal investigators : D.K. Bagchi, P. Banik, S. Adhikary,  
Units involved: AGSU and EMBRU
39. Name of the project : Ecology and physiological studies on the mangrove of Sundarbans  
Principal investigators : M. Ghose, A. Choudhury, S. Bandopadhyay, S. Das, K. Bhattacharya,  
P. Nandy and H. Joshi  
Units involved: AGSU, ASU
40. Name of the project : Studies on the ecology, conservation, propagation and utilization of palms with special reference to rattans  
Principal investigators : M. Ghose, S. Das, K. Bhattacharya  
Unit involved : AGSU
41. Name of the project : Status of Austro-Asiatic Tribes in the Peopling of India  
Principal investigator : B. M. Reddy  
Unit involved : AHGU
42. Name of the project : DNA Polymorphisms in the Caste and tribal populations of India  
Principal investigator : B. M. Reddy  
Unit involved : AHGU
43. Name of the project : Health and disease among populations inhabiting contrasting ecological niches  
Principal investigator : S. Mukhopadhyay  
Unit involved : AHGU
44. Name of the project : Genetic affinity and diversity among the Adi tribe of Arunachal Pradesh : Population structure and genetic differentiation of Adi-Pasi tribe  
Principal investigator : T.S. Vasulu  
Unit involved : AHGU
45. Name of the project : Studies on Genetic Epidemiology and Diversity in Indian Populations  
Principal investigator : P. P. Majumder  
Unit involved : AHGU
46. Name of the project : Studies on Genomic Diversity and Affinities in Ethnic Populations of Northeast India  
Principal investigator : P. P. Majumder  
Unit involved : AHGU
47. Name of the project : Cervical Neoplasia: Host Genetic Factors for High Risk HPV-Infection  
Principal investigator : S. Sengupta  
Unit involved : BIOCU
48. Name of the project : HPV infection and Cervical Cancer in the Northeastern States of Manipur and Sikkim (Northeast Project)  
Principal investigator : S. Sengupta  
Unit involved : BIOCU

49. Name of the project : Mathematical Ecology and Epidemiology  
Principal investigator : J. Chattopadhyay  
Unit involved : EMBU
50. Name of the project : Study of Some Health Economic Issues of Meghalay  
Project coordinator : S. Mitra  
Unit involved : ERU
51. Name of the project : Birth-Order, Gender and Wealth as Determinants of Child Labour  
Principal investigators : S. Das, B. Dutta and K. Basu  
Unit involved : Planning
52. Name of the project : An Estimate of Extent of Sub-Standard Drug Sales in Delhi and their Effects on Public Health  
Principal Investigators : R. Somanathan and N. Kaur  
Unit involved : Planning
53. Name of the project : Mapping Water demand  
Principal investigator : E. Somanathan  
Unit involved : Planning
54. Name of the project : Regional Economic Growth in India  
Principal Investigator : C. Ghate  
Unit involved : Planning
55. Name of the project : Labour Productivity in the Indian Steel Industry  
Principal investigators : S. Das and R. Somanathan  
Unit involved : Planning
56. Name of the project : Socialization and Cognitive moral development of Children across Cultures  
Principal investigator : A. Ghosh  
Unit involved : PSYRU
57. Name of the project : Economic Reforms and Rural Development : A Study of Agricultural Labour in Eastern India  
Project coordinators : V.K. Ramachandran and Madhura Swaminathan  
Unit involved : SRU
58. Name of the project : Study of Social Network in some Villages in Giridih area in Jharkhand and Md. Bazar area of West Bengal  
Project coordinator : Anil K. Chaudhuri  
Unit involved : SRU
59. Name of the project : Appraisal of Village Resource Mapping : Case Studies in West Bengal  
Project coordinator : Atis Dasgupta  
Unit involved : SRU
60. Name of the project : Occupational Segregation in the Factory Sector in Indian Industries (1961-2001)  
Project coordinator : Molly Chattopadhyay  
Unit involved : SRU

### Completed

1. Name of the project : Analysis of fMRI data and Human Brain Mapping  
Project coordinator : S. Purkayastha  
Units Involved: SMU, CVPRU, ASU
2. Name of the project: Eleventh PCM Memorial Lectures  
Project coordinators : Arup Bose, Probal Chaudhuri and C.A. Murthy  
Units involved : SMU and MIU
3. Name of the project : Developing Audit Sampling tools for PWD, PHE and I&W  
Project leader : A. Chaudhuri  
Unit involved : ASU
4. Name of the Project : Functional Magnetic Resonance Imaging  
Project coordinator : S. Palit  
Unit involved: CVPRU
5. Name of the project : Cloud Motion Vector (CMV) Estimation using Infra Red (IR)/Water Vapour (WV) Imageries.  
Principal investigator : A. K. De  
Unit involved : ECSU
6. Name of the project : Image Information Retrieval  
Principal investigator : D.P. Mukherjee  
Unit involved : ECSU
7. Name of the project : Soft knowledge-based network for data mining  
Principal investigators : S. Mitra and S. K. Pal  
Unit involved: MIU
8. Name of the project : Data condensation, classification and rule generation for data mining.  
Principal investigators : C. A. Murthy and S. K. Pal  
Unit involved: MIU
9. Name of the project : Modeling and enhancing the performance of genetic algorithms  
Principal investigators : A. Ghosh and S. K. Pal  
Unit involved : MIU
10. Name of the project : National workshop on nonlinear physics  
Principal investigator : K. Kumar  
Co-investigator : R. Roychoudhury  
Unit involved : PAMU
11. Name of the project : Problems of wave propagation in fluid  
Principal investigator : B.N. Mandal  
Unit involved : PAMU
12. Name of the Project : Rice area characterization using satellite imagery and geographical information system tools.  
Principal investigators : P. Banik, R.N. Das, P.K. Ghosal  
Unit Involved: AGSU
13. Name of the project : Gene-environment interaction in the pathogenesis of oral cavity cancer and precancer  
Principal investigator : B. Roy  
Unit involved : AHGU

14. Name of the project : A Study of Optimality in the Allocation of public Amenities across Villages in India  
Principal investigators : R. Somanathan and S. Athreya  
Unit involved : Planning
15. Name of the project : Local governance, Poverty and Local Forest Resources  
Principal investigator : S. Das  
Unit involved : Planning
16. Name of the project : India's Environment  
Principal investigator : E. Somanathan  
Unit involved : Planning
17. Name of the project : Commodity Futures Markets and Price Stabilization  
Principal investigator : B. Ramaswami  
Unit involved : Planning
18. Name of the project : A Study of the knowledge, attitude and participation of elected Panchayat Members in health and family welfare programmes in West Bengal.  
Principal investigator : S. Barman  
Unit involved : PSU
19. Name of the project : Health Care Practice and HIV/AIDS awareness level among sex-worker. a case study of North 24 Parganas  
Principal investigators : R. Deb Roy, S. Gupta and P. De  
Unit involved : PSU
20. Name of the project : Ascertaining Component wise intercensal population numbers by symptomatic accounting and related procedures in two districts of Assam.  
Principal investigator : S. Dihidar  
Unit involved : PSU
21. Name of the project : Analysis of GHO-12 data collected from Antarctica expedition  
Principal investigator : D. Dutta Roy  
Unit involved : PSYRU
22. Name of the project : Nationalism, Modernity and the Indian Statistical Institute (1931-2000)  
Project coordinator : Uma Dasgupta  
Unit involved : SRU
23. Name of the Project : North East Project  
Project team : ALN Murthy, SVSN Murthy, T Parthasarathy (University of Hyderabad)  
Unit involved : SQC & OR, Hyderabad
24. Name of the Project : North East Project  
Project Team : S. Adhikari and A. Gupta  
Unit involved : SQC & OR Unit, Kolkata
25. Name of the Project: Training cum Awareness Programme on Total Customer Satisfaction through Quality Management  
Project Team : A K Chakraborty and B Pradhan  
Unit involved : SQC & OR (T&P), Kolkata

26. Name of the Project : Training cum Awareness Programme on Statistical Quality Control and Allied Techniques  
Project Team : S. C. Chakravarty and B. Pradhan  
Unit Involved : SQC & OR (T&P), Kolkata

### Externally Funded Projects

#### Ongoing

1. Name of the project : Banach Algebra techniques and the geometry of Banach spaces  
Principal investigators : TSSRK Rao, Bangalore and K Jarosz, SIUE, USA  
Unit involved : SMU, Bangalore and Kolkata  
Funded by : DST-NSF
2. Name of the project : Studies in geometry of Banach spaces  
Principal investigators : TSSRK Rao, Bangalore and G. Godefroy from Paris IV  
Unit involved : SMU, Bangalore and Kolkata  
Funded by : IFCPAR
3. Name of the project: Development of Versatile, Portable Software for Bioinformatics  
Principal investigators : P. Chaudhuri and R. L. Karandikar  
Unit involved: SMU, Delhi and Kolkata, Advanced Technology Centre, Tata Consultancy Service, Hyderabad  
Funded by : CSIR
4. Name of the project : Bayesian Automated Recognition of Targets (BART)  
Principal investigator : S. Bose  
Unit involved : SMU and ASU  
Funded by : ISRO
5. Name of the Project : Spatial Stochastic processes and random minimal spanning trees  
Principal Investigator : R. Roy  
Unit involved : SMU, Delhi  
Funded by : DST
6. Name of the Project : On the reliability of solid motor  
Principal Investigator : D. Sengupta  
Unit involved : SMU, Delhi  
Funded by : ISRO
7. Name of the Project : Studies in geometry of Banach spaces geometry of Banach spaces  
Principal investigator : T.S.S.P.K. Rao  
Unit involved : SMU, Bangalore and Kolkata  
Funded by : IFCPAR (Indo-French)
8. Name of the Project : Swarnajayanti I fellowship project  
Principal investigator : B.V. Rajarama Bhat  
Unit involved : SMU, Bangalore  
Funded by : Department of Science and Technology
9. Name of the project : Evaluation flight control software  
Project leader: A. Dewanji  
Unit involved : ASU  
Funded by : ISRO

10. Name of the project : Cryptanalysis of complex LFSR based systems  
Project leader : B. Roy  
Unit involved : ASU  
Funded by : DRDO
11. Name of the project : Visual cryptographic schemes  
Project leader : B. Roy  
Unit involved : ASU  
Funded by : ISRO
12. Name of the project : Design aid/fool for selecting & testing of connection polynomials  
Project leader : B. Roy  
Unit involved : ASU  
Funded by : CAIR
13. Name of the project : Development of Cryptographic protocols based on Weil and Tate pairing on elliptic curve  
Project leader : B. Roy  
Unit involved : ASU  
Funded by : MIT
14. Name of the project : Steganographic Schemes for Satellite Images for ISRO  
Project leader : S. Maitra  
Unit involved : ASU  
Funded by : ISRO
15. Name of the project : Cryptanalysis and design of steganographic schemes  
Project leader : S. Maitra  
Unit involved : ASU  
Funder by : DRDO
16. Name of the project : Development of an Indigenous Block Cipher Scheme for ISRO  
Project leader : P. Sarkar  
Unit involved : ASU  
Funded by : ISRO
17. Name of the project : Investigation of means to assess errors in surveys by judicious techniques  
Project leader : A. Chaudhuri  
Unit involved : ASU  
Funded by : CSIR
18. Name of the project : New Techniques of Fast Image Compression based on Human Vision Systems and Geometric Data Structures  
Principal investigators : B. B. Bhattacharya and M. K. Kundu  
Co-Investigator : C. A. Murthy  
Units involved : ACMU and MIU  
Funded by : Intel Corporation, USA
19. Name of the project : Delay Fault Modeling and Test Generation for Power Supply Noise  
Principal investigator : S. Sur-Kolay  
Co-Investigator : B. B. Bhattacharya  
Unit Involved : ACMU  
Funded by : Intel Corporation, USA

20. Name of the project : Handwriting Recognition for Postal Automation  
Principal investigator : B. B. Chaudhuri  
Unit involved : CVPRU  
Funded by : Indo-French Centre for the Promotion of Advance Research (IFCPAR)
21. Name of the project : Sharing Capability in Localisation and Human Language Technologies  
Principal investigators : B. B. Chaudhuri and N.S. Dash  
Unit involved : CVPRU  
Funded by : ASI@IT&C of the European Commission (EC)
22. Name of the project : Development of an ANN-based Prediction Model for Jute Yarn Quality  
Principal investigator : S. Pal  
Unit involved : ECSU  
Funded by : Indian Jute Industries' Research Association (IJIRA)
23. Name of the project : Estimation of Ground Vibration using ANN  
Project coordinator : J. Das  
Unit(s) involved : ECSU  
Funded by : CMRI
24. Name of the project : New techniques for fast image compression based on human visc system and geometric data structures  
Project coordinators : M. K. Kundu and B. B. Bhattacharya  
Units involved : MIU and ACMU  
Funded by : INTEL Corporation, U.S.A
25. Name of the project : Knowledge-based Connectorist Data Mining System: Design and Applications  
Project coordinators : S. K. Pal and S. Mitra  
Unit involved : MIU  
Funded by : Council for Industrial & Scientific Research (CSIR)
26. Name of the project : Soft Computing for Medical Image Segmentation and Classification  
Project coordinator : S. Bandyopadhyay  
Units involved : MIU  
Funded by : Indian National Science Academy (INSA)
27. Name of the project : Web Mining  
Project coordinator : S.K. Pal  
Units involved : MIU  
Funded by : the INSEAD, France
28. Name of the project : Soft computing in Chemogenomics  
Project coordinator : C. A. Murthy  
Unit Involved : MIU  
Funded by : Silicogena
29. Name of the project : Tectonic setting of alkaline intrusives : A case study for two such complexes around Parakhol and Koraput in the Orissa sector of the Eastern Ghats granite belt  
Principal investigator : S. Bhattacharya  
Unit involved : GSU  
Funded by : Council of Scientific & Industrial Research (CSIR)
30. Name of the project : Depositional motifs of the Satpura Gondwana succession: their spatial and temporal variability in relation to basin tectonics  
Principal investigator : T. Chakraborty  
Unit involved: GSU  
Funded by: Department of Science and Technology, New Delhi

31. Name of the project : Turbulent and incipient suspensions due to bursting and their sedimentological implications : An experimental study  
Principal investigator : B. S. Mazumder  
Co- investigators : J. K. Ghosh and Chandan Chakraborty  
Unit involved : PAMU, SMU and GSU  
Funded by : Department of Science and Technology (DST), New Delhi
32. Name of the project : Studies on the Effect of Multiple Scattering on the Shift of the Spectral Lines and Applications  
Project leader : S. Roy  
Unit involved : PAMU  
Funded by : Department of Science & Technology (DST), New Delhi
33. Name of the project : Algebraic Analysis of some Exactly Solvable Quantum Models  
Project leader : P. Parashar  
Unit involved : PAMU  
Funded by : Department of Science & Technology (DST), New Delhi
34. Name of the project : Rice Based Cropping System and Micro Level Studies on Sustainability  
Principal investigator : D.K. Bagchi  
Unit involved : AGSU  
Funded by : IRRI
35. Name of the project : Forest and the Resources for the Poor Urban Household in Developing Countries  
Principal investigator : D.K. Bagchi  
Unit involved : AGSU  
Funded by : DFID
36. Name of the project : RRPS-27: Development of Improved Jute  
Principal investigator : A. Goswami  
Unit involved : AGSU  
Funded by : ICAR
37. Name of the project : Genomic Diversity in the Tribal Populations of AP in the Broader Context of the Peopling of India  
Principal investigator : B. M. Reddy  
Unit involved : AHGU and CCMB  
Funded by : CSIR
38. Name of the project : People's Use of Forest Resources vis-à-vis Impact of Forest Depletion on Livelihood Issues of Local People in the Sikkim Himalaya  
Principal investigator : B. Mukhopadhyay  
Unit involved : AHGU  
Funded by : Ministry of Environment and Forests, Government of India
39. Name of the project : Genetic predisposition to anti-tuberculosis drug-induced hepatotoxicity  
Principal investigator : B. Roy  
Unit involved : AHGU  
Funded by : ICMR
40. Name of the project : Human Genomic Diversity Interlink: A Network Study of Genomic & Mutational Diversities in Indian Populations  
Principal investigator : P. P. Majumder  
Unit involved : AHGU  
Funded by : DBT

41. Name of the project : Effect of Alu Insertion/Deletion Polymorphism at the DCPI Locus on Blood Pressures and Lipid Levels Among Individuals Belonging to Defined Haplogroups Drawn from Two Tribal Populations of India  
Principal investigator : P. P. Majumdar  
Unit involved : AHGU  
Funded by : ICMR
42. Name of the project : Single nucleotide polymorphisms: Validation and identification in ethnic populations of India  
Principal investigator : P. P. Majumdar  
Unit Involved : AHGU  
Funded by : DBT
43. Name of the project : Empirical Study on the Labour-related Problems of Tea Gardens in West Bengal  
Project coordinator : Atis Dasgupta  
Unit involved : SRU  
Funded by : Department of Labour, Govt. of West Bengal
44. Name of the project : Study on Status of Women in West Bengal  
Project coordinator : Atis Dasgupta  
Unit involved : SRU  
Funded by : West Bengal State Women's Commission
45. Name of the project : Optimization Methodology and Algorithms for Printing Sheets  
Project Team : S. R. Mohan, S. K. Neogy and A. Seth  
Unit involved : SQC & OR, Delhi  
Funded by : R Systems International Ltd., Noida
46. Name of the project : Implementation of ISO 9001: 2000  
Project Team : P. Das and S. Gauri  
Unit involved : SQC & OR , Kolkata  
Funded By : Pragma Apparel
47. Name of the project : Developing Brand Share Prediction Model for FMCG product  
Project Team : A. Majumdar, A. Banerjee, R. Sett  
Unit involved : SQC & OR, Kolkata  
Funded By : ACN ORG-MAEG Pvt. Ltd.
48. Name of the project : Implementation of ISO 9001: 2000  
Project Team : A. Majumdar, P. Das, S. Gauri  
Unit involved : SQC & OR, Kolkata  
Funded By : Sunrise Biscuit Company Pvt. Ltd., Gauhati
49. Name of the project : Six Sigma for Marketing processes  
Project Team : A. Majumdar, P. Das, S. Gauri  
Unit involved : SQC & OR, Kolkata  
Funded By : Marketing Division, ITC Limited
50. Name of the project : Improving Continuous Availability of Cigarettes using Six Sigma Methodology  
Project Team : A Majumdar, P Das, N Das, S K Gauri  
Unit involved : SQC & OR, Kolkata and SQC & OR (T&P), Kolkata  
Funded by : ITC (Marketing), Kolkata

### Completed

1. Name of the project : Techniques of Topology, Geometry, and Analysis on Manifolds  
Principal investigator : A. Mukherjee  
Unit involved : SMU, Kolkata  
Funded by : DST
2. Name of the project: Audit Sampling – phase II  
Principal investigators : T. J. Rao and A. Choudhury  
Units involved : SMU, Kolkata, ASU, PAMU, PSRU.  
Funded by : Ministry of Finance, Govt. of West Bengal
3. Name of the project : Banach algebra techniques and the geometry of Banach spaces  
Principal investigator : T.S.S.R.K. Rao  
Unit involved : SMU, Bangalore and Kolkata  
Funded by : Department of Science & Technology, New Delhi
4. Name of the Project : Noncommutative Markov processes  
Principal investigator : K.B. Sinha  
Unit involved : SMU, Bangalore and Kolkata  
Funded by : IFCPAR (Indo-French)
5. Name of the project : Geometric Invariants for Quotients Modules  
Principal investigator : G. Misra  
Unit involved : SMU, Bangalore  
Funded by : DST and NSF
6. Name of the project : Resource Centre for Indian Language Technology Solutions – Bengali  
Principal investigator : B. B. Chaudhuri  
Unit involved : CVPRI  
Funded by : Dept. of Information Technology, Govt. of India.
7. Name of the project : Water Waves Scattering by Obstacles & Surface Discontinuities  
Project leader : B. N. Mandal  
Unit involved : PAMU  
Funded by : Department of Atomic Energy, Govt. of India, Mumbai (National Board for Higher Mathematics)
8. Name of the project : Large Amplitude Ion Acoustic Double Layers in Multispecies Relativistic Plasma  
Project leader : R. Roychoudhury  
Unit involved : PAMU  
Funded by : Council of Scientific & Industrial Research, New Delhi
9. Name of the project : Feasibility of a screening program with abnormal cytology and oncogenic human papillomavirus and other infections in the Maria-Gond Tribal women : reproductive health care study  
Project coordinators : C. Duttgupta and S.Sengupta  
Unit involved : BIOCU  
Funded by : Indian Council of Medical Research (ICMR)
10. Name of the project : Study about the Steel Sector (Medium and Small Scale) Units.  
Principal investigators : M. Pal and A. K. Adhikari  
Units involved : ERU and ASU  
Funded by : West Bengal Financial Corporation (WBFC)

