

## **Review of the activities of Indian Statistical Institute** **for the year 2016-2017**

The Indian Statistical Institute, Kolkata was established on 17<sup>th</sup> December, 1931 and was registered as a non-profit learned society under the Societies Registration Act (XXI of 1860) on 28<sup>th</sup> April, 1932 and subsequently came under the purview of the West Bengal Societies Registration Act (XXVI of 1961) which was amended in 1964. For its substantial contribution to the quality of theoretical and applied statistical work, the Institute was recognised as an “Institute of national importance” by “The Indian Statistical Institute Act, 1959, No.57 of 1959” of the Parliament on 24<sup>th</sup> December, 1959. By virtue of this Act, the Institute was empowered to award degrees and diplomas in statistics. As a result, Bachelor of Statistics B.Stat. (Hons.), Master of Statistics (M.Stat.) and Ph.D. programmes started in July, 1960. Scope was further enlarged by the “Indian Statistical Institute (Amendment) Act, No.38 of 1995” of the Parliament, when Institute was empowered to award degrees/diplomas not only in Statistics but also in Mathematics; Quantitative Economics; Computer Science; Library & Information Science; Quality, Reliability & Operations Research and such other subjects related to statistics. The Institute is engaged in an integrated programme of research, training & practical application of statistics through several projects in close collaboration with the Govt. of India, maintaining a very high standard as a centre of excellence which has resulted in its earning several national/ international recognitions over the years.

2. The objectives of the Institute are:

- (i) to promote the study and dissemination of knowledge of statistics, to develop statistical theory and methods, and their use in research and practical applications generally with special reference to problems of planning of national development and social welfare.
- (ii) to undertake research in various fields of natural and social sciences, with a view to the mutual development of statistics and these sciences.
- (iii) to provide for and undertake the collection of information, investigations, projects and operational research for purposes of planning and the improvement of efficiency of management and production.
- (iv) to undertake any other ancillary activities in fulfillment of the objectives (i), (ii) and (iii) above.

3. The Institute has its Headquarters in Kolkata with four other centres at Delhi, Bangalore, Chennai and the North-East centre at Tezpur, Assam. The Institute has also a branch at Giridih and network of service units of Statistical Quality Control and Operations Research Division across the country at Mumbai, Coimbatore, Pune and Hyderabad besides Kolkata, Delhi, Bangalore and Chennai.

4. As envisaged in the “Indian Statistical Institute Act, 1959, No. 57 of 1959”, the Institute is fully funded by the Government of India. The major amount of internal receipts comes from the sale of prospectus, realisation from staff on account of licence fee, share of overhead charges from externally funded projects, fees from consultancy rendered by the Statistical Quality Control and Operations Research Division etc.

5. The accounts of the Institute for 2016 - 2017 has been audited by M/s. S.K. Mallick & Co. Chartered Accountants, Kolkata who were appointed by the Institute for the purpose after their selection by the Govt. of India in consultation with the Controller & Auditor General, India and the Institute, as per provision contained in Section 6 (1) of the “Indian Statistical Institute Act, 1959, No. 57 of 1959”.