11. Name of the project : Environmental Management Capacity Building Technical Assistance  
Project: Environmental Economics Component.  
Principal Investigator : D. Coondoo  
Unit involved : ERU  
Funded by : World Bank
12. Name of the project : External Evaluation of Total Litera Campaign (TLC) in Kamrup District, Assam.  
Principal Investigator : P.K. Majumdar  
Unit / Division involved : PSU  
Funded by : National Literacy Mission, Department of Adult Education, M.O.H.R.D., Govt. of India and National Literacy Mission, Kamrup District, Assam.
13. Name of the project : Statistical methods to study Effectiveness of New Engine oil  
Project leader : D.K. Manna  
Unit involved : SQC & OR, Chennai  
Funded by : Indian Additives Ltd.
14. Name of the project: Proficiency Testing Programme on Egg Powder Testing  
Project Team : S.R. Mohan, S.K. Neogy and A. Seth  
Unit involved : SQC & OR, Delhi  
Funded by : NABL, Department of Science & Technology, Govt. of India
15. Name of the project : Minimization of Heat Rate In Power Generation  
Project leader : B. Majumdar  
Unit involved : SQC and OR, Delhi  
Funded by: NTPC, Dadri
16. Name of the project : Development of Process Capability Baseline  
Project Team : A. Banerjee, R. Sett  
Unit involved : SQC & OR, Kolkata  
Funded By : Skytech Solutions
17. Name of the project : Break through improvement using Six Sigma  
Project leader : A. Banerjee  
Unit involved : SQC & OR, Kolkata  
Funded By : Progeon Limited
18. Name of the project : Implementation of Six Sigma  
Project Team : A. Banerjee, R. Sett  
Unit involved : SQC & OR, Kolkata  
Funded By : ITD, ITC Limited
19. Name of the project : Implementation of Software Metrics  
Project leader : A. Banerjee  
Unit involved : SQC & OR, Kolkata  
Funded By : Robert Bosch India Limited
20. Name of the project : Maintenance of ISO 9001:2000 QMS and ISO 14001 EMS  
Project leader : R. Sett  
Unit involved : SQC & OR, Kolkata  
Funded By : Coates of India Limited
21. Name of the project : Implementation of ISO 9001: 2000  
Project leader : R. Sett  
Unit involved : SQC & OR, Kolkata  
Funded By : Surya Nepal Pvt. Ltd., NEPAL

22. Name of the project : Implementation of ISO 9001: 2000  
Project Team : S. Sengupta, A. Gupta  
Unit involved : SQC & OR, Kolkata  
Funded By : East India Pharmaceuticals Works Limited
23. Name of the project : Training Programme on Software Metrics  
Project leader : A. Banerjee  
Unit involved : SQC & OR, Kolkata  
Funded By : Tala Consultancy Services
24. Name of the project : Training Programme on Six Sigma Methodology  
Project leader : A. Banerjee  
Unit involved : SQC & OR, Kolkata  
Funded By : Mentorix Technologies Pvt. Limited
25. Name of the project : Implementation of ISO 9001: 2000  
Project Team : P. Das, S. Gauri  
Unit involved : SQC & OR, Kolkata  
Funded By : Britannia Industries Limited
26. Name of the project : Training Programme on Statistical Process Control  
Project leader : A. R. Mukhopadhyay  
Unit involved : SQC & OR, Kolkata  
Funded By : Indian Chambers of Commerce
27. Name of the project : Process capability Study for Reduction of Heat Failure at SMS  
Project Team : S C Chakravarty and B Pradhan  
Unit involved : SQC & OR (T&P), Kolkata  
Funded by: Metal & Steel Factory (Govt. of India) Ishapore, Nawabganj
28. Name of the project : Process Capability Study for Reduction in Rejection by Control of ESR Process  
Project Team : S C Chakravarty and B Pradhan  
Unit involved : SQC & OR (T&P), Kolkata  
Funded by : Metal & Steel Factory (Govt. of India) Ishapore, Nawabganj
29. Name of the project : Process Capability Study for Reduction in Rejection in cartridge Case  
Project Team : S C Chakravarty and B Pradhan  
Unit involved : SQC & OR (T&P), Kolkata  
Funded by : Metal & Steel Factory (Govt. of India) Ishapore, Nawabganj
30. Name of the project : Implementation of Sampling Inspection  
Project Team : S C Chakravarty and B Pradhan  
Unit involved : SQC & OR (T&P), Kolkata  
Funded by : Metal & Steel Factory (Govt. of India) Ishapore, Nawabganj
31. Name of the project : Process Capability Study for Control of Defects (Piping in M. P. Section)  
Project Team : S C Chakravarty and B Pradhan  
Unit involved : SQC & OR (T&P), Kolkata  
Funded by : Metal & Steel Factory (Govt. of India) Ishapore, Nawabganj
32. Name of the project : Training Programme on Statistical Quality Control  
Project Team : N Das, B Pradhan, A K Chakraborty, D Raychaudhury, T. K. Dutta  
Unit involved : SQC & OR (T&P), Kolkata  
Funded by: Gun and Shell Factory, Cossipore

33. **Name of the project : Training Programme on Experiments with Mixture Designs**  
 Project leader : S K Majumdar  
 Unit involved : SQC & OR (T&P), Kolkata  
 Funded by : ECS Ltd., Mumbai
34. **Name of the Project : Improving First Pass Yield of Assembling Process of electromechanical relays**  
 Project leader : A. Sarkar  
 Unit involved : SQC & OR, Mumbai  
 Funded by : L&T, Mumbai
35. **Name of the project : Improvement of First Pass Yield of an Overload Tripping Device**  
 Project leader : A. Sarkar  
 Unit involved: SQC & OR, Mumbai  
 Funded by : L&T, Mumbai
36. **Name of the project : To reduce product change over time**  
 Project leader : A. Sarkar  
 Unit(s) involved : SQC & OR, Mumbai  
 Funded by : Huber Chemicals, Mumbai
37. **Name of the project :: Improving accuracy of Bag filling process**  
 Project leader : A. Sarkar  
 Unit involved: SQC & OR, Mumbai  
 Funded by: Huber Chemicals, Mumbai
38. **Name of the project : Improving throughput of milling process**  
 Project leader : A. Sarkar  
 Unit involved : SQC & OR, Mumbai  
 Funded by: Huber Chemicals, Mumbai
39. **Name of the project : Evolving marketing strategy through the concepts of design of experiments**  
 Project leader : A. Sarkar  
 Unit involved : SQC & OR, Mumbai  
 Funded by : L&T, Mumbai
40. **Name of the project : Reduction in "Less than C10 Contents" in Domestic Grade LAB through Six Sigma Methodology**  
 Project leader : A. Sarkar  
 Unit involved: SQC & OR, Mumbai  
 Funded by : Reliance Industries Limited, PatalGanga

## 5. SYMPOSIA, CONFERENCES, WORKSHOPS, LECTURES AND SEMINARS ORGANISED

### *Symposia and Conferences*

International conference on "Stochastic Processes and Interacting Particle Systems" was organized by SMU, Delhi during December 12-14, 2003 at ISI, Delhi.

International conference on "Cryptography, Indocrypt 2003" was organized by SMU, Delhi during December 7-10, 2004 at ISI, Delhi.

Conference on "Operating Systems" was organized by ACMU, Kolkata during March 1-5, 2004 at ISI, Kolkata.

Fifth International conference on "Advances in Pattern Recognition 2003 (ICAPR03) was organized by ECSU, Kolkata during December 10-13, 2003 at ISI, Kolkata.

Conference on "Ecology and biodiversity in North-East India" was organized by Biological Sciences Division during March 22-23, 2004 at Sitchar.

Conference on "Methods and Models in Economics" was organized by ERU, Kolkata during January 15-17, 2004 at ISI, Kolkata.

"Industry-ISI Meet" was organized by SOC & OR Division during November 17-18, 2003 at Hyatt Regency, Kolkata.

Conference on "Operations Research with Economic and Industrial Applications (ICOR-2004)" was organized by SOC & OR Division during January 8-10, 2004 at Bangalore.

Conference on "Six Sigma" was organized by SOC & OR Division during February 11-12, 2004 at Bangalore.

Seminar on "Statistical Process Control and Allied Techniques" was organized by SOC & OR Division during August 11-30, 2003 at Bangalore.

Seminar on "Quality leverage for Development" was organized by SOC & OR Division during March 29-30, 2004 at Bangalore.

Video Conference on "Digital Libraries" was organized by DRTC and The British Library, Bangalore on March 03, 2004 at The British Library, Bangalore.

Seminar on "Digital Libraries" was organized by DRTC, on March 08, 2004 at ISI, Bangalore.

### *Workshops and Training Programmes*

Workshop on "Network Analysis with Applications to Social Sciences" was organized by SMU, Kolkata during November 24 – December 6, 2003 at ISI Kolkata.

Nurture Programme for the 1998 Indian National Mathematical Olympiad (INMO) batch, was organized by SMU, Bangalore in June 2003 at ISI, Bangalore.

Workshop on "Brownian Motion" was Organized by SMU, Bangalore during June 9-14, 2003 at SMU, Bangalore.

Pre-AMS Instructional Workshop was organized by SMU, Bangalore during December 11-16, 2004 at SMU, Bangalore.

Workshop on "Statistical Data Analysis using Computers" was organized by ASU, Kolkata during March 8-12, 2004 at Administrative Training Institute, Kohima.

Workshop on "Teaching of Computer Programming in Schools" was organized by ASU, Kolkata during March 15-27, 2004 at Computer Centre, Manipur University, Imphal.

Autumn School on "Information Technology : Emerging Research Issues" was organized by CVPRU during September 22-26, 2003 at North-Eastern Regional Institute of Science and Technology (NERIST), Itanagar, A.P.

School on "Computational Information Processing" was organized by ECSU during March 17-20, 2004 at Kohima Science College, Jotsoma, Nagaland.

Autumn School on "Pattern Recognition and Data Mining with Applications to Web & Biological data" was organized by MIU during September 23-27, 2003 at North Eastern Hill University (NEHU) at Shillong.

Spring School on "Data Mining and Bioinformatics: Recent Trends" was organized by MIU during March 22-26, 2004.

National School on "Non-linear Dynamics" was organized by Physics & Applied Mathematics Unit at ISI Kolkata during 21-27 December, 2003.

Workshop on "Quantitative Analysis of North East Indian Economy" was organized by ERU, Kolkata during March 08-13, 2004 at North Eastern Hill University, Shillong.

Workshop on "Second National Family Survey (NFHS-2) - Data Users" was organized by PSU, Indian Institute for Population Sciences, Mumbai and ORC Macro International, Washington D.C., USA during November 4-5, 2003 at ISI, Kolkata.

Workshop on "Techniques of Analysis of Demographic and Health Statistics and Application of Computer Softwares" was organized by PSU, Kolkata during January 20-30, 2004 at ISI, Kolkata.

Workshop on "Semantic Web" was organized by DRTC, Bangalore during December 8-10, 2003.

Workshop on "Library Consortia for Resource Sharing" was organized by DRTC, Bangalore on February 05, 2004.

Winter School on "Computer Programming" was organized by CSSC during October 13-23, 2003 at Department of Mathematics, Assam University, Silchar.

Workshop on "Statistical Data Analysis using SPSS" was organized by CSSC during March 23-27, 2004 at St. Anthony's College, Shillong.

## **Lectures and Seminars**

### **P.C. Mahalanobis Memorial Lectures**

During the year under review, Professor Ulf Grenander, Brown University, USA delivered the P.C. Mahalanobis Memorial Lectures at the Kolkata, Delhi and Bangalore Centres of the Institute on the following topics :

- i) Pattern of thought (January 27, 2004) at Kolkata.
- ii) Pattern theory : The Formative years (January 28, 2004) at Kolkata.
- iii) Towards a Theory of Natural Sciences (January 19, 2004) at Delhi.
- iv) Towards a Theory of Natural Sciences (January 30, 2004) at Bangalore.

The other Lectures/Seminars organized by the Institute and delivered by visiting scientists are listed below :

### **Theoretical Statistics and Mathematics Division**

#### ***Stat-Math Unit, Kolkata***

Aiyah, Michael, University of Edinburgh, U.K. (November 20, 2003) : Projective Planes, Spheres, Seven Varieties.

Balaji, V., Chennai Mathematical Institute (October 09, 2003): Principal Bundles on Riemann Surfaces.

Bandyopadhyay, Antar, University of California, Berkeley, USA (June 19, 2003): Recursive Distribution Equations and Associated Recursive Tree Processes.

Basak, Tathagata, University of California, Berkeley (August 11, 2003): Lattices and Reflection Groups.

Bhattacharjee, Debashis, Unit for Science Education, North-Eastern Hill University, Shillong (January 19, 2004): Some Rings of Arithmetic Functions

Bhattacharya, Alok, Jaharal Nehru University (February 04, 2004): Transposable Elements and their role in Genome.

Bose, Anjan, Washington State University, Pullman, Washington, USA (November 24, 2003): Reliability of the power grid or how to avoid blackouts.

Chaudhuri, Nirmalendu (December 08, 2003): Centre for Mathematics and its applications Australian National University Canberra, Australia.

Chaudhuri, Sanjay, University of Washington, Seattle (September 15, 2003): Estimation of the minimum mean of normal populations under the tree order restriction.

Chatterjee, Sourav, Stanford University, U.S.A. (September 08, 2003): Large dimensional random matrices.

Dasgupta, Nairanjana, Washington State University (January 21, 2004): Large and small sample methods for conducting many-to-one comparisons for logistic regression slopes.

Datta, Basudeb, Department of Mathematics, Indian Institute of Science, Bangalore (May 22, 2003): Combinatorial triangulations of homology spheres.

Demuth, Michael, Department of Mathematics, Technical University of Clausthal, Germany (February 12, 2004): Framework and Results in Stochastic Analysis.

Dhamadhikari, Avinash, Department of Statistics, Pune University (December 10, 2003): Estimation and construction of bounds in prototype testing.

Fienberg, Stephen, E., Carnegie Mellon University (December 31, 2003): In search of the Magic: The Truth About the Polygraph.

Fuller, Wayne, A., Iowa State University (January 01, 2004): Fractional Imputation.

Ghosal, Subhashis, North Carolina State University, Raleigh, USA (June 23, 2003): Bayesian nonparametric estimation of transition density and prediction in Markov Process.

Gore, A. P., Department of Statistics, University of Pune (April 30, 2003): Measurement of biodiversity in India.

Grenander, Ulf, Brown University, USA (January 27, 2004): Pattern of thoughts.

Grenander, Ulf, Brown University, USA (January 28, 2004): Pattern theory: The Formative years.

Guha, Aparim, Department of Statistics, University of California, Berkeley, California, USA (January 14, 2004): Employing mutual information in examining the association of time series and point processes.

Gurjar, R. V., TIFR (March 26, 2004):  $C_+$  -actions  $C^*$

Gurjar, R. V., School of Mathematics, TIFR, Mumbai (April 30, 2003): Variation of the local fundamental groups of a quotient.

Laskar, Renu, Clemson university, USA (December 23, 2003): Chessboard graphs and their parameters.

Majumdar, Mukul, Cornell University, USA (January 02, 2004): Splitting: Theory and Application to Intertemporal Allocation.

Marron, J. S., University of North Carolina, Chapel Hill and Statistical and Applied Mathematical sciences Institute (SAMSI) (March 15, 2004): Distance Weighted Discrimination & Geometrical Representation of High Dimension – Low Sample Size Data.

Mondal, Abhyuday, Department of Statistics, University of Michigan, Ann Arbor, USA (June 16, 2003): Bayesian Factor Screening and Response Surface Designs.

Nadkarni, M.G., Chennai Mathematics Institute (October 29, 2003): Did Cantor Sow the seed of Measure and Integral?

Nurmi, Tapio, Department of Mathematics, Statistics and Philosophy, University of Tampere, Finland (December 15, 2003): Mixed Models for the Analysis of Industrial Data.

Oja, Hannu, University of Jyväskylä, Finland (January 12, 2004): Affine Equivariant Multivariate Sign and Rank Methods.

Pensky, Marina, Department of Mathematics, University of Central Florida, Orlando (July 21, 2003): Frequentist assessment of Bayesian wavelet shrinkage rules.

Ray, Surajit, The Pennsylvania State University, USA (July 25, 2003): Distance-based Model-selection with Application to the Analysis of Gene Expression Data.

- Ray, Swagato, K., Department of Mathematics, IIT, Kanpur (December 11, 2003): On the completeness of small Translates of functions in  $L^p(\mathbb{R}^n)$ .
- Roy, Parthani, School of ORIE, Cornell University (January 22, 2004): Lyapunov Exponents for Random Logistic Maps.
- Sarkar, Jayaydeb, Department of Mathematics, IISC (February 09, 2004): Characteristic Function of a Pure Contractive Tuple.
- Sengupta, Jyoti, School of Mathematics, TIFR (March 11, 2004): Distinguishing Hecke eigenvalues of primitive cusp forms.
- Sengupta, Jyoti, School of Mathematics, TIFR (March 16, 2004): Spectral analysis on symmetric spaces
- Selthuraman, J., Florida State University (December 30, 2003): The Counts of  $k$  strings in Bernoulli sequences.
- Shastri, A. R., IIT, Mumbai (June 06, 2003): Matrix Varieties.
- Shastri, Parvati, Department of Mathematics, University of Mumbai (September 30, 2003): Integral points on the Unit sphere.
- Sunder, V. S., IMSc (March 26, 2004): Unitary invariants of tensors.
- Sunder, V. S., IMS, Chennai (April 29, 2003): A complete set of numerical invariants for a subsfactor.
- Varadhan, S. R. S., Courant Institute of Mathematics (February 26, 2004): Homogenization in periodic and random media.
- Stat-Math Unit, Delhi**
- Balasubramanian, R., Institute for Mathematical Sciences, Chennai ( February 24, 2004 ) : On the Birch-Swinnerton Dyer Conjecture.
- Bassan, Bruno, University of Roma (January 16, 2004) : Pricing Stocks and Options with Bayesian Games.
- Bhaya, Amit, Federal University of Rio de Janeiro (February 17, 2004) : Iterative methods as dynamical systems with feedback control.
- Borkar, V. Tata Institute of Fundamental Research, Mumbai, (September 03, 2003) : Neyman-Pearson reloaded.
- Dales, H. G., University of Leeds, United Kingdom (March 17, 2004) : Homological properties of modules over group algebras.
- Dani, S. G., Tata Institute of Fundamental Research, Mumbai, (September 01, 2003) : On some Diophantine inequalities with matrix argument.
- Fuñer, Wayne A., Iowa State University (January 22, 2004) : Fractional imputation.
- Gaubert, Stephane, INRIA, France (January 14, 2004) : Spectral Theory of Monotone Homogeneous Maps.
- Grenander, Ulf, Brown University (January 19, 2004) : PCM lectures on "Theory of Natural Scenes".
- Juneja, Sandeep, Tata Institute of Fundamental Research, Mumbai, (August 19, 2003) : Rare Event Simulation Methodologies : An Overview.

- Konno, Norio, Yokohama National University, Japan (January 30, 2004) : Quantum random walks and their related topics.
- Legas, Martinez, Universitat Autònoma de Barcelona, Spain (February 06, 2004) : Monotone operators representable by l. s. c. convex functions.
- Mehta Vikram, Tata Institute of Fundamental Research, Mumbai (March 25-26, 2004) : Complete Reducibility of  $GL(n)$  over  $C$  and Some Applications.
- Muliere Pietro, Istituto Metodi Quantitativi, Università L. Bocconi, Milano (January 07, 2004) : Inequality Measures and Equalizing Transfer.
- Muliere Pietro, Istituto Metodi Quantitativi, Università L. Bocconi, Milano, (January 12, 2004) : Predictive Inference in Bayesian Nonparametrics.
- Petrone Sonia, Istituto Metodi Quantitativi, Università L. Bocconi, Milano, (January 12, 2004) : Constructive Approximation of Distributions with Applications in Bayesian Nonparametrics.
- Raghunathan, M. S, Tata Institute of Fundamental Research, Mumbai (February 27, 2004) : The Atiyah-Singer Index Theorem.
- Rajput, Balaram S., The University of Tennessee, Knoxville, TN (December 24, 2003) : Isoperimetric Inequalities.
- Rammurthy, M, Kingston University, Canada, (January 09, 2004) : Ramanujan Graphs and Riemann Zeta Function.
- Schloumik, Dana, University of Montreal (January 28, 2004) : Geometry of polynomial vector fields.
- Seshan, Krishna, Intel Corporation (January 05, 2004) : Tools for Teaching Elementary Statistics.
- Sethuraman, Bharath, California State University, Northridge (February 04, 2004) : Some varieties arising from commuting matrices.
- Sridharan, R., Chennai Mathematical Institute, Chennai (September 19, 2003) : Tschirnhaus transformation and essential dimension.
- Sunder, V. S., Institute of Mathematical Sciences, Chennai, (April 28, 2003) : Complete family of numerical invariants for subfactors.
- Vanninathan, M., Tata Institute of Fundamental Research, Bangalore (March 31, 2004) : Viscosity Solutions in PDE.
- Stat-Math Unit, Bangalore***
- Aravinda, C.S., Chennai Mathematical Institute, Chennai (April 01-04, 2003) : Topological rigidity of non-positively curved manifolds II and Topological rigidity of non-positively curved manifolds III.
- Athreya, K.B., Cornell University and Iowa State University (June 26, 2003) : Harris irreducibility of iteration of random S-unimodal map.
- Athreya, K.B., Iowa State University & Cornell University, USA (January 12, 2004) : Harris irreducibility of random logistic maps.
- Datta, Basudeb, Indian Institute of Science, Bangalore (April 10, 2003) : 10-vertex 4-sphere is standard.
- Dey, Rukmini, Harish-Chandra Research Institute, Allahabad (June 19, 2003) : A dimensional reduction of the Seiberg-Witten equations and geometric quantization

Evans, L.C., University of California, USA (July 30, 2003) : Linear programming and Hamiltonian dynamics.

Godefroy, G., University of Paris VI (November 20, 2003) : Lipschitz isomorphisms between Banach spaces.

Grenander, Ulf, Brown University (January 30, 2004) : PCM lectures – Theory of Natural Scenes.

Holla, Yogish, TIFR, Mumbai (July 24, 2003) : Topological type of a principal bundle over a curve.

Krishnaswami Alladi, University of Florida, Gainesville (August 05, 2003) : Applications of the sieve to probabilistic number theory.

Kulkarni, S.H., Indian Institute of Technology, Chennai (May 29, 2003) : Uniform norms on real algebras.

Lafon, Guillaume, Ecole Normale Supérieure, Paris (January 19, 2004) : An Enriques surface without rational points on  $\mathbb{C}(t)$ .

Morgan, J.P. Virginia Tech (November 14, 2003) : Orthogonal partitions and the analysis of variance.

Nayak, Suresh, Chennai Mathematical Institute, Chennai (April 23, 28, 29, 2003) : Gothendieck duality and derived categories.

Paranjape, Kapil, Institute of Mathematical Sciences, Chennai (September 05, 2003) : Geometric characterization of Arithmetic varieties

Patil, D.P., Indian Institute of Science, Bangalore (May 08, 2003) : Regular sequences.

Raghavan, T.E.S., University of Illinois at Chicago (January 05, 2004) : On Stochastic games with perfect information

Raghuram, A., University of Iowa, USA (January 09, 2004) : Quadratic reciprocity and  $GL_2$

Rao, S.E., TIFR, Mumbai (September 15, 2003) : Irreducible representations of Toroidal Lie Algebras.

Sarkar, Jaydeb, Indian Institute of Science, Bangalore (January 22, 2003) : Characteristic Functions for pure commuting tuples.

Schurmann, Michael, Ernst-Moritz-Arndt-Universität, Germany (February 12, 2004) : Non-commutative independence and quantum levy processes.

Sethuraman, Bharath, California State University, USA (March 05, 2003) : Valuation theory of division algebras.

Steide, Michael, Università Degli Studi Del Molise, Italy (July 23- September 14, 2003) : Lecture series on Hilbert modules.

Subramanian, Jayasree, ICFAI, Bangalore (September 15, 2003) : Gender and Science Institutions : a case study of research institutions in Bangalore.

Sunder, V.S., Institute of Mathematical Sciences, Chennai (December 24, 2003) : Unitary invariants for tensors.

Tewari, U.B., Indian Institute of Technology, Kanpur (February 09- April 15, 2004) : Topics in Fourier Analysis

Vidyashankar, Anand, University of Georgia, USA (July 29, 2003) : Population evolution under conditioning.

Vijayan, K., University of Western Australia, Australia (January 7-8, 2004) : An application of design of experiments ideas in petroleum production and an easy method of constructing a pair of Orthogonal latin square of a given order.

Voll, Christopher, Mathematical Institute, Oxford, UK (December 05, 2003) : Zeta functions of groups.

## Applied Statistics Division

### *Applied Statistics Unit*

Banerjee, Asit K., E.I. duPont de Nemours & Company Inc. Wilmington, DE, USA (March 03, 2004) : Statistics and Neural Networks

Mitra, Sujini, Department of Statistics, Carnegie Mellon University (February 17, 2004) : Biometric Authentication: A Statistical Perspective.

Roy, Parthaniil, Cornell University, USA (January 15, 2004) : Random Dynamical Systems.

Sarkar, Jyotirmoy, Indiana University Purdue University Indianapolis (9 December 09, 2003) : Proportional Hazards model with Random Proportionality Multiplier.

Sen, Anindya, University of Chicago, USA (January 20, 2004) : Understanding Price Fluctuations in Financial Markets.

Sharma, Ravendra Kumar, Johns Hopkins Center for Research on Neonates, Lucknow (February 27, 2004) : Parental Value of Children in an Agricultural Society in Uttar Pradesh.

## Computer and Communication Sciences Division

### *Advanced Computing and Microelectronics Unit*

Basu, S.K., Banaras Hindu University (June 25, 2003) : A Native Genetic Approach to Non-stationary Optimization.

Bhowmick, Partha, B. E. College (September 19, 2003) : Different Properties of and Algorithms on Digital Straight Lines.

Dasgupta, Parthasarathi, IIS, IITM Kolkata (September 5, 2003) : A Novel Metric for Interconnect Architecture Performance.

Deo, N., University of Central Florida, USA (March 17, 2004) : Graph-theoretic Structure of the World Wide Web.

Goswami, Partha P., Calcutta University (November 28, 2003) : Efficient k-Nearest Neighbors Searching Algorithms for Query Line and Line Segment.

Iyengar, S.S., Louisiana State University (July 10, 2003) : Computational Aspects of Distributed Sensor Networks.

Jana, Prasanta Kumar, Indian School of Mines, Dhanbad (June 10, 2003) : Some New Parallel Algorithms on OTIS Mesh.

Kundu, Sandip, Intel Corporation, USA (January 22, 2004) : Analysis of Power Supply Grid of Microprocessors.

Lakshminpathi, S., Intel Corporation of India, Bangalore (January 9, 2004) : Usage Models for Core Components of Wireless Networks.

Mitra, Pinaki, National Institute of Management, Calcutta (July 04, 2003) : A Simple Randomized Algorithm to Compute the Generator of the Group  $(z_k, x_p)$ .

Mukhopadhyaya, Ashis, University of Windsor, Canada (June 08, 2003) : Encoding Quadrilateral Meshes.

Pal, Sudabkumar Prasant, Indian Institute of Technology, Kharagpur (June 09, 2003) : Creating and Applying Multi-partite Quantum Entanglement for Distributed Problem Solving.

Rao, S.V., Indian Institute of Technology, Guwahati (June 07, 2003) : Computing the Closest Point to a Ring.

Ray, Rahul, Max Planck Institute, Germany (December 19, 2003) : Translating a Planar Object to Maximize Point Containment and a Related Problem of Finding Planarity in Terrains.

Sen, Arunabha, Arizona State University, USA (December 29, 2003) : Survivable Routing in Optical Networks.

Simani, Pradip K., Clemson University, USA (December 24, 2003) : Self-stabilizing Distributed Algorithm for Strong Matching.

Zachariah, Sujit, Intel India Development Center, Bangalore (September 12, 2003) : Layout Analysis for Test: An Enabler for Accurate Realistic Fault Modeling.

#### ***Computer Vision and Pattern Recognition Unit***

Bhattacharya, Pushpak, Dept. of Computer Science and Engineering, IIT, Mumbai (May 28, 2003) : Natural Language Processing in a Multilingual Context.

#### ***Electronics and Communication Sciences Unit***

Bagchi, Subhas C., Dept. of Statistics, University of West Florida, USA (August 01, 2003) : Breast Cancer Detection using Rank Network Neighbor Classification Rules.

Ghatak, Shubhandu, TCS India (March 15, 2004) : Earned Value Project Management.

Ray, Nilanjan, School of Electrical & Computer Engineering, University of Virginia, USA (February 13, 2004) : Tracking Rolling Leukocytes from Intravital Microscopic Video Imagery.

#### ***Machine Intelligence Unit***

Mitra, Debasish, Dept. of Computer Science, Florida Institute of Technology, USA (December 18, 2003) : Digital Signal Processing in Predicting Secondary Structures of Proteins.

### **Physics and Earth Sciences Division**

#### ***Geological Studies Unit***

Basu, Asish R., Dept. of Earth Sciences, University of Rochester, USA (January 13, 2004) : Geochemical and petrological evidence for subduction – accretion process in the Archean eastern India.

Roy Choudhury, Kingahuk, Statistica Dept., UCC, Cork, Ireland (December 17, 2003) : Automated Grain Boundary Detection by CASRG.

*Physics and Applied Mathematics Unit*

Ahmed, Zafar, Nuclear Physics Department, Bhabha Atomic Research Centre, Trombay, Mumbai (September 01, 2003) : Gaussian Pseudo-unitary Ensembles of Pseudo-Hermitian.

Bhattacharjee, Somendra M., Institute of Physics, Bhubaneswar (January 15, 2003) : Unzipping DNA by Force.

Bhattacharyya, P.K., Department of Mathematics, IIT, Delhi, (August 20, 27 and September 3, 2003) : Finite Element Method for Boundary Value Problems.

Chakrabarti, A., Department of Mathematics, Indian Institute of Science, Bangalore (May 21, 2003) : On Trapped Modes in Surface Water Wave Problems.

Chakrabarti, A., Department of Mathematics, Indian Institute of Science, Bangalore (February 20, 2004) : On Three-Part Wiener Hopf Problems.

Ghosh, Sankalpa, Technion University, Israel (September 18, 2003) : Vortices in Bose-Einstein Condensate.

Ghosh, Sibasish, Institute of Mathematical Sciences, Chennai (October 08, 2003) : Bound Entangled States and their Applications in Quantum Information Theory.

Hossain, MD. Anwar, Department of Mathematics, University of Dhaka, Bangladesh (May 12, 2003) :

Jayaraman, Girija, Center for Atmospheric Sciences, IIT, Delhi (May 20, 2003) : Numerical simulation of secondary flow in a constricted curved annulus : an application to flow in a catheterized artery.

Khare, A., Institute of Physics, Bhubaneswar (April 30, 2003) : New identities for Jacobi Elliptic and Related Functions.

Martin Francis Lambert, Department of Civil & Environmental Engineering, University of Adelaide, Australia (January 30, 2003) : Inverse Transients, Morphology and Hidden Markov Modelling for Climate Persistence.

Martin, Oberlack, Technical University Darmstadt, Germany (December 18, 2003) : Turbulent Diffusion - a Symmetry Approach.

Patil, Arun Kumar, Institute of Physics, Bhubaneswar (May 13, 2003) : Quantum Mechanical Universal Constructor.

Ray, Rajarshi, Department of Theoretical Physics, TIFR, Mumbai (March 05, 2004) : Looking for False Vacuum Bubble in Heavy Ion Collisions.

Roy, Anirban, Institute of Mathematical Sciences, Chennai (October 29, 2003) : Probabilistic Cloning and No-signalling.

Rudraiah, N., Bangalore University, Bangalore (February 13, 2004) : Nano Structure and Smart Materials.

Sanyal, R., Indian Institute of Information Technology, Allahabad (May 08, 2003) : Quantum Computation - A new way of computation.

Sanyal, R., Indian Institute of Information Technology, Allahabad (May 13, 2003) : Quantum Algorithm & Emulator for Quantum Computer.

## **Biological Sciences Division**

### ***Agricultural Sciences Unit***

Roben, Spooner-Hart, Centre for Horticulture & Plant Sciences, University of Western Sydney, Australia ((December 17, 2003) : Natural Alternatives to pesticides originating from Australian flora.

Sanyal, Saroj Kumar, Dept of Agricultural Chemistry and Soil Science, Bidhan Chandra Krishi Viswa Vidyalaya (March 17, 2004) : Arsenic contamination in ground water in the Bengal Delta Region : Implications in Agricultural System.

Vassilios Sarafis, School of Life Sciences, University of Queensland, Australia ( December 30, 2003) : Advances in Plant imaging.

### ***Anthropology and Human Genetics Unit***

Dey, S.K., Eastern Illinois University, Charleston, USA (December 22, 2003) : Mathematical Analysis of Cancer treatment.

## **Social Sciences Division**

### ***Economic Research Unit***

Chakrabarty, Debjyoti, University of Sydney, Australia (March 18, 2004) : Poverty Trap and Growth in a Model of Endogenous Time Preference.

Chakraborty, Kalyan, Emporia State University, USA (January 02, 2004) : Consumers' Willingness to Pay for Hormone Free Milk and the Economic Value of Milk Market Segmentation.

Chaudhuri, Ananish, University of Auckland, New Zealand (March 04, 2004) : Evolution of Conventions in an Inter-generational Public Goods Game with Private and Public Knowledge of Advice.

Dasgupta, Indraneel, University of Nottingham, UK (January 05, 2004) : Cheap Money, Informalization and Enforcement.

Fields, Gary, Cornell University, USA (January 09, 2004) : Economic Mobility Really Is Multifaceted.

Ghatak, Maitreesh, London School of Economics, UK (September 18, 2003) : Competition and incentives with Motivated Agents.

Ghosh, Arghya, University of New South Wales, Sydney, Australia (March 25, 2004) : Political Economy of Infrastructure : A Spatial Approach.

Ghosh, Sugata, Cardiff Business School, Cardiff University, UK (May 22, 003) : Debt, Growth and Budgetary Regimes.

Lawrence, Pater, Department of Economics, Keele University, UK (June 26, 2003) : Financial Liberalization and Household Behavior in India : Some Preliminary Results.

Marjit, Sugata, Centre for Studies in Social Science, Kolkata (August 28, 2003) : Development Theory: A Few Questions (unnayan tatta samparke koyektal prashna).

Mukherjee, Arijit, University of Nottingham, UK, (December 18, 2003) : Incentive of Foreign Investment : Trade Cost or Cheap Labour.

Ray, Indrajit, The University of Birmingham, U.K (April 17, 2003) : Inconsistent Players.

Ray, Subhash C., University of Connecticut (March 4, 2004) : Does the Presence of Surplus Labor Hinder Production in Indian Manufacturing?

Sengupta, Ramprasad, Jawaharlal Nehru University, New Delhi : Socio – Economic Impact of the Four Laning of National Highway 2.

#### *Economic Analysis Unit*

Aziz, Abdul, ISEC, Bangalore (October, 2003) : Liberalization and economic Reforms.

Kadekodi, Gopal, University of Madras (November 2003) : Environmental Economics.

Krishna K.L., ICRIER, New Delhi (August 2003) : Econometrics of Inventory Analysis.

Vithal, Indian Institute of Plantation Management, Bangalore (November 2003) : Financial Markets.

#### *Planning Unit*

Athreya, Kartik, Federal Reserve Bank of Richmond (November 14, 2003) : Personal bankruptcy or public insurance?

Bhalla, Surjeet, Oxus Research (March 12, 2004) : Misconceptions about pro-poor growth.

Bhattacharya, Anindya, The University of York, UK (December 12, 2003) : Dutta-Jackson-Le Breton equilibria as solution for farsighted stability of bilateral networks.

Chakraborty, Rajesh, Georgia Institute of Technology (August 12, 2003) : Compensation, Inequality and Corruption.

Chanda, Areendam, North Carolina State University (August 05, 2003) : Dual economies and International TFP differences.

Das, Mausumi, Delhi School of Economics, (September 26, 2003) : Mortality, Human Persistent Inequality.

Dutta, Bhaskar, University of Warwick (September 12, 2003) : Farsighted Network Formation.

Fukumi, Atsushi, Kobe university (November 28, 2003) : Social divisions, Fiscal policy and Economic growth : an empirical study with state wise data in India.

Gravel, Nicolas, GREQAM-IDEF and Université de la Méditerranée (Ab-Merdor II) (February 13, 2004) : Does endogenous formation of Jurisdictions lead to wealth stratification?

Gupta, Shreekant, Delhi School of Economics (March 05, 2004) : Resource use efficiency of US electricity generating plants during the SO<sub>2</sub> trading regime : A distance function approach.

Johri, Alok, McMaster University, (March 11, 2004) : Learning-by-doing and endogenous price stickness.

Kar, Anirban, India Development Foundation (October 31, 2003) : Allocating multiple estimates among agents with single peaked preferences.

Krishna Vijay, Pennsylvania State University (August 01, 2003) : Eliciting information from experts.

Lalond, Matthieu, Ecole normale superieure (March 19, 2004) : Degree and index in evolutionary game theory.

Mitra, Siddhartha, NCAER, (July 25, 2003) : Controlling in formalization : Punitive vs. strategic measures.

Mookherjee, Dilip, Boston University (January 06, 2004) : Pro-poor targeting and accountability of local governments in West Bengal.

Putterman, Louis, Brown University (January 16, 2004) : Experiments on cooperation, punishment and heterogeneous societies.

Roy, Joydeep, Leon Kozminski Academy, Warsaw (August 08, 2003) : Price Fellowship.

Roy, Santanu, Southern Methodist University (December 10, 2003) : The economics of controlling a biological invasion.

Seshan, Krishan, Intel Corporation (January 05, 2004) : Tools for teaching elementary statistics.

Sethi, Rajiv, Columbia University, (March 15, 2004) : Statistical discrimination with neighbourhood effects : can integration eliminate negative stereotypes?

Tadeusz, Tyszka, Polish Academy of Science and Centre of Market Psychology Lkaem Warsaw (February 17, 2004) : Psychological challenges to standard utility theory.

Tadeusz, Tyszka, Polish Academy of Science and Centre of Market Psychology Lkaem Warsaw (February 19, 2004) : Perception of randomness and predicting uncertain events.

Weber, Shlomo, Southern Methodist University (February 05, 2004) : The Rawlsian principle and secession-proofness in large heterogeneous societies.

### *Sociological Research Unit*

Bandyopadhyay, Anjali, Mc Gill University, Montreal and SAMATA, Hyderabad (December 19, 2003) : Women in mining.

Gupta, Dipankar, JNU, New Delhi (December 05, 2003) : Vanishing Village.

Ray, Prasanta, (October 28, 2003) : Need for triangulation of quantitative and qualitative methods in Sociology.

### **SQC & OR Division**

Ali, Eshragh Jahromi, Industrial Engineering Dept., Sharif University of Technology, Iran (March 12, 2004) : A New Approach to Distribution Fitting : Decision on Beliefs in Response Surface Methodology [Part 2].