6. The programme of work in a particular year, the financial estimates thereof and quantum of grants to be given by the Ministry of Statistics and Programme Implementation for the purpose, are decided in the light of the recommendations of a committee set up by the Ministry of Statistics and Programme Implementation under Section 8 (1) of the “Indian Statistical Institute Act, 1959, No. 57 of 1959”. The composition of the committee includes distinguished economists and scientists as well as representatives from the Govt. of India, namely the Ministry of Statistics & Programme Implementation and Ministry of Finance. The programme of work and the expenditure estimates/grants for 2016-2017 were accordingly worked out on the basis of the recommendations of the aforesaid committee. During the year 2016-2017, the Committee recommended Rs.21636.00 lakhs (Government Grant Rs. 21186.00 lakhs and ISI internal receipt Rs. 450.00 lakhs) under Non-Plan (BE) and Rs. 21145.06 lakhs under Plan (BE). The Government approved a sum of Rs.18881.10 lakhs and of Rs.8000.00 lakhs for Non-Plan and Plan expenditure respectively. At the revised estimate stage, the Institute sought for a grant of Rs.20369.86 lakhs and Rs.11800.00 lakhs under Non-Plan and Plan respectively, which was also recommended by the Section 8(1) Committee. The Government sanctioned a grant of Rs.16715.52 lakhs (including the negative balance of Rs.10.98 lakhs during the financial year 2015-2016) under Non-Plan and the Plan RE allocation was fixed at Rs.6089.85 lakhs (including the amount of Rs.1160.15 lakhs expenditure over income during the financial year 2015-2016). The non-plan expenditure was less by Rs.618.69 lakhs from the fund allotted by the Ministry and Miscellaneous receipt. Plan Expenditure was Rs.813.46 Lakhs over the fund allotted.

7. During the year, the Institute continued to conduct its regular and professional courses for students leading to award degrees in B.Stat. (Hons.); B.Math. (Hons.); M.Stat. (M-Stream and S-stream); M.Math; Master of Science (M.S.) in Quantitative Economics; M.Tech. in Computer Science; M.Tech. in Quality, Reliability & Operations Research (QROR); MS in Library and Information Science; PG Diploma in Statistical Methods and Analytics; PG Diploma in Business Analytics; PG Diploma in Computer Applications; Research Fellowship in Statistics; Mathematics; Quantitative Economics; Computer Science; Quality, Reliability & Operations Research; Physics and Applied Mathematics; Agriculture & Ecology; Human Genetics; Geology; Linguistics and Library & Information Science.

8. The Institute runs the International Statistical Education Centre (ISEC), an Associate Institute in Kolkata, under the auspices of the UNESCO and the Government of India. The centre provides training in theoretical and applied statistics at various levels to selected participants from the countries in the Middle-East, South and South-East Asia, the Far-East and the Commonwealth countries in Africa. Major training programme of the centre is a 10-month regular course in Statistics leading to Statistical Training Diploma. In addition, special courses of varying duration were also organized. During the year, ISEC successfully completed its training program of 70<sup>th</sup> Term of the Regular Courses with 28 trainees from fifteen different countries like Afghanistan, Bangladesh, Congo, Côte d’Ivoire, Ethiopia, Fiji, Ghana, Kenya, Mongolia, Niger, Nigeria, South Sudan, Sri Lanka, Tanzania and Zambia and awarded Statistical Training Diploma.

9. R.C. Bose Centre for Cryptology and Security is presently functioning from 203, B.T. Road Campus and conducting various Diploma courses and short term training programmes for the Defence Personnel apart from providing necessary help to the various wings of Indian Defence establishments in respect of Cryptology and Cyber Security Research. The planning, design, engineering and construction work for its new premises has been entrusted to M/s. National Buildings and Construction Corporation Limited. The construction of Cryptology Centre, Hostel Building and Residential Units are in progress at the Gupta Niwas Campus of the Institute.

10. The Associate Institute, “Center for Soft Computing Research: A National Facility”, which was established in 2004 is primarily funded by the Department of Science and Technology, Govt. of India under its IRHPA (Intensification of Research in High Priority Areas) scheme.

11. The Annual Report for the year 2016 - 2017 indicates the details of research work carried out by the Institute during the year in Theoretical Statistics and Mathematics Division; Applied Statistics Division; Computer and Communication Sciences Division; Physics and Earth Sciences Division; Biological Sciences Division; Social Sciences Division; Statistical Quality Control & Operations Research (SQC & OR) Division; and Library, Documentation & Information Sciences Division. The composition of each Division is given below:

**Theoretical Statistics and Mathematics Division:** Stat-Math Unit at Kolkata, Delhi, Bangalore and Chennai.

**Applied Statistics Division:** Applied Statistics Unit at Kolkata and Chennai, Interdisciplinary Statistical Research Unit at Kolkata Applied and Official Statistics Unit at North-East Centre, Tezpur.