Martínez-Legas, Universitat Autònoma de Barcelona, Spain (February 06, 2004) : Monotone operators representable by l.s.c. convex functions.

### ***Documentation Research and Training Centre***

David, Kohn, University of Cincinnati, Cincinnati, OH 45244 (February 09, 2004) : The University of Cincinnati Digital Press: An Experiment in Creative Problem Solving.

Lewisson, Grant, Centre for Information Behaviour and the Evaluation of Research (Cyber), City University, London EC1V0HB (September 05, 2003) : The Long Road to Health: Steps in the Evaluation of a Country's Biomedical research Portfolio.

Murthy, Narayana, Dept. of Computer & Information Science, University of Hyderabad, Hyderabad (January 13 & 14, 2004) : (i) Demos on Kannada Morphological Analyzer, English to Kannada Translation, Telegu Morphological Analyzer, (ii) Inside a Search Engine and Syntactic Analyse and research Discussion on Morphological Analysis in Indian Languages (January 21&22, 2004).

Rath, Durga Shankar, Rabindra Bharathi University, Kolkata (May 21, 2003) : Relevance of Artificial Intelligence (AI) in Library and Information science, (May 22, 2003) : Application of AI for Automatic Cataloguing

Shepherd, Michael, Faculty of Computer Science, Dalhousie University, Canada B3H 1W5 (December 03, 2003) : Architecture of Dynamic Aggregation and Reuse of learning object.

Watters, Carolyn, Faculty of Computer Science, Dalhousie University, Canada B3H 1W5 (December 05, 2003) : Term Frequency for Information Retrieval.

## 6. Publication of Sankhya

The internationally renowned Journal Sankhya was founded by P. C. Mahalanobis in 1933 and began publication under his editorship. From 2003, Sankhya is published in one combined series, four times a year in February, May, August and November. The recent issues of the journal are available on the website <http://sankhya.iscal.ac.in>. The website also has other features such as searching and online submission.

Journal Committee as on March 31, 2004

*Editors:* Arup Bose, Aloke Dey and B.V.Rao

*Technical Editor:* Debasis Sengupta

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The following issues have been published during April 2003 to March 2004:

May 2003	:	Volume 65	Part 2
August 2003	:	Volume 65	Part 3
November 2003:		Volume 65	Part 4
February 2004 :		Volume 66	Part 1 (in press)

## 7. SCIENTIFIC PAPERS AND PUBLICATIONS

### Books Published

#### Theoretical Statistics and Mathematics Division

##### *Stat-Math Unit, Kolkata*

Mukherjee, K.K. : *Differential Calculus in Normed Linear Spaces*, Hindustan Book Agency.

##### *Stat-Math Unit, Delhi*

Bhunia, R. (ed.) : *Connected at Infinity*, Hindustan Book Agency, New Delhi, 2003.

##### *Stat-Math Unit, Bangalore*

Sury, B. : *Group theory - selected problems*, Universities Press, Hyderabad, pp. 190, 2004.

Thangavelu, S. : *Wavelets and their applications*, Allied Publishers Pvt. Ltd., Chennai, pp.296, 2003.

Thangavelu, S. : *An introduction to the uncertainty principle: Hardy's theorem on Lie groups*, Birkhauser, Boston, pp.174, 2004.

#### Computer and Communication Sciences Division

##### *Electronics and Communication Sciences Unit*

Mukherjee, D.P. and Pal, S. (eds.) : *Advances in Pattern Recognition, ISBN: 81-7764-532-3*, Allied Publishers, New Delhi, India, 524, 2003.

##### *Machine Intelligence Unit*

Mitra, S. and Acharya, T. : *Data Mining*, John Wiley, New York, 397, 2003.

Pal, S.K., Polkowski, L. and Skowron, A. (eds.) : *Rough-Neural Computing: Techniques for IIR Computing with Words*, Springer, Berlin, 734, 2004.

Pal, S.K. and Shilu Simon C.K. : *Foundations of Soft Case - Based Reasoning*, John Wiley, New Jersey, USA, 274, 2004.

#### Biological Sciences Division

##### *Anthropology and Human Genetics Unit*

Adak, D.K., Bhattacharya, B.N., Ghosh, R., Pal, M., Bharati, P. and Vasulu, T.S. : *Demography and Health Profiles of the Tribals (A study of M.P.)*, Anmol Publications, New Delhi, 2003.

#### Social Sciences Division

##### *Economic Research Unit*

Chattopadhyay, K. and Mitra, A. : *Environment and Nature-Based Tourism, An Environment and Sustainability*, Kanishka Publishers, New Delhi, 102, 2003.

Pai, M., Adak, D.K., Bhattacharya, D.N., Ghosh, R., Bharati, P. and Vasuku, T.S. : *Demography and Health Profile of the Tribals: A Study of M.P.*, Anmol Publications Pvt. Ltd., 2003.

#### **Sociological Research Unit**

Chatterjee, Anun K. : *Social Network Approach*, Classique Books, Kolkata, 2004.

Ramachandran, V.K. and Madhura Swaminathan (eds.) : *Agrarian Studies : Essays on Agrarian Relations in Less Developed Countries*, Zed Press Spring, London, 2003.

### **Papers Published in Journals**

#### **Theoretical Statistics and Mathematics Division**

##### **Stat-Math Unit, Kolkata**

Bandyopadhyay, P. and Dutta, S. : Almost constrained subspaces of Banach spaces, *Proc. Amer. Math. Soc.*, 132, 107-115, 2004.

Bandyopadhyay, P., Basu, S., Dutta S. and Lin, B.L. : Very non-constrained subspaces of Banach spaces, *Extracta Math.*, 18, 161-185, 2003.

Bandyopadhyay, P., Jarosz, K. and Rao, T.S.S.R.K. : Unitaries in Banach spaces, *Illinois J. Math.*, 48, 339-351, 2004.

Bandyopadhyay, P. and Roy, A.K. : Nested sequence of balls, uniqueness of Hahn-banach extensions and the Vlasov property, *Rocky Mountain Journal of Mathematics*, 33, 27-67, 2003.

Basu, S., Burma, D.P., Chaudhuri, P. : Words in DNA sequences : some case studies based on their frequency statistics, *Journal of Mathematical Biology*, 46, 479-503, 2003.

Bose, A. and Chatterjee, S. : Generalised bootstrap for estimators of minimisers of convex functionals, *Journal of Statistical Planning and Inference*, 11, 225-239, 2003.

Bose, A., Gangopadhyay, S., Sarkar, A. and Sengupta, A. : Convergence of lower records and infinite divisibility, *Journal of Applied Probability*, 40, 1-16, 2003.

Bose, A. and Mukherjee, K. : Estimation of the ARCH parameters by solving linear equations, *Journal of Time Series Analysis*, 24, 127-136, 2003.

Bose, A., Sarkar, A. and Sengupta A. : Infinite product of records, *Journal of Applied Statistical Sciences*, 12, 1-10, 2003.

Bose, A. and Sengupta, D. : Strong consistency of minimum contrast estimators, *Sankhya*, 65, 440-463, 2003.

Chandra T.K. and Goswami, A. : Cesaro alpha-Integrability and Laws of large numbers I, *Journal of Theoretical Probability*, 16, 655-669, 2003.

Datta, M. : Connections with prescribed first Pontrjagin form, *Trans. Amer. Math. Soc.*, 355, 3813-3824, 2003.

Ghosh, A.K. and Chaudhuri, P. : Optimal smoothing in Kernel discriminant analysis, *Statistica Sinica*, 14, 457-483, 2004.

- Ghosh, J.K., Amewou Atisso, M., Ghosal, S., and Ramamoorthi, R.V. : Posterior consistency for semiparametric regression problems, *Bernoulli*, 9, 291-312, 2003.
- Ghosh, J.K., Chaudhury, A., Bose, M. : An application of adaptive sampling to estimate highly localized population segments, *Journal of Statistical Planning and Inference*, 121, 175-189, 2004.
- Ghosh, J.K., Basu, R. and Mukherjee, R. : Empirical Bayes prediction intervals in a normal regression model: higher order asymptotics, *Statistics and Probability Letters*, 63, 197-203, 2003.
- Goswami, A. : Random continued fractions : A Markov chain approach, *Economic Theory*, 23, 85-105, 2004.
- Goswami, D. and Kuku, A.O. : A complete formulation of Baum Connes Conjecture for discrete quantum groups, *K Theory*, 30, 341-363, 2003.
- Rao, T.J.: Statistics during early days in developing countries with special reference to India, *Bull. Int. Stat. Inst.*, 25-25, 2003.
- Rao, T.J., Sinha, B. K. and Srivenkataramana, T. : On order relations between selection probabilities in RHC sampling scheme, *Journal of Appl. Statist. Sci*, 12, 67-73, 2003.
- Singh, T. and Acharya, M. : Graceful signed graphs:III, the case of signed cycle in which negative sections form a maximum matching, *Graph Theory Notes, New York*, 45, 11-15, 2003.
- Sarkar, R.P., Mohanty, P., Ray, S.K. and Sitaram, A. : The Helgason-Fourier transform for symmetric spaces. II, *Journal of Lie Theory*, 14, 227-242, 2004.
- Sinha, B.K. and Hedayat, A.S. : On a sampling design for estimation of negligible accident rates involving electronic toys, *Amer. Statist.*, 57, 249-252, 2003.
- Sinha, B.K., Das, K. and Mandal, N.K. : Optimal experimental designs for models with covariates, *Journal of Statist. Plann. Inference*, 115, 273-285, 2003.
- Sinha, B.K. and Shah, K.R. : On some aspects of data integration techniques with environmental applications, *Environmetrics*, 14, 409-416, 2003.
- Stat-Math Unit, Delhi**
- Alabert, A., Farre, M. and Roy, R. : Exit times from equilateral triangles, *Applied Mathematics and Optimization*, 49, 43-53, 2004.
- Athreya, S., Roy, R. and Sarkar, A. : On the coverage of space by random sets, *Advances in Applied Probability*, 36, 1-18, 2004.
- Bapat, R.B. : Perron eigenvector of the Tsellin matrix, *Linear Algebra and Its Applications*, 363, 3-16, 2003.
- Bapat, R.B., Gutman, Ivan and Xiao, Wenjun : A simple method for computing resistance distance. *Zeitschrift für Naturforschung*, 58a, 494-498, 2003.
- Bapat, R.B., Jain, S.K. and Tynan, John : Decomposition of generalized polynomial symmetric matrices, *Linear Algebra and Its Applications*, 376, 69-83, 2004.
- Bapat, R.B. : Resistance matrix of a weighted graph, *Commun. Math. Comput. Chem.* 50, 73-82, 2004

- Barmi, H., Kochar, S., Mukerjee, H. and Samanlego, F. : Estimation of cumulative incidence functions in competing risks studies under an order restriction, *Journal of Statistical Planning and Inference*, 118, 145-165, 2004.
- Bhatia, R. and Zhan, X. : Norm Inequalities for operators with positive real part, *Journal of Operator Theory*, 50, 67-76, 2003.
- Bhatia, R. and Eisner, L. : Higher order logarithmic derivatives of matrices, *SIAM Journal on Matrix Analysis*, 25, 662-668, 2003.
- Bhatia, R. : Partial traces and entropy inequalities, *Linear Algebra and Its Applications*, 370, 125-132, 2003.
- Bhatia, R. : On the exponential metric increasing property, *Linear Algebra and Its Applications*, 375, 211-220, 2003.
- Bhatt, Abhay G. and Karandikar, R.L. : Martingale problems and path properties of solutions, *Sankhya*, 65, 733-743, 2003.
- Bhatt, Abhay G. and Roy, R. : On random minimal directed spanning trees, *Advances in Applied Probability*, 36, 19-42, 2004.
- Bose, M. and Dey, A. : Some small and efficient cross-over designs under a non-additive model, *Utilitas Mathematica*, 63, 173-182, 2003.
- Bose, A., Gangopadhyay, S., Sarkar, A. and Sengupta, A. : Convergence of lower records and infinite divisibility, *Journal of Applied Probability*, 40, 865-880, 2003.
- Bose, A., Sarkar, A. and Sengupta, A. : Infinite product of records, *Journal of Applied Statistical Science*, 2003.
- Chai, F.S., Das, A. and Dey, A. : Block designs for symmetric parallel line assays with block size odd, *Sankhya*, 65, 689-703, 2003.
- Das, A. and Ghosh, H. : Optimal diallel cross designs for estimation of heritability, *Journal of Statistical Planning and Inference*, 116, 185-196, 2003.
- Das, A., Gupta, V.K. and Prasad, R. : Variance balanced block designs with unequal block sizes, *Utilitas Mathematica*, 64, 183-192, 2003.
- Das, A. : Efficient control-test designs for diallel cross experiments, *Sankhya*, 65, 671-688, 2003.
- Das, A., Sinha, K., Kageyama, S. and Saha, G.M. : Some series of block designs with nested rows and columns, *Australas. Jour. Combin.*, 29, 337-347, 2004.
- Das, A. and Ghosh, H. : Optimal diallel cross designs for interval estimation of heredity, *Statist. Probab. Letters*, 67, 47-55, 2004.
- Das, A., Dey, A. and Midha, C.K. : On a property of orthogonal arrays and optimal blocking of fractional factorial plans, *Metrika*, 57, 127-135, 2003.
- Das, A. and Dey, A. : Designs for diallel cross experiments with specific combining abilities, *Journal of the Indian Society of Agricultural Statistics* (Invited paper, Special issue in honour of Prem Narain) 57, 247-256, 2004.

Dewan, I., Deshpande J.V. and Kulathinal, S.B. : On testing dependence between time to failure and cause of failure via conditional probabilities, *Scandinavian Journal of Statistics*, 31, 79-92, 2004.

Fontes, L.R., Machado, F. and Sarkar, A. :  $\rho_s(G)$  for the frog model is not a monotonic function of  $G$ , *Journal of Applied Probability*, 41, 292-298, 2004.

Pal, A. and Chakraborty, P.S. : Spectral triples and associated Connes-de Rham complex for the quantum  $U(2)$  and the quantum sphere, *Commun. Math. Phys.*, 240, 447-456, 2003.

Pal, A. and Chakraborty, P.S. : Equivariant spectral triples on the quantum  $SU(2)$  group, *K-Theory*, 26, 107-126, 2003.

Rao, B.L.S.P. and Dewan, Isha : Mann-Whitney test for associated sequences, *Ann. Inst. Statist. Math.*, 55, 111-119, 2003.

Rao, B.L.S.P. : Moment inequalities for supremum of empirical process for  $\alpha$ -mixing sequences, *Commun. Stat. Theory and Methods*, 32, 1695-1701, 2003.

Rao, B.L.S.P. : Parametric estimation for linear stochastic differential equations driven by fractional Brownian motion, *Random Operators and Stochastic Equations*, 11, 229-242, 2003.

Rao, B.L.S.P. : Estimation of cusp in nonregular nonlinear regression models, *Journal of Multivariate Anal.*, 88, 243-251, 2004.

Rao, B.L.S.P. : On some inequalities for  $N$ -demimartingales, *Journal of Ind. Soc. Ag. Statistics*, 57, 208-216, 2004.

Rao, B.L.S.P. : Sequential estimation for fractional Ornstein-Uhlenbeck type process, *Sequential Analysis*, 23, 33-44, 2004.

Suen, C. and Dey, A. : Construction of asymmetric orthogonal arrays through finite geometries, *Journal of Statistical Planning and Inference*, 115, 623-635, 2003.

Zheng, Bing and Bapat, R.B. : Characterization of generalized inverses by a rank equation, *Applied Mathematics and Computation*, 151, 53-67, 2004.

#### **Stat-Math Unit, Bangalore**

Bandyopadhyay, P., Krzysztof, Jarosz and Rao, T.S.S.R.K. : Unitaries in Banach spaces, *Annals Journal of Math*, 48, 339-351, 2004.

Dutta, S. and Rao, T.S.S.R.K. : On weak\*-extreme points in Banach spaces, *J.Convex Anal.*, 10, 531-539, 2003.

Raja, C.R.E. : Krangel-Lin decomposition for probability measures on hypergroups, *Bull. Sci. Math.*, 127, 283-291, 2003.

Raja, C.R.E. : Absolute continuity of autophage measures on finite-dimensional vector spaces, *Math. Nachr.*, 263-264, 198-203, 2004.

Raja, C.R.E. : Ergodic amenable actions of algebraic groups, *Glasgow Mathematical Journal*, 46, 97-100, 2004.

Rajarama Bhat, B.V., Bhattacharyya, T. and Dey, S. : Standard non-commuting and commuting dilations of commuting tuples, *Transactions of the American Mathematical Society*, 356, 1551-1566, 2004.

Rajeev, B. and Thangavelu, S. : Probabilistic representations of solutions to the heat equation, *Proc. Indian Acad. Sci.*, 113, 321-332, 2003.

Rao, T.S.S.R.K. : Proximinal subspaces of  $A(K)$  of finite codimension, *International Journal of Math. Math. Sci.*, 39, 2501-2506, 2003.

Smitha, C. and Thangavelu, S. : On Strichartz uncertainty principle for the Heisenberg group, *Tohoku Math. Journal*, 55, 451-466, 2003.

Thangavelu, S. : Paley-Wiener and Hardy theorems for NA groups, *Math. Z.*, 245, 483-502, 2003.

## Applied Statistics Division

### *Applied Statistics Unit*

Angers, J.F. and Biswas, A. : A Bayesian analysis of the four year follow up data of the Wisconsin epidemiologic study of diabetic retinopathy, *Statistics in Medicine*, 23, 601-615, 2004.

Bandyopadhyay, U. and Biswas, A. : Randomized allocation procedure for testing a normal mean with known variance, *Journal of Statistical Planning and Inference*, 121, 215-229, 2004.

Bandyopadhyay, U. and Biswas, A. : Interval estimation in adaptive allocations using point estimates, *Calcutta Statistical Association Bulletin*, 54, 31-44, 2003.

Bandyopadhyay, U., Das, R. and Biswas, A. : Fixed width confidence interval for  $P(X < Y)$  in a partial sequential sampling scheme, *Sequential Analysis*, 22, 75-93, 2003.

Bandyopadhyay, Subhadip and Bandyopadhyay, Shibdas : Choosing better training sample for classifying an individual into one of two correlated normal populations, *Calcutta Statistical Association Bulletin*, 54, 167-179, 2003.

Basu, A. and Lindsay, B.G.: The iteratively reweighted estimating equation in minimum distance problems, *Computational Statistics and Data Analysis*, 45, 105-124, 2004.

Basu, T., Datta, A., Dewanji, A., Ganguly, K.S., Matai, S., Samanta, T., Sarkar, M., Tapaswi, P.K. : Pulsed electro-magnetic field procedure in rheumatoid and osteoarthritis, *The Journal of Rehabilitation in Asia*, 37, 29-43, 2004.

Bhattacharya, B. and Basu, A. : Disparity based goodness of fit tests for and against order restrictions for multinomial models, *Journal of Nonparametric Statistics*, 15, 1-10, 2003.

Biswas, A. Dewanji, A. : Sequential adaptive designs for clinical trials with longitudinal responses, *Applied Sequential Methodologies*, 69-84, 2004.

Biswas, A. and Das, K. : A semiparametric Bayesian analysis of the salamander mating experiment, *Journal of Statistical Research*, 37, 103-125, 2003.

Bose, M. and Dey, A. : Some small and efficient cross-over designs under a non-additive model, *Utilitas Math*, 63, 173-182, 2003.

Bose, M. : The mathematics of symmetrical factorial designs, *Resonance*, 8, 14-19, 2003.