**Computer and Communication Sciences Division:** Advanced Computing & Microelectronics Unit, Computer Vision & Pattern Recognition Unit, Electronics & Communication Sciences Unit, Machine Intelligence Unit, Cryptology and Security Research Unit at Kolkata, Documentation Research and Training Centre, Systems Science & Informatics Unit at Bangalore and Computer Science Unit at Chennai.

**Physics & Earth Sciences Division:** Geological Studies Unit and Physics & Applied Mathematics Unit at Kolkata.

**Biological Sciences Division:** Agricultural & Ecological Research Unit, Biological Anthropology Unit and Human Genetics Unit at Kolkata.

**Social Sciences Division:** Economic Research Unit, Linguistic Research Unit, Population Studies Unit, Psychology Research Unit, Sampling & Official Statistics Unit at Kolkata, Sociological Research Unit at Kolkata and Giridih, Economic Analysis Unit at Bangalore and Economics Planning Unit at Delhi.

**Statistical Quality Control & Operations Research (SQC & OR) Division:** Bangalore, Chennai, Coimbatore, Delhi, Hyderabad, Kolkata, Mumbai, Pune and a Central SQC (CSQC) Office at Kolkata.

**Library, Documentation & Information Sciences Division:** Central Library at Kolkata, Chennai, Delhi, Bangalore and Tezpur.

There is also a Computer and Statistical Services Centre (CSSC), which manages the central computing facilities of ISI, Kolkata. Throughout the year, the IT infrastructures of the Institute have been updated/ developed by the CSSC. The IT infrastructure of the Institute including server's virtualization (cloud), software [Vmware (esxi and Vcenter), Matlab, Mathematica, ArcGis, R etc], Network (wired and wifi), Network and Internet security, IP Telephones, Video conferencing facility, e-library and internet facilities (NKN - 1 gbps) were managed by the CSSC and used by all the Centers of the Institute as a LAN. The meetings including Academic Council meetings among the Institute's Centers (Delhi, Bengaluru, Chennai and Tezpur) and Giridhi Unit through Video Conferencing facilities were managed by the CSSC. The classes (M.Tech. in Computer Science and PGDA of ISI Tezpur) through video conferencing facilities were organized by the CSSC throughout the year. The Server of the accounting package FACT installed in ISI Kolkata was accessed from all outlying Centers and Unit through the Site-to-Site VPN connections for maintaining central accounts system of the Institute. The CSSC also arranged to provide technical support to the Institute by Computer Trainees trained by the CSSC.

## 12. Externally Funded Project

Apart from theoretical and experimental plan research, the Institute undertook a variety of about one hundred and twenty-two externally funded projects from different Government and non-Government organizations like CAGE, Warwick University, UK; Manchester University; IGC, London School of Economics, London; European Commission; German Ministry of Education; Goethe University, Germany; Marie Curie Research Staff Exchange Fellowship of 7<sup>th</sup> European Community Framework Programme; CBE, Canada; Russian Federation of Basic Research (RFBR), Russia; India-Taiwan Joint Research Programme in Science & Technology; Indo-French Center for Promotion of Advanced Research; IBM, USA; Hewlett Packard (Global Soft & Global Analytics); DU, Dubai, United Arab Emirates; Infosys Technologies Ltd.; Intel Corporation, USA; NetApp Inc, USA; Microsoft Research India; Samsung Electronics, Korea; Youribot Limited, Hong Kong, China; DRDO, Govt. of India; Department of Atomic Energy, Govt. of India; ISRO-Chandrayaan, Govt. of India; NIA, Ministry of Home Affairs, Govt. of India; Department of Information Technology, Govt. of India; Ministry of Defence, Government of India; Ordnance Factory; Planning Commission, Government of India; Reserve Bank of India; Mother Dairy, New Delhi; MYK, Hyderabad; National Highways Authority of India; National Institute of Biologicals; Naval Armament Inspectorate (NAI), Karaikudi; DGCI & S, Govt. of India; Airport Authority of India; Centre for Artificial Intelligence and Robotics; Coal India Limited; Council of Scientific and Industrial Research (CSIR), Govt. of India; DBT, Govt. of India; DeitY, MCIT, Govt. of India; DST-JSPS and DST-SERB, Govt. of India; ICSSR, Govt. of India; UGC; HAL Management Academy, Bangalore; Advanced Systems Lab Hyderabad; SBI Associate Banks; State Bank of India; Science and Engineering Research Board, Scientific Analysis Group, Govt. of India; Government of Gujarat; DST, New Delhi; Department of Biotechnology, Govt. of WB; DST, Govt. of WB; Telangana State Electricity Regulatory Commission; National Tea Research Foundation; Adani Power, Ahmadabad; Aditya Birla Fashion & Retail Limited, Bangalore; Airbus India, Bangalore; Asian Paints; Bannari Amman; Bilcare; Biocon Ltd., Bangalore; Aditya Birla Group Companies; Centum Electronics; Crossdomain Solutions, Bangalore; Deloitte, Hyderabad & Mumbai; FIAT, Pune; Gallagher Operations Support Services Pvt. Ltd., Pune; H&R Johnson (India); Hinduja

Global Solutions; Hitachi India Limited, Bangalore; Hitachi India Private Limited; Hollingsworth & Vose India, Mysore; Huawei Technologies; ITC Limited – PSPD, Bhadrachalam, Tribeni, Bollaram and Kovai; J.K. Paper Ltd., Rayagada, Orissa; Jindal Steel and Power; L&T EBG, Mumbai; L&T Infotech Ltd.; Noble Hygiene, Mumbai; Society for Indian Automobile Manufacturers; Symbiosis Institute of Business Management, Lavale; TACO Group; Tata Consultancy Services Limited (TCS ion); Tata Steel; Technova Imaging Systems Ltd; Titan Jewellery Division (Tanishq), Hosur; TVS Motors, Hosur; Vodafone International; XIMB, Bhubaneswar etc.

### 13. Seminars, Workshops, Conferences, Symposiums etc. organized

During the year, the Institute organized several seminars, workshops, conferences, symposiums with the participation of leading academicians/scientist from India and abroad. A few of them are highlighted below:

- International Workshop-cum-Conference on “*Game Theory and optimization*”: SQC & OR Unit, Chennai, held at IIT, Madras, Chennai, June 6-10, 2016.
- 4<sup>th</sup> International Conference on “*India Biodiversity Meet, 2016*”: jointly organized by AERU, Kolkata and Government College of Engineering and Textile Technology, Berhampur, in collaboration with Biomathematical Society of India, October 24 – 27, 2016.
- International conference and workshop on “*Recent advances in Operator Theory and Operator Algebras – 2016 (OTOA-2016)*”: Stat-Math Unit, Bangalore, December 13-22, 2016.
- International Workshop on “*Pattern Analysis and Applications (IWPA 2017)*”: CVPR, Kolkata, January 18-20, 2017.
- International Workshop on “*Open Data Repositories*”: DRTC, Bangalore, March 1-3, 2017.
- National Conference on “*Condensed Matter Physics*”: PAMU, Kolkata, February 2–3, 2017.
- National Symposium on “*Psychology in Diabetes: issues, challenges and care*”: PRU, Kolkata in collaboration with Indian Academy of Health Psychology, March 1, 2017.
- 2<sup>nd</sup> National Workshop on “*Medical Imaging*”: ECSU, Kolkata, in collaboration with IASST Guwahati and ECSU, ISI, March 8-9, 2017.
- Symposium on “*Interdisciplinary Statistical Research*”: ISRU, Kolkata, June 28, 2016.
- Training Programme on “*Advanced topics on Discrete Logarithms over Finite Fields & Elliptic Curves*”: Stat-Math Unit, Delhi, held at DRDO, New Delhi, July 14-22, 2016.
- Mini Workshop on “*Linear complementarity and its generalizations*”: SQC & OR Unit, Chennai, September 24-25, 2016.