- Burnett R.T., Dewanji, A., Dominici, F., Goldberg, M.S., Cohen, A., Krewski, D. : On the relationship between time-series studies, dynamic population studies, and estimating life lost due to short-term exposure to environmental risks, *Environmental Health Perspectives*, 111, 1170-1174, 2003
- Chaudhuri, A., Bose, M. and Ghosh, J.K. : An application of adaptive sampling to estimate highly localized population segments, *Journal of Statistical Planning and Inference*, 121, 175-189, 2003
- Chaudhuri, A., Saha, A. : On adaptive cluster sampling and generalized regression method of estimating localized elements, *Probability and Statistical Science*, 2, 35-45, 2004
- Chaudhuri, A. : Estimation from an under-covered sample in a complex survey for auditing. *Cakrta Statistical Association Bulletin*, 54, 115-122, 2003.
- Chaudhuri, A. : Unbiased variance estimation on sub-sampling from a varying probability sample. *Journal of the Indian Society for Agricultural Statistics*, 57, 129-133, 2004.
- de Gunst M.C.M., Dewanji, A., Luebeck, E.G. : Exploring heterogeneity in tumor data using Markov Chain Monte Carlo, *Statistics in Medicine*, 22, 1691-1707, 2003.
- Dewanji, A., Sengupta, D. : Estimation of competing risks with general missing pattern in failure types *Biometrics*, 59, 1063-1070, 2003.
- Mukherjee, D.P., Maitra, S. and Acton, S.T. : Spatial domain digital watermarking of multimedia objects for buyer authentication, *IEEE Transactions on Multimedia*, 6, 1-5, 2004
- Park, C. and Basu, A. : The generalized Kullback-Leibler divergence and robust inference. *Journal of Statistical Computation and Simulation*, 73, 311-332, 2003.
- Ray Chaudhuri, A., Basu, A., Tan, K., Bhandari, S.K. and Chaudhuri B.B. : An efficient set estimator in high dimensions: consistency and applications to fast data visualization, *Computer Vision and Image Understanding*, 93, 260-287, 2004.
- Sarkar, P. and Schellenberg, Paul J. : Construction of symmetric balanced squares with blocks more than one, *Designs, Codes, and Cryptography*, 30, 235-280, 2003
- Sarkar, P. : Computing shifts in 90/150 cellular automata sequences. *Finite Fields and their Applications*, 9, 175-186, 2003.
- Sarkar, P. and Maitra, S. : Efficient implementation of cryptographically useful large Boolean functions *IEEE Transactions on Computers*, 52, 410-417, 2003.
- Sengupta, A. : On the construction of probability distributions on the sphere. *Journal of the Calcutta Mathematical Society*, 96, 139-154, 2004.
- Sheng, X., Biswas, A. and Carriere, K.C. : Incorporating inter-item correlations in item response level analysis, *Biometrical Journal*, 45, 837-850, 2003.
- Stanica, P. and Matra, S. : A constructive count of rotation symmetric functions. *Information Processing Letters*, 88, 299-304, 2003.

## Computer and Communication Sciences Division

### Advanced Computing and Microelectronics Unit

- Bhattacharya, B.B., Dmitriev, A. and Gössel, M. : Zero-aliasing space compaction of test responses using a single periodic output, *IEEE Transactions on Computers*, 52, 1646-1651, 2003

Chaudhuri, J., Nandy, S.C. and Das, S. : Largest empty rectangle among a point set, *Journal of Algorithms*, 46, 54-78, 2003.

Das, N., Bhattacharya, B.B. and Bezrukov, S. : Permutation routing in optical MIN with minimum number of stages, *Journal of Systems Architecture (Elsevier)*, 48, 311-323, 2003.

Das, S., Sur-Kolay, S. and Bhattacharya, B.B. : Manhattan-diagonal routing in channels and switchboxes, *ACM Transactions on Design Automation of Electronic Systems (TODAES)*, 9, 75-104, 2004.

Ghosh, S.C., Sinha, B.P. and Das, N. : Channel assignment using genetic algorithm based on geometric symmetry, *IEEE Transactions on Vehicular Technology*, 52, 860-875, 2003.

Ghosh, S.C., Sinha, B.P. and Das, N. : A new approach to efficient channel assignment for hexagonal cellular networks, *International Journal of Foundations of Computer Science*, (World Scientific), 14, 439-463, 2003 (Invited Paper).

Nandy, S.C. and Bhattacharya, B.B. : Finding an empty staircase polygon of largest areawidth in a planar point-set, *Computational Geometry - Theory and Applications (Elsevier)*, 26, 143-171, 2003.

Nandy, S.C., Das, S., and Goswami, P.P. : An efficient  $k$  nearest neighbors searching algorithm for a query line, *Theoretical Computer Science (Elsevier)*, 299, 273-288, 2003.

Rahaman, H., Das, D.K. and Bhattacharya, B.B. : Testing of stuck-open faults in Generalized Reed-Muller and EXOR Sum-of-Products CMOS circuits, *IEE Proceedings - Computers and Digital Techniques*, 151, 83-93, 2004.

Ray, S., Goswami, P.P., Das, S. and Nandy, S.C. : Optimal algorithm for a special point-labeling problem, *Information Processing Letters*, 89, 91-98, 2004.

#### **Computer Vision And Pattern Recognition Unit**

Das, S. and Chaudhuri, B.B. : Readability modelling using statistical regression: a study on Bangla texts, *International Journal of Dravidian Linguistics*, 33, 59-70, 2004.

Dash, N.S. : Corpus linguistics in India: present scenario and future direction, *Indian Linguistics*, 64, 85-113, 2003.

Dash, N.S. : Frequency and function of characters used in the Bangla text corpus, *Literary and Linguistic Computing*, 19, 145-159, 2004.

Dash, N.S. and Chaudhuri, B.B. : Relevance of corpus in language research and application, *International Journal of Dravidian Linguistics*, 32, 101-122, 2003.

Garai, G. and Chaudhuri, B.B. : A novel genetic algorithm for automatic clustering, *Pattern Recognition Letters*, 25, 173-187, 2004.

Ray Chaudhuri, A., Basu, A., Tan, K., Bhandari, S. and Chaudhuri, B.B. : An efficient set estimator in high dimensions: consistency and applications to fast data visualization, *Computer Vision and Image Understanding*, 93, 260-287, 2004.

#### **Electronics and Communication Sciences Unit**

Chakraborty, D. and Pal, N.R. : A neuro-fuzzy scheme for simultaneous feature selection and fuzzy rule-based classification, *IEEE Transactions on Neural Networks*, 15, 110-123, 2004.

Chanda, B. and Chaudhuri, B.B. : Automatic selection of structuring element for Bengali numeral recognition, *Pattern Recognition and Artificial Intelligence*, 17, 215-229, 2003.

Huang, C.D., Lin, C.T. and Pal, N.R. : Hierarchical learning architecture with automatic feature selection for multiclass protein fold classification, *IEEE Transactions on Nanobiotechnology*, 2, 221-232, 2003.

Majumder, K.K. and Dutta Majumder, D. : A fuzzy system modeling of the evolution of tumour in human tissues, *Journal of Intelligent and Fuzzy Systems*, 13, 17-25, 2003.

Mukherjee, D.P., Maltra, S. and Acton S.T. : Spatial domain digital watermarking for buyer authentication, *IEEE Transactions on Multimedia*, 6, 1-15, 2004.

Mukhopadhyay, S. and Chanda, B. : Multiscale morphological segmentation of grayscale images, *IEEE Transactions on Image Processing*, 12, 533-549, 2003.

Pal, N.R. and Mudi, R.K. : Computational intelligence for decision-making systems, *International Journal of Intell. Systems*, 18, 483-486, 2003.

Pal, N.R., Pal, S., Das, J., and Majumder, K. : SOFM-MLP : a hybrid neural network for atmospheric temperature prediction, *IEEE Transactions on Geoscience and Remote Sensing*, 41, 2783-2791, 2003.

Pal, S. and Pal, N.R. : Connectionist models for approximate solutions of non-linear equations in one variable, *Neural, Parallel & Scientific Computations*, 11, 185-206, 2003.

Pal, T. and Pal, N.R. : SOGARG: A self-organized genetic algorithm-based rule generation scheme for fuzzy controllers, *IEEE Transactions on Evolutionary Computation*, 7, 397-415, 2003.

Pal, T., Pal, N.R. and Pal, M. : Learning fuzzy rules for controllers with genetic algorithms, *Int. J. Intell. Systems*, 18, 569-592, 2003.

Roy, P.K. and Dutta Majumder, D. : Cognitive processing and activation during sleep and dream : an analysis using stochastic transition and resonance, *IEEE J. of Research*, 49, 1-12, 2003.

Sarkar, S.K., Kumar, R., Ahmed, I., Prasad, M.S.V.N., Das, J. and De, A.K. : Rain structure estimation from X band radar reflectivity measurement for radio system applications in microwave and millimeter wave frequency bands, *Int. J. of Radio & Space Physics*, 32, 98-103, 2003.

#### **Machine Intelligence Unit**

Acharyya, M., De, R.K. and Kundu, M.K. : Segmentation of remotely sensed images using wavelet features and their evaluation in soft computing framework, *IEEE Transactions on Geoscience and Remote Sensing*, 41, 2900-2905, 2003.

Acharyya, M., De, R.K. and Kundu, M.K. : Extraction of features using M-band wavelet packet frame and their neuro-fuzzy evaluation for multi-texture segmentation, *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 25, 1639-1644, 2003.

Bandyopadhyay, S. : An automatic shape independent clustering technique, *Pattern Recognition*, 37, 33-45, 2004.

Banerjee, M. and Kundu, M.K. : Edge based feature for content based image retrieval, *Pattern Recognition*, 11, 2649-2661, 2003.

- Biswas, S. : Segmentation based gray-level image data compression, *Pattern Recognition*, 36, 1501-1517, 2003.
- Choudhury, S. and Mitra, S. : A connectionist approach to sodar pattern classification, *IEEE Transactions on Geoscience and Remote Sensing Letters*, 1, 42-46, 2004.
- Choudhury, S., Mitra, S. and Pal, S.K. : Neuro-fuzzy classification and rule generation of modes of radiowave propagation, *IEEE Transactions on Antennas and Propagation*, 51, 862-871, 2003.
- Mañ, K. and Mitra, S. : Clustering and its validation in a symbolic framework, *Pattern Recognition Letters*, 24, 2367-2376, 2003.
- Maulik, U. and Bandyopadhyay, S. : Fuzzy partitioning using real coded variable length genetic algorithm for pixel classification, *IEEE Transactions on Geoscience and Remote Sensing*, 41, 1075-1081, 2003.
- Mitra, P., Murthy, C.A. and Pal, S.K. : A probabilistic algorithm for active support vector learning, *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 26, 413-418, 2004.
- Naik, Sanil K. and Murthy, C.A. : Hue preserving color image enhancement without gamut problem, *IEEE Transactions on Image Processing*, 12, 1591-1598, 2003.
- Pakhira, M.K., Bandyopadhyay, S. and Maulik, U. : Validity index for crisp and fuzzy clusters, *Pattern Recognition*, 37, 487-501, 2004.
- Pal, S.K. and Mitra, P. : Case generation using rough sets with fuzzy representation, *IEEE Transactions on Knowledge and Data Engineering*, 16, 292-300, 2004.

## Physics and Earth Sciences Division

### Geological Studies Unit

- Bandyopadhyay, S., Gillette, D.D. and Sengupta, D.P. : Dentition of Barapasaurus tagorei from the Kota Formation (Early Jurassic) of India, *Journal of Vertebrate Paleontology*, 23, 31-32, 2003.
- Bhattacharya, S. and Kar, R. : Alkaline intrusion in a granulite ensemble in the Eastern Ghats belt, India: shear zone pathway and a pull-apart structure, *Proc. Ind. Acad. Sci.*, 113, 37-48, 2004.
- Bhattacharya, S., Kar, R., Teixeira, W. and Basal, M. : High-temperature crustal anatexis in a clockwise P-T-t path: isotopic evidence from a granulite-granitoid suite in the Eastern Ghats belt, India, *Journal of Geological Society of London*, 160, 39-46, 2003.
- Chakraborty, C., Mandal, N. and Ghosh., S. : Kinematics of the Gondwana basins of the peninsular India, *Tectonophysics*, 377, 299-324, 2003.
- Chakraborty, C., Ghosh, S.K. and Chakraborty, T. : Depositional record of tidal flat sedimentation in the Permian coal measures of central India: Barakar Formation, Mohpani Coalfield, Satpura Gondwana basin, *Gondwana Research*, 6, 817-827, 2003.
- Chaudhuri, A.K. and Deb, G.K. : Proterozoic Rifting in the Pranhita-Godavari Valley: implication on India-Antarctica Linkage, *Gondwana Research*, 7, 301-312, 2004.
- Ghosh, S.K., Chakraborty, C. and Chakraborty, T. : Tide - and wave generated sediment packages in Lower Gondwana coal measures of central India: Barakar Formation (Permian), Satpura basin, *Journal Geological Society of London*, 161, 117-131, 2004.

Kar, R., Bhattacharya, S. and Sheraton, J.W. : Hornblende-dehydration melting in mafic rocks and the link between massif-type charnockite and associated granulites, Eastern Ghats Granulite Belt, India, *Contrib. Mineral. Petro.*, 145, 707-729, 2003.

Mandal, N., Samanta, S.K., Bhattacharyya, G. and Chakraborty, C. : Deformation of ductile inclusions in a multiple inclusion system in pure shear, *Journal of Structural Geology*, 25, 1359-1370, 2003.

Mukhopadhyay, J. and Chaudhuri, A.K. : Stratigraphy of the Chanda Limestone from the Proterozoic Penganga Group, Adilabad, Andhra Pradesh, India : implications for understanding depositional setting and palaeogeography, *Journal of Geological Society of India*, 62, 356-368, 2003.

Patranabis Deb, S. : Lithostratigraphy of the Neoproterozoic Chattisgarh Sequence, its bearing on the tectonics and Palaeogeography, *Gondwana Research*, 7, 323-337, 2004.

Samanta, S.K., Mandal, N. and Chakraborty, C. : Flow patterns around rigid inclusions in a multiple inclusion system undergoing bulk simple shear deformation, *Journal of Structural Geology*, 25, 209-221, 2003.

Saha, D. and Chakraborty, S. : Deformation pattern in the Kurnool and Nallamalai Groups in the northeastern part (Palnad area) of the Cuddapah Basin, south India and its implication on Rodinia/Gondwana tectonics, *Gondwana Research*, 6, 573-583, 2003.

#### **Physics and Applied Mathematics Unit**

Albeverio, S., Fei, S. M., Parashar, P. and Yang, W.L. : Non local properties and local invariants for Bipartite systems, *Physical Review A*, 68, 010303-010306, 2003.

Agrawal, P., Parashar, P. and Pati, A.K. : Exact remote state preparation for multipartites using dark states, *International Journal of Quantum Information*, 1, 301-319, 2003.

Basu, B., Dhar, S. and Bandyopadhyay, P. : Quantum Hall skyrmions in the framework of  $O(4)$  nonlinear sigma model, *International Journal of Modern Physics B*, 18, 171-184, 2004.

Basu, B., Dhar, S. and Bandyopadhyay, P. : High  $T_c$  superconductivity, Skyrmions and the Berry phase, *Physical Review B*, 69, 94505-94511, 2004.

Chakrabarti, A., Kanoria, M. and Mandal, B. N. : A waveguide problem involving a thick iris in the theory of electromagnetism, *Indian Journal of Pure and Applied Mathematics*, 34, 859-871, 2003.

(Chowdhury) Gayen, R. and Mandal, B. N. : Water wave scattering by two thin symmetric inclined plates submerged in finite depth water, *International Journal of Applied Mechanics and Engineering*, 8, 589-601, 2003.

Dandapat, B.S., Santra, B. and Andersson, H.I. : Thermocapillarity in a liquid film on an unsteady stretching surface, *International Journal of Heat and Mass Transfer*, 46, 3009-3015, 2003.

Dandapat, B.S. and Mukhopadhyay, A. : Finite amplitude long wave instability of a film of conducting fluid flowing down an inclined plane in presence of electromagnetic field, *International Journal of Applied Mechanics and Engineering*, 8, 379-393, 2003.

Dandapat, B.S., Daripa, P. and Ray, P.C. : Asymptotic study of film thinning process on a spinning angular disk, *Journal of Applied Physics*, 94, 4144-4155, 2003.

Dandapat, B.S., Singh, S.N. and Singh, R.P. : Heat Transfer due to permeable stretching wall in presence of transverse magnetic field, *Archives of Mechanics*, 56, 127-141, 2004.

- Das, P.K. and Accardi, L. : Phase measurement in interacting fock space, *International Journal of Theoretical Physics*, 42, 2721-2734, 2003.
- De, B. and Bhattacharyya, S. : Transverse mass distribution characteristics of  $\pi^0$  Production in  $^{208}\text{Pb}$ -induced reactions and the combinational approach, *Modern Physics Letters A*, 18, 1383-1396, 2003.
- De, B., Bhattacharyya, S. and Guptaroy, P. : Analysing spectra on production of light clusters in heavy ion collisions and the reflections on the average phase space density, *European Physical Journal A*, 15, 415-421, 2003.
- De, B., Bhattacharyya, S. and Guptaroy, P. : Particle production in RHIC, the  $p_T$ -Spectra and a new approach, *International Journal of Modern Physics A*, 18, 2367-2377, 2003.
- Ganguly, U.N., Mameloukas, C., Poria, S. and Mazumdar, H.P. : Effective Viscosity in a two-fluid flow of blood through an artery with inserted catheter, *Journal of Technology*, XXXVII, 53-61, 2003.
- Ghosh, S. : Energy crisis or a new soliton in the noncommutative CP(1) model ?, *Nuclear Physics B*, 570, 359-372, 2003.
- Ghosh, S. : Effective field theory for noncommutative spacetime : A toy model, *Physics Letters B*, 571, 97-104, 2003.
- Ghosh, S. : Maxwell-Chern-Simons theory is free for marginally noncommutative spacetimes, *Physics Letters B*, 583, 347-352, 2004.
- Ghosh, S. : Soldering formalism in noncommutative field theory : A brief note, *Physics Letters B*, 579, 377-383, 2004.
- Guptaroy, P., De, B., Bhattacharyya, S. and Bhattacharyya, D.P. : On direct photon production in Pb Pb and Au Au collision, *Heavy Ion Physics*, 17, 167-177, 2003.
- Guptaroy, P., De, B. and Bhattacharyya, S. : Direct photon production in high energy hadronic and nuclear collisions : measured data versus a model, *International Journal of Modern Physics A*, 18, 5047-5068, 2003.
- Guptaroy, P., De, B., Bhattacharyya, S. and Bhattacharyya, D.P. : Multiple production of mesons in Au + Au and Pb + Pb collisions, *International Journal of Modern Physics E*, 12, 493-517, 2003.
- Kumar, K., Bandyopadhyay, A. and Mondal, G.C. : Parametric instability in a fluid with temperature-dependent surface tension. *Europhysics Letters*, 65, 330-336, 2003.
- Levai, G., Sinha, A. and Roy, P. : An exactly solvable PT symmetric potential from the natanzon class, *Journal of Physics A*, 36, 7611-7623, 2003.
- Maitra, S. and Roychoudhury, R. : Speed and shape of dusty acoustic solitary waves, *Physics of Plasmas*, 10, No. 6, 2230-2235, 2003.
- Mandal, B.N. and Chakarbari, A. : A generalisation to the hybrid fourier transform and its application, *Applied Mathematics Letters*, 16, 703-708, 2003.
- Mazumder, B.S. and Dalai, D.C. : Sallation layer of particles in water flows related to transport stage, *Nordic Hydrology*, 34(4), 343-360, 2003.
- Mondal, G.C. and Kumar, K. : The effect of the corollis force on Faraday waves. *Proceedings of Royal Society of London A*, 460, 897-908, 2004.

- Porá, S., Chakraborty, B.K. and Mazumdar, H.P. : Some aspects of Rikitake system of dynamical equations, *International Journal of Applied Mechanics and Engineering*, 8, 87-96, 2003.
- Roy, B. and Roychoudhury, R. : Intelligent states for an interpolating algebra, *International Journal of Modern Physics B*, 17, 4631-4644, 2003.
- Roy, P. : Quantum statistical properties of the Gazeau-Klauder coherent state of the anharmonic oscillator, *Optics Communications*, 221, 145-152, 2003.
- Sahu, B. and Roychoudhury, R. : Travelling wave solution of Korteweg-de-Vries-Burger's equation, *Czechoslovak Journal of Physics*, Vol. 53, 517-527, 2003.
- Sahu, B. and Roychoudhury, R. : Exact solutions of cylindrical and spherical dust ion acoustic waves, *Physics of Plasmas*, 10, 4162-4165, 2003.
- Sinha, A., Roychoudhury, R. and Varshni, Y.P. : Wentzel-Kramers-Brillouin quantization rules for two-dimensional quantum dots, *Physica B*, 325, 214-223, 2003.
- Tapanidis, T., Tsagas, Gr. and Mazumdar, H.P. : On the symmetries of the differential equation governing damped harmonic vibration, *Nonlinear Functional Analysis and Application*, 7, 473-480, 2003.
- Tapanidis, T., Tsagas, Gr. and Mazumdar, H.P. : Application of scaling group of transformations to Viscoelastic second-grade fluid flow, *Nonlinear Functional Analysis and Application*, 8, 345-350, 2003.

## Biological Sciences Division

### *Agricultural Sciences Unit*

- Adhikary, S., Gayen, S., Bhattacharya, A. and Goswami, A. : Genetic polymorphism of Horse Gram (*Dolichos biflorus*) in eastern India at the seed storage protein level, *Journal of Ecophysiological and Occupational Health*, 3, 259-272, 2003.
- Bhattacharya, A., Chakraborty, C., Ray, P.S. and Goswami, A. : Stem cells research- a modern therapeutic approach in Biotechnology, *Journal of Ecophysiological and Occupational Health*, 3, 165-178, 2003.
- Ghosal, P.K., Chakraborty, T., Bhattacharya, B. and Bagchi, D.K. : Relative agronomic effectiveness of phosphate rocks and P adsorption characteristics of an Oxid Rhodustall in eastern India, *Journal of Plant Nutrition and Soil Science*, 166, 750-755, 2003.
- Goswami, A., Chatterjee, M., Mukherjee, A., Bhattacharya, A., Das, S., and Chattopadhyaya, D. : Study of human olfactory sensory system in response to various odorants in different divisions of eastern Indian population, *Journal of Ecophysiological and Occupational Health*, 3, 205-210, 2003.
- Joshi, H. and Ghose, M. : Forest structure and species distribution along soil salinity and pH gradient in mangrove swamps of the Sundarbans, *Tropical Ecology*, 44, 1-10, 2003.
- Nandy Datta, P. and Ghose, M. : Estimation of osmotic potential and free amino acids in some mangroves of the Sundarbans, India, *Acta Botanica Croatia*, 62, 37-45, 2003.

### *Anthropology and Human Genetics Unit*

- Basu, A., Majumder, P.P. : A comparison of two popular statistical methods for estimating the time to most recent common ancestor (TMRCA) from a sample of DNA sequences, *Journal of Genetics*, 82, 7-12, 2003.

- Basu, A., Mukherjee, N., Roy, S., Sengupta, S., Benerjee, S., Chakraborty, M., Dey, B., Roy, M., Roy, B., Bhattacharyya, N.P., Roychowdhury, S., and Majumdar, P.P. : Ethnic India: A genomic view, with special reference to peopling and structure, *Genome Research*, 13, 2277-2290, 2003.
- Bhattacharya, N., Tripathi, A., Dasgupta, S., Sabbir, M.G., Roy, A., Sengupta, A., Roy, B., Roychowdhury, S. and Panda, C.K. : Association of deletion in the chromosomal 8p21.3-23 region with the development of invasive head and neck squamous cell carcinoma in Indian patients, *Indian Journal of Medical Research*, 118, 77-85, 2003.
- Chakraborty, S.B., Dasgupta, S., Roy, A., Sengupta, A., Roy, B., Roychowdhury, S. and Panda, C.K. : Differential deletions in chromosome 3p are associated with the development of head and neck squamous cell carcinoma from Indian patients, *Cancer Genetics and Cytogenetics*, 146, 130-138, 2003.
- Dutta, R., Trivedi, R., Vasulu T.S. and Kashyap, V.K. : Geographic contiguity and genetic affinity among five ethnic populations of Manipur, India: Further molecular studies based on VNTR and STR marker loci, *Annals of Human Biology*, 30, 117-131, 2003.
- Grover, D., Majumdar, P.P., Rao, C.B., Brahmachari, S.K. and Mukerji, M. : Nonrandom distribution of Alu elements in genes of various functional categories: Insight from analysis of human chromosomes 21 and 22, *Molecular Biology and Evolution*, 20,1420-1424, 2003.
- Karmakar, B., Yakovenko, K. and Kobylansky, E. : Multivariate analysis of sexual dimorphism in two types of dermaloglyphic traits in five endogamous populations of West Bengal, India, *Homo*, 53, 263-278, 2003.
- Kumar, V., Basu, D. and Reddy, B.M. : Genetic heterogeneity in Northeastern India: reflection of tribe-caste continuum in the genetic structure, *American Journal of Human Biology*, 16, 1-12, 2004.
- Mondal, G., Tripathi, A., Bhattacharya, N., Sikdar, N., Roy, A., Sengupta, A., Roy, B., Panda, C.K. and Roychowdhury, S. : Allelic imbalance at chromosome 11 in head and neck squamous cell carcinoma in an Indian patient population, *Journal of Clinical Pathology*, 56, 512-518, 2003.
- Majumdar, P.P. : C.C.Li: His science and his spirit, *Genetic Epidemiology*, 26, 81-87, 2004.
- Reddy, B.M., Demarchi, D.A., Bharti, S., Kumar, V. and Crawford, M.H. : Patterns of ethnic, linguistic, and geographic heterogeneity of palmer interdigital ridge counts in the Indian Subcontinent, *Human Biology*, 76, 211-228, 2004.
- Roy, B. : Anti-tuberculosis drug-induced hepatotoxicity and genetic polymorphisms in drug-metabolizing genes, *Current Pharmacogenomics*, 1, 101-109, 2003.
- Roy, B. and Sikdar, N. : Polymorphisms in drug-metabolizing genes and risk of head and neck squamous cell carcinoma, *International Journal of Human Genetics*, 3, 99-108, 2003.
- Roy, S., Thakur Mahadik, C., Majumdar, P.P. : Mitochondrial DNA variation in ranked caste groups of Maharashtra (India) and its implication on genetic relationships and origins, *Annals of Human Biology*, 30, 443-454, 2003.
- Roychowdhury, A., Ghosh, R., Vasulu, T.S. and Bharati, P. : Heritability estimates of height and weight in Mahishya caste population, *International Journal of Human Genetics*, 3, 151-154, 2003.
- Sengupta, M. and Karmakar, B. : Intergenerational trend of some dermatoglyphic traits in Vaidyas of West Bengal, India, *Collegium Antropologicum*, 27, 515-521, 2003.

Sikdar, N., Paul, R.R., Panda, C.K., Banerjee, S.K. and Roy, B.: Loss of heterozygosity at APC and MCC genes of oral cancer and leukoplakia tissues from Indian tobacco chewers, *Journal of Oral Pathology and Medicine*, 32, 450-454, 2003.

Sikdar, N., Mahmud, Sk. A., Paul, R.R. and Roy, B. : Polymorphism in CYP1A1 and CYP2E1 genes and susceptibility to leukoplakia in Indian tobacco users, *Cancer Letters*, 195, 33-42, 2003.

Sikdar, N., Paul, R.R. and Roy, B. : Glutathione S-transferase M3 (A/A) genotype as a risk factor for oral cancer and leukoplakia among Indian tobacco smokers, *International Journal of Cancer*, 109, 95-101, 2004.

Singh, S., Sengupta, S., Murhekar, K.M., Sehgal, S.C., Majumder, P.P. : Single nucleotide polymorphisms in two genes among the Jarawa, a primitive tribe of the Andaman and Nicobar Islands, *Current Science*, 86, 326-328, 2004.

Tandon, M., Vasulu, T.S., Trivedi, R. and Kashyap, V.K. : Genetic affinity between two ethnically diverse caste groups of north India: A study based upon 15 Microsatellite Loci, *International Journal of Human Genetics*, 4, 1, 37-43, 2004.

Tripathi, A., Dasgupta, S., Roy, A., Sengupta, A., Roy, B., Roychowdhury, S. and Panda, C.K. : Sequential deletions in both arms of chromosome 9 are associated with the development of head and neck squamous cell carcinoma from Indian patients, *Journal of Experimental and Clinical Cancer Research*, 22, 289-97, 2003.

Tripathi (Bhar), A., Banerjee, S., Chunder, N., Roy, A., Sengupta, A., Roy, B., Roychowdhury, S. and Panda, C.K. : Differential alterations of the genes in the CDKN2A-CCND1-CDK4-RB1 pathway are associated with the development of head and neck squamous cell carcinoma in Indian patients, *Journal of Cancer Research and Clinical Oncology*, 129, 642-650, 2003.

Vikrant, K. and Reddy, B.M. : Status of Austro-Asiatic tribes in the peopling of India: an exploratory study based on available palaeontological, ethno-historic, linguistic and biological data, *Journal of Biosciences*, 28, 507-522, 2003.

Vishwanathan, H., Edwin, D., Usha Rani, M.V., Majumder, P.P. : A survey of haplotype frequencies and linkage disequilibrium at the DRD2 locus in the Nilgiri hill tribes, South India, *Current Science*, 84, 566-570, 2003.

Vishwanathan, H., Edwin, D., Usharani, M.V., Majumder, P.P. : Insertion/deletion polymorphisms in tribal populations of southern India and their possible evolutionary implications, *Human Biology*, 75, 873-887, 2004.

Vishwanathan, H., Deepa, E., Cordaux, R., Stoneking, M., Usha Rani, M.V., Majumder, P.P. : Genetic structure and affinities among tribal populations of southern India: a study of 24 autosomal DNA markers, *Annals of Human Genetics*, 68, 128-138, 2004.

### **Biochemistry Unit**

Chaudhuri, K., Banerjee, R., Pandit, B., Mukherjee, A., Sengupta, S., Roychowdhury, S., and Bhattacharya, N.P. : Identification of two differentially expressed mitochondrial genes in a methotrexate resistant Chinese hamster cell strain derived from V79 cells using RNA fingerprinting by arbitrarily primed polymerase chain reaction (RAP-PCR), *Radiation Research*, 60, 77-85, 2003.

Dutta Gupta, C., Sengupta, S., Roy, M., Sengupta, D., Bhattacharya, P., Laikangbam, P., Roy, S., Ghosh, S. and Das, R. : Are Muslim women less susceptible to oncogenic human papillomavirus infection? A study from rural eastern India, *International Journal of Gynecological Cancer*, 14, 1-11, 2004.

### **Biometry Research Unit**

Chattopadhyay, R.R.: Possible mechanism of hepatoprotective activity of *Azadirachta indica* leaf extract ; Part II, *Journal of Ethnopharmacology*, 89, 217-219, 2003.

### **Chemistry Unit**

Bhattacharyya, S.K. : Molybdenum in surface soils of Hills and Foot Hills of West Bengal. *Journal of Institution of Chemists (India)*, 75, 65-67, 2003.

### **Embryology Research Unit**

Chattopadhyay, J., Pal, S. and El abdellaoui, A. : Classical predator-prey system with infection on prey population - a mathematical model, *Mathematical Methods in the Applied Sciences* 26, 1211-1222, 2003.

Chattopadhyay, J., Srinivasu, P.D.N. and Bairagi, N. : Pelicans at risk in Salton Sea - an eco-epidemiological model - II, *Ecological Modelling*, 167, 199-211, 2003.

Haque, M. and Chattopadhyay, J. : Influence of nonlinear incidence in an eco-epidemiological model of the Salton Sea, *Nonlinear Studies*, 10, 373-388, 2003.

Sarkar, R.R. and Chattopadhyay, J.: Occurrence of planktonic blooms under environmental fluctuations and its possible control mechanism - mathematical models and experimental observations, *Journal of Theoretical Biology*, 224, 501-516, 2003.

Sarkar, R.R. and Chattopadhyay, J. : The role of environmental stochasticity in a toxic phytoplankton - non-toxic phytoplankton - zooplankton system, *Environmetrics*, 14, 775-792, 2003.

Sarkar, R.R. and Chattopadhyay, J. : A technique for maximum harvesting effort in a noise induced bioeconomic fishery model, *Journal of Bioscience*, 28, 497-506, 2003.

### **Plant Chemistry Unit**

Chanda, S., Ghosh, K. and Chakraborti, S. : A novel protease producing Streptomyceete from a Jute field of West Bengal, India, *Asian Journal of Microbiology, Biotechnology and Environmental Science*, 5, 53-56, 2003.

Labbe, R.F. and Dewanji, A. : Iron assessment tests: transferrin receptor vis-à-vis zinc protoporphyrin, *Clinical Biochemistry (Elsevier Science Publishers)*, 37, 165-174, 2004.

Mazumdar, P., Gangopadhyay, S. and Chanda, S. : Cellulolytic activity of some promising fungi in selected biodegradation studies, *Journal of Mycopathological Research*, 41, 27-33, 2003.

## **Social Sciences Division**

### **Economic Research Unit**

Bhaumik, S.K. and Coondoo, D.: Econometrics of yield spreads in the money market: a Note, *Applied Financial Economics*, 13, 645-653, 2003.

Bhaumik K.S., Bose, S. and Coondoo, D.,: The emerging Indian bond market: problems and prospects, *Journal of Global Financial Markets*, Spring, 34-43, 2003.

- Bose, S. and Coondoo, D.: A study of the Indian corporate bond market, *Money & Finance, ICRA Bulletin*, 2, 25-51, January-March 2003.
- Bourguignon, F. and Chakravarty, S. R.: The measurement of multidimensional poverty, *Journal of Economic Inequality*, 1, 25-49, 2003.
- Chakraborty, B.S. : Trade in International goods in a model with monopolistic competition, *Economica*, 70, 551- 566, 2003.
- Chakravarty, S.R. and Moyes, P. : Individual welfare, social deprivation and income taxation, *Economic Theory*, 21, 843-870, 2004.
- Chakravarty, S.R. and Muliere, P.: Welfare indicators: a review and new perspectives, measurement of inequality, *Metron – International Journal of Statistics*, 61, 457 – 497, 2003.
- Chakravarty S.R., Silber, J. and Pflingsten, A.: Measuring inter – industry trade: an axiomatic approach, *Keio Economic Studies*, 49, 2002, 99–110. (This issue of the journal was published in May, 2003).
- Chattopadhyay, M.: Role of Government in the development of social aspects of level of living in India, *Man & Development*, 25, 49-66, 2003.
- Coondoo, D., Majumder, A., Mukherjee, R. and Neogl, C.: Tax performance and taxable capacity: An analysis for selected states in India, *Journal of Public Finance and Public Choice*, 20, 21-42, 2003.
- Coondoo, D., Majumder, A. and Ray, R.: On a method calculating regional consumer price differentials with illustrative evidence from India, *Review of Income and Wealth*, Series 50, 51-68, 2004.
- Ghosh, B. and De, P.: Causality between Performance and Traffic: An Investigation with Indian Ports, *Maritime Policy and Management*, London, 30, 5-27, 2003.
- Ghosh, B. and De, P. :India in the BIMST-EC: some issues, *India Quarterly: A Journal of International Affairs*, Delhi, LIX, 1-29, July-December, 2003.
- Ghosh, C. and Ghosh, A.: Fiscal deficit subsidy and inflation, *Indian Economic Review*, 1-57, 2003.
- Ghosh, C.: Economic liberalization: A doubtful case, *Economic and Political Weekly*, 2003.
- Gupta, M.R.: Productive consumption and endogenous growth: A theoretical analysis, *Keio Economic Studies*, 40, 45-57, 2003.
- Gupta, M.R.: Child labour and economic development: A theoretical analysis, *Arthaniti*, 2, 97-107, 2003.
- Kabiraj, T.: Patent licensing in a leadership structure, *The Manchester School*, 72, 188-205, 2004.
- Kabiraj, T: An Incentive based salary of a teacher, *Artha Bhaskaran*, 12,7-16, 2003.
- Kabiraj, T and Mukherjee, A : Bilateral merger: a note on Salant – Switzer – Reynolds model, *Journal of Quantitative Economics*, 1, 82-88, 2003.
- Majumder, A.: (Book Review) 'Essays in Panel Data Econometrics' by Marc Nerlove, Cambridge University Press, *Sankhyā*, Series B, 65, Part 2, 493-495, 2003.
- Majumder, A. and Mukherjee, D.: Hierarchical preference and consumption Deprivation, *Journal of Economic Research*, 8, 1-16, 2003.

Mazumdar, K. : A new approach to human development index, *Review of Social Economy*, 61, 535-548, 2003.

Mazumdar, K. : Do standards of living converge?, *Social Indicators Research*, 64, 29-50, 2003.

Mukherjee, P. and Coondoo, D.: Volatility of FII in India, *Money & Finance, ICRA Bulletin*, 2, 85-102, October 2003 – March 2004.

Pal, M., Ghosh, B. and Neogi, C.: Frontier production function and extreme observations, *Arthaniti (New Series)*, 2, 42- 61, 2003.

Pal, T., Pal, N.R. and Pal, M.: Learning fuzzy rules for controllers with genetic algorithms, *International Journal of Intelligent Systems*, 18, 569- 592, 2003.

Sarkar, A. and Mitra, S.: Relative profitability from production and trade: A study of selected potato markets in West Bengal, *Economic and Political Weekly*, 38, 2003.

#### **Planning Unit**

Das, S.P. : Trade and relative wages in a global economy, *Review of International Economics*, 11, 397-41, 2003.

Das, S.P. and Katayama, Seiichi : International joint venture and host-country policies, *Japan Economic Review*, 54, 381-394, 2003.

Ghate, C. : Optimal fiscal policy in an economy facing socio-political instability, *Review of Development Economics*, 7, 583-595, 2003.

Ghate, C. : The politics of endogenous growth, *Topics In Macroeconomics*, Berkeley Electronic Press, 3, 2003.

Majumdar, D. and Sen, A. : Ordinally Bayesian incentive compatible voting rules, *Econometrica*, 72, 523-540, 2004.

Roy Chowdhury, P. : Bertrand equilibrium with entry : some limit results, *International Journal of Industrial Organization*, 19, 319-344, 2003.

Roy Chowdhury, P. : Bertrand-Engeworth equilibrium in large markets with non-manipulable residual demand, *Economics Letters*, 79, 371-375, 2003.

Roy Chowdhury, P. : Inefficiency in a model of team formation, *Group decisions and negotiations*, 12, 195-215, 2003.

Somanathan, E. and Sethi, R. : What can we learn from cultural group selection and co-evolutionary models?, *Journal of Economic behaviour and Organization*, 53, 105-108, 2004.

#### **Population Studies Unit**

Datta, P. : Nepali migration to Darjeeling : an Indian experience, *The Oriental Anthropologist*, 3, 149-163, 2003.

Gupta, S. and Deb Roy, R. : Mother and child health care among Santals, *Bharatiya Samajik Chintan*, 2, 38-42, 2003.

Pal, M., Bharati, P., Vasulu, T.S., Chaudhuri, A., Bhattacharya, B.N., Das, R.N. and Ghose, R. : Maternal mortality in rural North 24 Parganas, West Bengal : estimation of its rate and identification of underlying causes, *Demography India*, 31, 253-258, 2003.

#### **Psychology Research Unit**

Dutta Roy, D. : Individual characteristics for the success in computer programming, *Journal of Personality and Clinical Studies*, 19, 57-61, 2003.

Dutta Roy, D. : Cluster analysis of GHQ-12 items using Indian Antarctica Expeditioners' responses, *Journal of Psychometry*, 17, 38-44, 2003.

Dutta Roy, D. : Organizational Diagnosis : Behavioural perspectives, *AIM EXPLORE*, 1, 38-39, 2003

Gupta, R. : Physical facilities available in primary schools and scholastic achievement, *Journal of Education and Psychology*, 61, 19-28, 2003

Gupta, R. : Relation between socio-economic deprivation and academic achievement in adolescents, *Psychologie und Education*, 2, 10-25, 2003.

Gupta, R. : Influence of Intelligence, Socio-economic Deprivation and Achievement Motivation on Adolescents' Scholastic Achievement, *Journal of Psychometry*, 17, 29-37, 2003.

#### **Sociological Research Unit**

Dasgupta, A. : Islam in Bengal : formative period, *Social Scientist*, 32, 30-41, 2004.