- 2<sup>nd</sup> Symposium on “*Climate Change and Agricultural Yield in Karnataka*”: EAU, Bangalore in collaboration with Karnataka Government, November 9, 2016.
- State-Level Workshop on “*Mathematics, Computer Science and Cryptology*”: CSRU, Kolkata held at Department of Mathematics, Brahmananda Keshab Chandra (BKC) College, Kolkata, November 8, 2016.
- 12<sup>th</sup> Annual Conference on “*Economic Growth and Development*”, EPU, Delhi, December 19-21, 2016.
- 6<sup>th</sup> Conference on “*West Bengal Growth*”: SOSU, Kolkata in collaboration with IGC and Jadavpur University, held at Jadavpur University, December 26-27, 2016.
- Training Programme on “*Winter School on Biological Research Methods*” (for Research Scholars and young faculty members of different Universities /Institutes across India): BAU, Kolkata, January 16 – 23, 2017.
- Symposium on “*XIII Annual Group Meeting of the All India Coordinated projects on Nematodes*”: organized by AERU, Kolkata in collaboration with Indian Council of Agricultural Research, New Delhi, February 24-25, 2017.
- Symposium on “*Human Genetics: Techniques and Statistical Analyses*”: HGU, Kolkata, held at Assam University, Silchar, March 23-24, 2017.
- Orientation Training Programme on “*Data analytics in Psychological Research*”: PRU, Kolkata held at the Indian Statistical Institute, Giridih Branch, Jharkhand, March 29, 2017.
- Workshop on “*Machine Intelligence and Applications*”: MIU, Kolkata, March 30, 2017.
- Workshop on “*Data Science and Machine Learning*”, CSCR, Kolkata, March 28-31, 2017.

#### 14. Publication

The internationally renowned journal *Sankhyā*, an official publication of the Indian Statistical Institute, was founded by Professor P.C. Mahalanobis in 1932 and began publication under his editorship. It is devoted to original research articles in Probability, Mathematical Statistics and Applied Statistics. Reviews and discussion articles on current research activity in the above areas are also published. A rigorous peer review process is followed for acceptance of articles submitted for publication in *Sankhyā*. Many seminal articles in Probability, Theoretical Statistics and Applied Statistics have appeared in *Sankhyā*. The journal is published in two separate series – Series A and Series B. Series A with two issues per year, one in February and the other in August, covers Probability and Theoretical Statistics, while Series B with two issues per year, one in May and the other in November, covers Applied and Interdisciplinary Statistics. Beginning 2010, Springer has entered into a co-publication agreement with the Institute and has taken over exclusive rights for the international distribution of the journal, in both prints and electronic editions from 2010. The editorial

system is now completely electronic, that is, the entire process starting from submission of articles to editorial processing ending in final editorial decision for articles is now done online. The free access to the electronic editions of *Sankhyā* is expected to be available for all scientific workers of the Institute through Springer.

#### 15. Scientific Papers and Publications

During the year, about 701 scientific papers were published in different journals of national and international repute.

#### 16. Scientific Assignments Abroad

One hundred fourteen Scientists of the Institute visited a number of foreign countries either on invitation or under cultural exchange programme for attending international seminars and conferences. Most of them presented scientific papers and delivered lectures in those seminars and conferences. Countries visited by ISI faculty members were Austria, Australia, Argentina, Algeria, Bangladesh, Brazil, Brussels, Chile, China, Chicago, Canada, Denmark, Dubai, France, Germany, Greece, Hongkong, Hungary, Israel, Italy, Indonesia, Japan, Korea, Kuala Lumpur, Morocco, Moscow, Malaysia, Mexico, Norway, New Zealand, Nepal, Poland, Portugal, Russia, Sri Lanka, South Korea, South Africa, Slovenia, Spain, Saudi Arabia, Switzerland, Sweden, Singapore, Thailand, Turkey, Taiwan, the Netherlands, UK, USA, Vietnam etc.