Dasgupta, U. : (Book review) 'In search of Freedom: An Unfinished Journey', by Manikuntala Sen, Delhi, *Indian Journal of Gender Studies*, 10, 179-182, 2003.

Jana, R. and Chatterjee, A.K. : Neither in 'hierarchical inequality' nor in 'competitive inequality' : a case of perpetual backwardness of Bauries, *Vanyajati*, XLXII, 27-33, 2004.

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

Anis, M.Z. and Pandey, R.J. : A note on the Murthy - Sarma estimators of the mean of the normal distribution for small samples, *Economic Quality Control*, 18, 83-90, 2003.

Das, N. : Study on implementing control chart assuming negative binomial distribution with varying sample size in a software industry, *Software Quality Professional*, 6, 1-7, 2003.

Das, N. : A study on estimating measurement error in the measurement of earing of puffer proof caps, *Quality Engineering*, 16, 265-268, 2003.

Gauri, S.K. : Statistical process control procedures for controlling the weight of packets of biscuits, *Total Quality Management & Business Excellence*, 13, 525-536, 2003.

Mandal, P. : Data quality in statistical process control, *Total Quality Management*, 15, 89-103, 2004.

Manna, D.K., Pal, S. and Kulandayan, A. : Estimation of warranty cost for a multi-module system, *International Journal of Quality and Reliability Management*, 21, 102-117, 2004.

Mohan, S.R., Neogy, S.K. and Das, A.K. : A note on linear complementarity problems and multiple objective programming, *Mathematical Programming*, 2003 (appeared electronically).

Mondal, S., Pal, S. and Manna, D.K. : Cost estimation under renewing warranty policy – an application, *Quality Engineering*, 16, 93-98, 2003.

Mukhopadhyay, A.R. : Estimation of cost of quality in an Indian textile industry for reducing cost of non-conformance, *TQM & Business Excellence*, 15, 229-234, 2004.

Mukhopadhyay, A.R. : Determining conducive processing conditions for wool fibres, *TQM & Business Excellence*, 14, 811-818, 2003.

Pal, S. and Manna, D.K. : A marketing decision problem in single-period stochastic inventory model, *OPSEARCH*, 40, 230-240, 2003.

Pal, S. and Murthy, G.S.R. : An application of Gumbel's bivariate exponential distribution in estimation of warranty cost of motor cycles, *International Journal of Quality and Reliability Management*, 20, 488-502, 2003.

Perumallu, P.K. and Gijo, E.V. : Quality improvement by reducing variation: a case study, *TQM & Business Excellence*, 14, 1023-1031, 2003.

Ramamurthy, K.G., Seth, A. and Sadegh, M.K. ; A combinatorial approach for component importance, *Communications in Statistics*, 32, 497-507, 2003.

Ravindran, G., Gowda, S., Song, Yoon : Some interconnections between strict monotonicity, globally uniquely solvable and properties in semi-definite linear complementarity problems, *Linear Algebra and its applications*, 370, 355-368, 2003.

Sampangi R.D. and Manna D.K. : A management decision problem in sugar industry, *PARADIGM*, 7, 60-74, 2003.

## Library and Information Sciences Division

### *Documentation Research and Training Centre*

Rath, D.S. and Prasad, A.R.D. : Heuristics for identification of bibliographic elements from Title Pages, *International Cataloguing and Bibliographic Control*, 2003.

### *Library (Kolkata)*

Basak, N. : Antya-Granthaagar Sahayogitar Aparnam "Consortium", *RBU Journal of Library and Information Science*, 7, 45-49, 2003-2004.

## Papers Published in Conference Proceedings

### Theoretical Statistics and Mathematics Division

#### *Stat-Math Unit, Kolkata*

Bandyopadhyay, P. and Dutta, S. : Weighted Chebyshev centres and intersection properties of balls in Banach spaces, Function spaces (Edwardsville, IL, 2002), K. Jarosz (ed.), *Contemp. Math.* 328, Amer. Math. Soc., Providence, RI, 43-58, 2003.

Banua, R., Dutta, R. and Sarkar, P. : Extending Joux's protocol to multi-party key agreement, *Proc. 4<sup>th</sup> International Conference on Cryptology in India INDOCRYPT2003, LNCS, 2904 T*, Johansson and S. Maitra (eds.), Springer-Verlag, 205-217, 2003.

Banua, R. and Das, S. : Finite field arithmetic using self-assembly of DNA tilings, *Proc. 2003 IEEE Conf on Evolutionary Computation CEC2003*, R. Sarkar, R.Reynolds et al (eds.), IEEE, Canberra, Australia, 2529-2536, 2003.

Ghosh, A.K., Chaudhuri, P. and Sengupta, D. : Multi-scale kernel discriminant analysis, *Proceedings of the 5th International Conference on Advances in Pattern Recognition*, 89-93, 2003.

Singh, T. and Acharya, M. : Characterization of signed graphs whose negations are switching equivalent to their iterated line sigraphs, *Proc. of Conference on Graph Theory and its Applications*, R.J. Wilson, R. Balakrishnan and G. Selthurman (eds.), Narosa Publishing House, 19-24, 2004.

#### **Stat-Math Unit, Bangalore**

Krzysztof Jarosz and Rao, T.S.S.R.K. : Weak\*-extreme points of injective tensor product spaces, *Function spaces, Contemporary Mathematics*, 328, 231-237, 2003.

Rajarama Bhat, B.V. : Atomic dilations, *Advances in Quantum Dynamics AMS-IMS-SIAM Summer Research Conference, South Hadley (2002)*, *Contemporary Mathematics*, 335, Geoffrey L. Price, et al.(eds.), Providence, RI, USA, 99-107, 2003.

Sury, B. : Central extensions of  $p$ -adic division algebras, *International conference on analytic number theory and  $L$ -functions*, R.Batasubramanian and K.Srinivas (eds.), Hindustan Book Agency, New Delhi, 2004.

### **Applied Statistics Division**

#### **Applied Statistics Unit**

Banua, R., Dutta, R. and Sarkar, P. : Extending Joux's protocol to multiparty key agreement, *Proceedings of Indocrypt 2003, LNCS 2904*, 205-217, 2003.

Biswas, A. and Angers, J.F. : Analyzing a bivariate ordinal data set on diabetic retinopathy, *Craiova Medical, Proceedings of the 1<sup>st</sup> MEDINF International Conference on Medical Informatics & Engineering MEDINF 2003*, 5, 290-291, 2003.

Gupta, K.C. and Sarkar, P. : Construction of perfect nonlinear and maximally nonlinear multi-output Boolean functions satisfying higher order strict avalanche criteria, *Proceedings of Indocrypt 2003, LNCS 2904*, 107-120, 2003.

Hong, Jin, Lee, Dong Hoon, Chee, Seongtaek and Sarkar, P. : Vulnerability of nonlinear filter generators based on linear finite state machines, *Proceedings of FSE*, February 2004.

Mishra, P.K. and Sarkar, P. : Application of Montgomery's trick to scalar multiplication for elliptic and hyperelliptic curves using a fixed base point, *Proceedings of Public Key Cryptography, LNCS 2947*, 41-54, 2004.

Mishra, P.K. and Sarkar, P. : Parallelizing explicit formula for arithmetic in the Jacobian of hyperelliptic curves, *Proceedings of Asiacrypt 2003, LNCS 2894*, 93-110, 2003.

Sarkar, P., Mishra, P.K. and Barua, R. : A parallel algorithm for computing simultaneous inversions with application to elliptic curve Scalar multiplication, *Proceedings of the 46th IEEE International Midwest Symposium on Circuits and Systems*, December 2003.

Sarkar, P., Håj-bj-bj : A new stream cipher with a self-synchronizing mode of operation, *Proceedings of Indocrypt 2003*, LNCS 2904, 36-51, 2003.

## Computer and Communication Sciences Division

### *Advanced Computing and Microelectronics Unit*

Bhattacharya, B.B., Seth, S.C. and Zhang, S. : Low-energy BIST design for scan-based logic circuits, *Proc. International Conference on VLSI Design*, IEEE CS Press, USA, 546-551, 2003.

Bhattacharya, B.B., Seth, S.C. and Zhang, S. : Double-tree scan : a novel low-power scan-path architecture, *Proc. International Test Conference (ITC)*, IEEE CS Press, USA, 470-479, 2003.

Bhōomick, P. and Bhattacharya, B.B. : Approximate fingerprint matching using Kd-tree, *Proc. International Conference on Pattern Recognition (ICPR)*, Cambridge, 2004.

Bishnu, A., Das, S., Nandy, S.C. and Bhattacharya, B.B. : An improved algorithm for point-set pattern matching under rigid motion, *Algorithms and Complexity (CIAC): Lecture Notes in Computer Science (LNCS)*, 2653, 36-45, May 2003.

Chakrabarti, A. and Sur-Kolay, S. : Mathematical modeling for quantum computing, *Proc. International Conference on Computers and Devices for Communication (CODEC 2004)*, January 2004.

Chakrabarti, A. and Sur-Kolay, S. : Adder circuits in quantum computers, *Proc. Seminar on Recent Advances in VLSI Design*, February 2004.

Majumdar, K. and Das, N. : Neural networks for location management in mobile cellular communication networks, *Proc. 18<sup>th</sup> International Conference IEEE TENCON 2003*, October 2003.

Mandal, P.S. and Mukhopadhyaya, K. : Estimating checkpointing rollback and recovery overheads, *Proc. 5<sup>th</sup> International Workshop on Distributed Computing (IWDC-2003)*, Lecture Notes in Computer Science (LNCS), 2918, 56-65, December 2003.

Mitra, S.K., Murthy, C.A., Kundu, M.K., Bhattacharya, B.B. and Acharya, T. : Digital watermarking using homogeneity in image, *Proc. IEEE TENCON*, 2003.

Rahaman, H., Das, D.K. and Bhattacharya, B.B. : Mapping symmetric functions to hierarchical modules for path-delay fault testability, *Proc. Asian Test Symposium (ATS)*, IEEE CS Press, USA, 284-289, November 2003.

Rahaman, H., Das, D.K. and Bhattacharya, B.B. : Testable design of GRM network with EXOR-tree for detecting stuck-at and bridging faults, *Proc. Asia-South-Pacific Design Automation Conference (ASPDAC)*, IEEE CS Press, USA, 224-229, January 2004.

Rahaman, H., Das, D.K. and Bhattacharya, B.B. : Easily testable realization of EXOR-sum-of-product network for detecting stuck-at and bridging faults, *Proc. International Conference on VLSI Design*, IEEE CS Press, USA, 487-492, January 2004.

Sinha, B.P. and Bandyopadhyaya, S. : OMULT : an optical interconnection system for parallel computing, (Invited paper), *Proc. International Conference on Computers and Devices for Communication (CODEC 2004)*, (CD version), January 2004.

Sur-Kolay, S., Kundu, S., Tirumurti, C., Zachariah, S. and Chang, Y. : Analysis and modeling of power supply related failures, *Proc. European Test Workshop*, May 2003.

Sur-Kolay, S., Banerjee, S. and Murthy, C.A. : Flavours of travelling salesman problem in VLSI design, *Proc. Indian International Conference on Artificial Intelligence*, December 2003.

Tirumurti, C., Kundu, S., Chang, Y. and Sur-Kolay, S. : Modeling approach for addressing power supply switching noise related failures of integrated circuits, *Proc. Design Automation and Test in Europe (DATE)*, February 2004.

### **Computer Vision and Pattern Recognition Unit**

Basak, S., Roy, K. and Pal, U. : English handwritten touching string segmentation, *Proc. International Conference on Communication, Devices and Intelligent Systems*, 628-631, 2004.

Bhattacharya, S., Bhattacharya, U. and Parui, S.K. : Chain code skeleton processing for handwritten character recognition, *Proc. National Workshop on Computer Vision, Graphics and Image Processing (WCVGIP 2004)*, Gwalior, 14-17, February 2004.

Bhattacharya, U. and Chaudhuri, B.B. : A majority voting scheme for multiresolution recognition of handprinted numerals, *Proc. 7th International Conference on Document Analysis and Recognition (ICDAR)*, Edinburgh, 16-20, 2003.

Bhattacharya, U. and Chaudhuri, B.B. : Databases for research on recognition of handwritten numerals of Indian scripts, *Proc. National Workshop on Computer Vision, Graphics and Image Processing (WCVGIP 2004)*, Gwalior, 18 -21, February, 2004.

Dash, N.S. and Chaudhuri, B.B. : Using text corpora for understanding polysemy in Bangla, *IEEE Proceedings of Language Engineering Conference*, K. Narayanmurthy et al (ed.), IEEE Computer Society, USA, 99-109, 2003.

Dash, N.S. : Corpus based study of lexical polysemy in Bangla for application in language technology, *Proc. Symposium on Indian Morphology, Phonology and Language Engineering (SIMPLE'04)*, A. Basu and S. Bhattacharya (eds.), Kharagpur, 70-74, 2004.

Garain, U., Mandal, A., Debnath, S. and Chaudhuri, B.B. : Compression of scan-digitized Indian language printed text: a soft pattern matching technique, *Proc. ACM Symposium on Document Engineering (DocEng)*, Grenoble, 185-192, 2003.

Garain, U., Mandal, A., Debnath, S. and Chaudhuri, B.B. : Pattern matching technique for compression of Indian language textual images, *Proc. 5th International Conference on Advances in Pattern Recognition (ICAPR)*, Kolkata, 312- 315, 2003.

Kar, U., Garain, U. and Chaudhuri, B.B. : Detection of stop words in compressed Indian language textual image, *Proc. National Workshop on Computer Vision Graphics and Image processing (WCVGIP 2004)*, Gwalior, 32-35, 2004.

Pal, U. and Datta, S. : Segmentation of Bangla unconstrained handwritten text, *Proc. 7th International Conference on Document Analysis and Recognition (ICDAR)*, IEEE Computer Society Press, California, 1128-1132, 2003.

Pal, U. and Roy, P.P. : Text lines extraction from Indian documents, *Proc. 5th International Conference on Advances in Pattern Recognition (ICAPR)*, D. P. Mukharjee and S. Pal (eds.), 275-289, 2003.

Pal, U. and Sarkar, A. : Recognition of printed Urdu script, *Proc. 7<sup>th</sup> International Conference on Document Analysis and Recognition (ICDAR)*, IEEE Computer Society Press, California, 1183-1187, 2003.

Pal, U., Sinha, S. and Chaudhuri, B.B. : Multi-Script line identification from Indian documents, *Proc. 7<sup>th</sup> International Conference on Document Analysis and Recognition (ICDAR)*, IEEE Computer Society Press, California, 880-884, 2003.

Pal, U., Sinha, S. and Chaudhuri, B.B. : Word-wise script identification from a document containing English, Devnagari and Telugu text, *Proc. Second National Conference on Document Analysis and Recognition*, 213-220, 2003.

Pal, U., Sinha, S. and Chaudhuri, B.B. : English multi-oriented text lines extraction, *Image Analysis: Proc. 13<sup>th</sup> Scandinavian Conference on Image Analysis (SCIA 2003)*, J. Bigun and T. Gustavsson (eds.), Springer Verlag, 1146-1153, 2003.

Pal, S., Roy, B.K. and Da, A. : A fast correlation attack for LFSR based stream ciphers, *Proc. 1<sup>st</sup> International Conference on Applied Cryptography and Network Security (ACNS), Lecture Notes in Computer Science (LNCS)*, 2846, Jianying Zhou, Moli Yung, Yonglei Han (eds.), Springer Verlag, 331-342, 2003.

Panji, S.K., Bhowmik, T.K. and Bhattacharya, U. : A novel scheme for extraction of shape descriptions from handwritten Bangla characters, *Proc. National Workshop on Computer Vision, Graphics and Image Processing (WCVGIP 2004)*, Gwalior, 1-4, February 2004.

Roy, K., Mustafa, J. and Pal, U. : A system for handwritten Bangla and English numeral recognition, *Proc. National Conference on Advanced Image Processing and Networking*, 105-114, 2004.

Roy, K., Pal, U. and Chaudhuri, B.B. : Address block location and pin code recognition for Indian postal automation, *Proc. National Workshop on Computer Vision, Graphics and Image Processing (WCVGIP 2004)*, Gwalior, 5-9, February 2004.

Sinha, S., Pal, U. and Chaudhuri, B.B. : Word-wise English and Malayalam script identification, *Proc. National Workshop on Computer Vision, Graphics and Image Processing, Gwalior, (WCVGIP 2004)*, 77-80, 2004.

Singh, Y.K. : Mel-frequency coding for subband image compression, *Proc. 46<sup>th</sup> SPIE Annual Meeting*, San Diego, 34-45, 2003.

Tripathy, N. and Pal, U. : Oriya unconstrained handwritten text segmentation, *Proc. National Workshop on Computer Vision, Graphics and Image Processing, Gwalior*, 36-39, 2004.

Tripathy, N., Panda, M. and Pal, U. : A system for Oriya handwritten numeral recognition, *SPIE Proceedings*, E. H. Barney Smith, J. Hu and J. Allan (eds.), 174-181, 2004.

#### **Electronics and Communications Sciences Unit**

Chakraborty, D. and Pal, N.R. : Expanding the training set for better generalization in MLP, *Proc. International Conference on Communication, Devices and Intelligent Systems (CODIS 2004)*, 454-457, 2004.

Chowdhury, S.P., Mandal, S., Das, A.K. and Chanda, B. : Automated segmentation of math-zones from document images, *Proc. 7<sup>th</sup> International Conference on Document Analysis and Recognition (ICDAR)*, 755-759, 2003.

- De, A.K., Mitra, S. and Mondal, A. : Auto detection of tracer clouds: a software approach, *Proc. International Conference On Microwave, Antenna, Propagation and Remote Sensing (ICMARS 2003)*, December 2003.
- Dhar, D.B. and Chanda, B. : Generation of E-map through symbol feature extraction from paper maps, *Proc. 2nd National Conference on Document Analysis and Recognition*, 44-51, July 2003.
- Dutta Majumder, D. : A unified study of PR, CV, and AI : a cybernetic and system approach, *International Conference on Recent Trends and New Direction in Cybernetics and Systems Science*, January 2004 (keynote paper).
- Dutta Majumder, D. : Fuzzy logic and other soft computing approaches for uncertainty management in science and society, *Proc. International Conference on Recent Trends and New Directions in Cybernetics and Systems Science*, January 2004 .
- Dutta Majumder, D. : Mathematics, logic, synergic and cybernetics: a unified foundational study, *National Instructional Workshop on Recent Trends of Research in Cybernetics and Systems Science*, January 2004 (keynote address).
- Dutta Majumder, D. : Multimodal image processing registration and fusion : mathematical tools and application, *International Conference on Advances in Pattern Recognition*, 2003 (keynote paper).
- Dutta Majumder, D. : Agenda for 21<sup>st</sup> century partnership with nature : a cybernetic approach to environmental problems, *TECHNORAMA*, 9-11, October 2003.
- Mandal, S., Chowdhury, S.P., Das, A.K. and Chanda, B. : Automated detection and segmentation of table of contents and index pages from document images, *Proc. 12th International Conference on Image Analysis and Processing (ICIAP'03)*, 213-218, September 2003.
- Mandal, S., Chowdhury, S.P., Das, A.K. and Chanda, B. : Automated detection and segmentation of table of contents page from document images, *Proc. 7th International Conference on Document Analysis and Recognition (ICDAR'03)*, 398-402, August 2003.
- Mitra, S. and De, A.K. : Segmentation of micro calcification in digital mammograms, *Proc. Intl. Conf. on Communications, Devices and Intelligent Systems (CODIS 2004)*, 536-539, January 2004.
- Mitra, S. and De, A.K. : Design and implementation of a multi thread virtual search engine simulator using Java network architecture, *Proc. Intl. Conf. on Computers and Devices for Communication, (CODEC 2004)*, CD version, January 2004.
- Mukherjee, D.P. and Maitra, S. : Robust buyer authentication scheme for multimedia object, *ICAE 2003*, IEEE Signal Processing Society, III-97-100, July 2003.
- Muni, D.P., Pal, N.R. and Das, J. : Multicategory classifier design using genetic programming, *Proc. International Conference on Communication, Devices and Intelligent Systems (CODIS 2004)*, 597-599, 2004.
- Pal, S., Das, J. and Majumder, K. : A hybrid neural architecture and its application to temperature prediction, *Joint International Conference on ICANN/WICONIP 2003*, Lecture Notes in Computer Science, 2714, 581-588, June 2003.
- Patal, S.K., Pal, N.R. and Pal, S. : Fuzzy edge detection with human psychovisual facts, *Proc. International Conference on Communications, Devices and Intelligent Systems (CODIS 2004)*, 496-499, January, 2004.
- Saha, S.K., Das, A.K. and Chanda, B. : An efficient search technique for CBIR systems, *Proc. 3rd International Workshop on Content Based Multimedia Indexing (CBMI'03)*, September 2003.

### **Machine Intelligence Unit**

Banerjee, M. and Kundu, M.K. : Content based Image retrieval with fuzzy geometrical features, *IEEE International Conference on Fuzzy Systems (Fuzz IEEE 2003)*, IEEE Press, St. Louis, USA, 932-937, 2003.

Chakraborty, R., Bandyopadhyay, S. and Maulik, U. : Extracting features for protein sequence classification, *Proc. International Conference on Information Technology: Prospects and Challenges (ITPC)*, Kathmandu, 265-270, 2003.

Maiti, S.P., Kundu, M.K. and Nandi, P.K. : Compression resilient image watermarking scheme in spatial domain, *International Conference on Communication, Devices and Intelligent Systems (CODIS 2004)*, Kolkata, India, 558-561, 2004.

Maiti, S.P., Kundu, M.K. and Nandi, P.K. : Spatial watermarking using spread spectrum modulation, *Proc. International Conference on Computers and Devices for Communication (CODEC 2004)*, Kolkata, CD Version, 2004.

Maiti, S.P., Kundu, M.K. and Nandi, P.K. : Robust and low cost watermarking using image characteristics, *Proc. International Conference on Advances in Pattern Recognition (ICAPR 2003)*, D. P. Mukherjee and S. Pal (eds.), Allied Publishers, Kolkata, 351-354, 2003.

Mitra, S., Kundu, M.K., Murthy, C.A., Bhattacharya, B.B. and Acharya, T. : Digital watermarking using homogeneity measure in image, *IEEE International Conference on Convergent Technologies for Asia Pacific (TENCON 2003)*, IEEE Press, Bangalore, 1944-948, 2003.

Mitra, P., Uma Shankar, B. and Pal, S.K. : Active support vector machine for pixel classification of remote sensing images, *Proc. 1st Indian International Conference on Artificial Intelligence (IICAI'03)*, Hyderabad, 543-553, 2003.

Narayan, B.L., Murthy, C.A. and Pal, S.K. : Topic continuity for web document categorization and ranking, *Proc. International Conference on Web Intelligence (IEEE/WIC'03)*, Halifax, 310-315, 2003.

Pal, S.K. and Mitra, P. : Rough sets, EM algorithm, MST and multispectral image segmentation, *Proc. 9th International Conference on Rough Sets, Fuzzy Sets, Data Mining, and Granular Computing (RSFDGrC'03)*, Chongqing, China, 104-105, 2003.

Pal, S.K. : Computational theory of perceptions, rough fuzzy granular computing and data mining, *Proc. International Conference on Computers and Devices for Communication (CODEC 2004)*, Kolkata, 2004.

Ray, S.S., Bandyopadhyay, S., Mitra, P. and Pal, S.K. : Bioinformatics in neurocomputing framework: relevance, functions and algorithms, *Proc. Int. Conf. on Computers and Devices for Communication (CODEC 2004)*, Kolkata, CD Version, 2004.

## **Physics and Earth Sciences Division**

### **Physics and Applied Mathematics Unit**

(Chowdhury) Gayen, R. and Mandal, B.N. : Water wave scattering by the two edges of a strip-like ice-cover, *Proc. 19<sup>th</sup> WWWFB*, E.F. Campana and A. Iafrafi (eds.), Cortona, Italy, 28-31 March, 2004.

Ghoshal, K. and Mazumder, B.S. : Stratification effects in a sediment-laden turbulent flow, *Indian Society for Hydraulics*, 161-165, 2003.

Mandal, B.N. and (Chowdhury) Gayen, R. : Scattering of water waves by two thin inclined plates, *Proc. 16<sup>th</sup> IWWWFB*, A. H. Clement and D. Ferrant (eds.), Le Croisic, France, 6-9 April 2003.

Mazumder, B.S., Ghoshal, K., Pal, D.K. and Mondal, K.K. : Measurements of turbulent flow over an artificial wave in an open-channel by 3-D acoustic doppler velocimeter, *Indian Society for Hydraulics*, 398-405, 2003.

## Biological Sciences Division

### *Anthropology and Human Genetics Unit*

Saha, R., Sinha, M. and Dasgupta, P. : Nutritional status and level of fatness among the Bengalee boys aged 7-16 years : Shifting trends over two decades, *Proceedings volume of the National Seminar on Man and Environment : Recent Trends in Human Biology*, A.B. Daschaudhun (ed.), Calcutta University Press, 15-25, 2004.

## Social Sciences Division

### *Economic Analysis Unit*

Narayana, N.S.S., Nath, Sanjoy, Ghosh, Probal : Intervention analysis in time series : An illustration with Indian economic reforms, *Indian Econometrics Society Conference, Souvenir*, Programme Committee, TIES Conference, Ties, ISEC Bangalore, 37-47, 2004.

### *Planning Unit*

Das, S.P. and Ghosh, S. : Endogenous trading bloc formation in a north-south global economy, *International Trade and Factor Mobility*, Oda, Masao (ed.), Institute of Legal Studies, Kansui University, Japan, 35-65, 2003.

### *Psychology Research Unit*

Banerjee, S.N. : A study on the detection of mental retardation among the primary school pupils with the suggestion of their rehabilitation, *National Seminar on inclusion in education : a matter of right to education for all*, Department of Education, Kalyani University, 83-87, 2003.

Bhattacharya, H. : A study on reading and writing competency of Bengali Language of the Neo-literate of North 24 Parganas, *91<sup>st</sup> Indian Science Congress, Chandigarh*, Ranjana Ray (ed.), Indian Science Congress Association, Kolkata, 55-56, 2004.

Dutta Roy, D. : Some teaching models of writing motivation to the children of primary education : Cognitive behavioural approach, *The 4<sup>th</sup> National Conference on Psychological approaches to teacher education*, Panch Ramalingam (ed.), Pondicherry, 35, 2003.

Dutta Roy, D. : Clustering items of GHO-12 in Antarctica expedition., *91<sup>st</sup> Indian Science Congress, Chandigarh*, Ranjana Ray (ed.), Indian Science Congress Association, Kolkata, 26, 2004.

Dutta Roy, D. : Reading and Writing motivation among students in Primary Education . A Psychological Study, *Proceedings of the 11<sup>th</sup> West Bengal State and Technology Congress*, 202, 2004.

Ghosh, A. : Leadership styles and Individualist-Collectivist Orientation of Executives, *7<sup>th</sup> International & 38<sup>th</sup> National Conference of Indian Academy of Applied Psychology*, P. Sinha (ed.), Department of Psychology, JNV University, Jodhpur, 35, 2003.

Gupta, R. : Prolonged Deprivation Profiles of School going Adolescent Boys and Girls, *7<sup>th</sup> International & 38<sup>th</sup> National Conference of Indian Academy of Applied Psychology*, P. Sinha (ed.), Department of Psychology, JNV University, Jodhpur, 36, 2003.

Mukhopadhyay, S. : Value importance as a moderator of the organizational awareness – mental health relationship. *91<sup>st</sup> Indian Science Congress*, Chandigarh, Ranjana Ray (ed.), Indian Science Congress Association, Kolkata, 13, 2004.

#### **Sociological Research Unit**

Ramachandran, V.K. and Swaminathan, M. : Financial Liberalisation and Rural Banking In India, *Conference volume of the Third International Symposium on Agricultural Modernization*, organized by the Rural Development Institute of the Chinese Academy of Social Sciences on April 19-21, 2003.

#### **Statistical Quality Control & Operations Research Division**

Aris, M.Z. : Change point detection in reliability models, *International Symposium on Emerging Strategies for Improving Productivity, Quality and Reliability*, Kolkata, 2003.

Biswas, A.K. and Manna, D.K. : Bipartite matching problem in manufacturing. *International Conference on Operations Research with Economic and Industrial Applications*, Indian Statistical Institute, Kolkata, 2004.

Chinnagiri M., Acharya, U.H. and Rao, T.S. : Quality engineering of insulators: A holistic approach, *Proceedings of the 9<sup>th</sup> Annual Research Seminar*, Dr. W. Edwards Deming Institute, NY, USA, 61-71, 2003.

Chinnagiri, M. : Fallacies during six sigma implementation, *Proceedings of 10<sup>th</sup> Annual Research Seminar*, Dr. W. Edwards Deming Institute, NY, USA, 101-107, 2004.

Chinnagiri, M. : Software process capability enhancement using statistical tools and techniques, *Proceedings of the ASIA SEPG<sup>SM</sup> 2003 Annual Conference*, QAI, New Delhi, 1-11, 2003.

Chinnagiri, M. and Acharya, U.H. : Achieving total quality : the deming way, *Proceedings of 10<sup>th</sup> Annual Research Seminar*, Dr. W. Edwards Deming Institute, NY, USA, 94-100, 2004.

Das, P.K. : Reduction in delay in procurement using six sigma philosophy, *in the session Managing six sigma in an organization of the conference on Six Sigma – A search for right answers*, 11-12 February, 2004.

Das, P.K. : Study on improvement of availability and utilization of lippers, *Industrial Applications -IV of the ICOR-2004 conference*, 8-10 February, 2004.

Gijo, E.V. and Rao, T.S. : Six sigma implementation : hurdles and more hurdles, *Proceedings of the Conference on Six Sigma*, Indian Statistical Institute, Bangalore, 1-5, 2004.

Majumdar, A. : Errors of sigma calculation using prescriptive methods, *Conference on "Six Sigma – A search for right answers*, 11-12 February, 2004.

Manna, D.K. : Project scheduling, *Operations Research : Sequencing, Scheduling and Inventory Models (AOR-1: Block 3, Unit 8)*, Indira Gandhi National Open University, New Delhi, 28-54, 2003.

Manna, D.K. : Sequencing, *Operations Research : Sequencing, Scheduling and Inventory Models (AOR-1: Block 3, Unit 7)*, Indira Gandhi National Open University, New Delhi, 5-27, 2003.

Mondal, S., Pal, S. and Manna, D.K. : Machine shop scheduling – an application, *International Conference on Operations Research with Economic and Industrial Applications*, Indian Statistical Institute, Kolkata, 2004.

Mulhopadhyay, A.R. : Reduction of packing rejection of yarn adopting six sigma way, *Conference on Six Sigma – A search for right answers*, 11-12 February, 2004.

Murthy, A.L.N. and Murthy G.S.R. : Scientific management system for irrigation and water supply, *International Conference on Operations Research with Economic and Industrial Applications*, Indian Statistical Institute, Kolkata, 2004.

Murthy, A.L.N., Murthy, G.S.R., Bhimasankaram, P. and Parthasarathy, T. : Positive semi-definite matrices and linear complementarity problem, *International Conference on Operations Research with Economic and Industrial Applications*, Indian Statistical Institute, Kolkata, 2004.

Pradhan, B. and Chakraborty, T.K. : Single sampling LTPD plans as a two-stage stochastic programming problem, *International Conference on Operations Research with Economic and Industrial Applications*, Indian Statistical Institute, Kolkata, 2004.

Rajagopal, A. : Improving efficiency of winding in an autoconer, *International Symposium on Emerging Strategies for Improving Productivity, Quality and Reliability*, Kolkata, 2003.

Rajagopal, A. : Techno-economic viability of sick unit by restructuring "NPA" and rehabilitating through breakthrough approach, *International Symposium on Emerging Strategies for Improving Productivity, Quality and Reliability*, 12-14 Dec. 2003, Kolkata.

Rangacharya, N.C.V., Ramana, M.S.V., Murthy, A.L.N. and Murali Rao, G. : Developing a project management efficiency metric using six sigma concepts for ITES project, *Conference on Project Management in IT Sector*, Project Management Institute, 25-26 April 2003, Conference Digest, 37-45, 2003.

Sampangi, R.D. and Parthasarathy, T. : Relationship between P and Q-properties of the linear transformation, MA in SDLCP, *International Conference on Operations Research with Economic and Industrial Applications*, Indian Statistical Institute, Kolkata, 2004.

## Library, Documentation and Information Sciences Division

### Documentation Research and Training Centre

Aruna, A. and Prasad A.R.D : Metadata encoding and transmission standard: an Overview, *Semantic Web*, A.R.D. Prasad (ed.), DRTC, ISI BC, Bangalore, Paper-J 1-30, 2003.

Madalli, D.P : A Digital Library of Library and Information Science using Dspace, *Semantic Web*, A.R.D Prasad (ed.), DRTC, ISIBC, Bangalore, PaperG:1-12, 2003.

Prasad A.R.D : An overview of the Semantic Web, *Semantic Web*, A.R.D. Prasad (ed.), DRTC, ISI BC, Bangalore, Paper-A 1-10, 2003.

Prasad, A.R.D and Aruna, A. : Standard and guidelines for digitization and digital repositories in National libraries, *ICONLIS Conference 2004*, H.K. Kaul (ed.), National Library, Kolkata, 251-269, 2004.

Rao, I.K. Ravichandra : Data mining and clustering techniques, *Workshop on Semantic Web*, A.R.D. Prasad (ed.), DRTC, ISI BC, Bangalore, Paper K: 1-12, 2003.

Rao, I.K. Ravichandra : Six sigma applications to Library and Information Science, *Conference on Six Sigma*, A.K. Chaudhuri (ed.), SQC, ISI BC, 1-5, 2004.

Rao, I.K. Ravichandra, Sahoo, B.B. and Egge, Leo : A distribution of papers based on fractions counting : an empirical study, *9<sup>th</sup> International Conference on Scientometrics and Informetrics*, ISSI, China, 241-250, 2003.

## Computer and Statistical Services Centre (CSSC)

Bagchi, A. with two other co-authors : SONSYS – A system to model a social network. *Proc. 8th International Conference on Information Technology*, Bhubaneswar, December 22-25, 2003.

## Papers Published In Books

### Theoretical Statistics and Mathematics Division

#### Stat-Math Unit, Kolkata

Basu, S. and Bose, A. : A gentle introduction to resampling plans, *Statistical Computing: Existing Methods and Recent Developments*, D. Kundu and A. Basu (eds.), Narosa, New Delhi, 233-264, 2004.

Ghosh, J.K. and Mukhopadhyay, N. : Parametric Empirical Bayes Model Selection – some Theory, Methods and Simulation, *IMS Lecture Notes in honor of Rabi Bhattacharya, K. Athreya et al* (eds.), U.S.A., 2003.

Goswami, A. and Sengupta, A. : Polynomially Harmonizable Processes and finitely polynomially determined Levy Processes, *Lecture-Notes Monograph Series, Institute of Mathematical Statistics, Probability, Statistics and their applications: Papers in Honor of Rabi Bhattacharya, Athreya et al* (eds.), Vol. 41, 153-168, 2003.

Sarkar, Rudra, P. and Sitaram, A. : The Helgason Fourier transform for symmetric spaces, *Trends in Mathematics*, Vol. 24. Sreedharan et al (eds.), Birkhauser, Basel, 467-473, 2003.

#### Stat-Math Unit, Delhi

Bhatt, Abhay G., Xiong Jie and Rajput Balram : Zakai equation of nonlinear filtering with Ornstein-Uhlenbeck noise: Existence and Uniqueness, *Stochastic Processes and Functional Analysis: Recent Advances, A Volume in Honor of Professor M.M. Rao, A.C. Krinik and R.J. Swift* (eds.), Marcel Dekker, Inc., New York, 67-79, 2004.

Dey, A. and Mukerjee, R. : Symmetrical Factorial Experiments : A Mathematical Theory, *Connected at Infinity*, R. Bhatia (ed.), Hindustan Publ. Co., New Delhi, 3-17, 2003.

#### Stat-Math Unit, Bangalore

Dasgupta, A. and Ramasubramanian, S. : Transition density of a reflected symmetric stable Levy process in an orthant, *Probability, Statistics and their Applications: Papers in honor of Rabi Bhattacharya, K.B.Athreya, M.Majumdar, M.Puri and Ed Waymire* (eds.), Institute of Mathematical Statistics, Beachwood, Ohio, USA, 117-131, 2003.

Ramasubramanian, S. : Diffusions and the martingale problem of Stroock and Varadhan, *Connected at infinity: a selection of mathematics by Indians*, R.Bhatia (ed.), Hindustan Book Agency, New Delhi, 105-129, 2003.

## Computer and Communication Sciences Division

### Electronics and Communications Sciences Unit

Bhattacharya, M. and Dutta Majumdar, D. : Fusion of multimodel medical images using Dempster-Shafer evidential reasoning, *Fuzzy Set Theory and its Mathematical Aspects and Applications*, A.K. Srivastava (ed.), Allied Publishers, New Delhi, 81-96, 2003.

De, A.K., Mitra, S. and Mondal, A. : Cloud motion vector estimation from sequences of satellite (IR) images, *Advances in Pattern Recognition (ICAPR'03)*, Mukherjee D.P. and Pal S. (eds.), Allied Publishers, New Delhi, 417-422, 2003.

Dhara, B.C. and Chanda, B. : Image compression algorithm using BTC and pattern fitting method, *Advances in Pattern Recognition (ICAPR'03)*, D.P. Mukherjee and S. Pal (eds.), Allied Publishers, New Delhi, 299-302, 2003.

Dutta Majumder, D. : Complexity analysis, uncertainty management and fuzzy dynamical systems: with some case studies. *Fuzzy Set Theory and its Mathematical Aspects and Applications*, A.K. Srivastava (ed.), Allied Publishers, New Delhi, 40-45, 2003.

Dutta Majumder, D. : Pattern recognition (PR) and machine learning (ML) . current trends and some applications, *Mathematical Modeling in Biology and Medicine*, J. Mishra (ed.), Mathematical Science Series, Narosa Publishing House, Delhi, 2003.

Lahiri, T. and Dutta Majumder, D. : Fuzzy multifractal approach in the study of texture complexity in an image database, *Fuzzy Set Theory and its Mathematical Aspects and Applications*, A.K. Srivastava (ed.), Allied Publishers, New Delhi, 131-135, 2003.

Mandal, S., Chowdhury, S.P., Das, A.K. and Chanda, B. : Automated detection and segmentation of form document, *Advances in Pattern Recognition (ICAPR'03)*, D.P. Mukherjee and S. Pal (eds.), Allied Publishers, New Delhi, 284-288, 2003.

Mukherjee, D.P. and Dutta Majumder, D. : Tongue image analysis software, *Intelligent Systems Design and Applications Series*, A. Abraham, M. Franke and M. Koppen (eds.), Springer Verlag, New York, 403-412, 2003.

Saha, S.K., Das, A.K. and Chanda, B.: Graytone image retrieval using shape feature based on petal projection, *Advances in Pattern Recognition (ICAPR'03)*, D.P. Mukherjee and S. Pal (eds.), Allied Publishers, New Delhi, 252-256, 2003.

## Physics and Earth Sciences Division

### *Physics and Applied Mathematics Unit*

Das, P.K. : Coherent vectors as eigenvectors of a backward shift on a Deformed Hilbert Space, Nova Science Publishers, Inc., USA, 2003.

Ghosh, S.: Noncommutative planar field theories, *Progress in Field Theory Research*, Frank Columbus (ed.), Nova Science Publishers, Inc., USA, 2004.

Ghosh, S. : The Saiberg-Witten map in noncommutative field theory : An alternative interpretation. *Relativity, Gravitation, Cosmology*, V. V. Dvoeglazov (ed.), Nova Science Publications, New York, USA, 2003.

Mazumder, B.S. and Bandyopadhyay, S. : Longitudinal dispersion of settling of particles in oscillatory turbulent shear flows, *Environmental Pollution*, Singh & Yadava (eds.), Allied Publishers Pvt. Ltd. 326-332, 2003.