#### 17. Visiting Scientists

Two hundred and eighty scientists from Abu Dhabi, Australia, Belgium, Brazil, Czech Republic, Canada, China, Denmark, Dallas, France, Germany, Hungary, Israel, Iran, Italy, Ireland, Japan, Malawi, Malaysia, Poland, Spain, Serbia, South Africa, Singapore, Taiwan, The Netherlands, USA, UK and India visited the Institute to attend various Workshops, Conferences, Seminars etc. and also to participate in collaborative research, teaching and other scientific activities of the Institute.

#### 18. Recognition to ISI Scientists

In appreciation and recognition to the high standard of research and scientific excellence maintained by the researchers of the Institute, several faculty members received laurels in the forms of Awards, Fellowship from organizations/bodies of national and international repute like Govt. of India, IEEE, INSA, DST etc. Several faculty members served as Visiting Scientist, Honorary Professor, Visiting Professors in various universities in US and Europe; Indian Council of Social Sciences Research (ICSSR); Indian National Science Academy etc. Besides, many faculty members were invited by national and international Institute/bodies to act as chairman, members, chief editor, editor in their several committees/editorial board etc. Among those, some of the most notable recognitions earned by the faculty members during the year 2016-2017 are indicated below: -

- Antar Bandyopadhyay has been awarded IISA 2016 Young Researcher Award in the Theory category by the Indian International Statistical Association (IISA), 2016.
- Jaydeb Sarkar has been awarded NASI-Scopus Young Scientist Awards, 2016.

- Saurabh Das has been awarded Young Scientist Award in URSI Asia-Pacific Radio Science Conference, Seoul, South Korea, 2016.
- Neena Gupta has been awarded B.M. Birla Science Prize in Mathematics.
- Rajendra Bhatia has been awarded The Hans Schneider Prize 2016 by The International Linear Algebra Society.
- Abhik Ghosh has been awarded International Society for Clinical Biostatistics (ISCB) Conference Awards for Scientists (CASC) for biostatisticians from the countries underdeveloped in clinical biostatistics, 2017.
- Chetan Ghate has been selected the Member of Monetary Policy Committee of the Reserve Bank of India for contribution to research in Indian macroeconomics (four-year term).
- Parthanil Roy has been appointed Youth Representative of Bernoulli Society.
- Bhargab Bikram Bhattacharya has been selected for INAE Chair Professorship by Indian National Academy of Engineering, June 2016 - May 2018.
- Sanghamitra Bandyopadhyay has been selected for J.C. Bose Fellowship, Engineering Sciences by Department of Science and Technology, Govt. of India, 2017-2022.
- Rajat K. De has been selected for Fulbright-Nehru Academic and Professional Excellence Fellowship (Flex Award), 2016- 2018.
- Supratik Pal has been selected for Alexander von Humboldt Fellowship (Alumni Support Grant) by Alexander von Humboldt Foundation, Germany, 2016.
- Dipti Prasad Mukherjee has been selected for Best paper award in 10<sup>th</sup> Indian Conference on Computer Vision, Graphics and Image Processing (ICVGIP), 2016.
- Bobby John has been selected Best Paper for 3rd International Conference on Robust Quality Engineering (ICRQE-2017), 2017.
- B.V. Rajarama Bhat has been selected for J C Bose Fellowship.
- Nikhil Ranjan Pal has been selected for Fellow of The World Academy of Sciences (TWAS), 2016.
- Arunava Sen has been selected for Economic Theory fellow, Society for Advancement of Economic Theory, 2016.

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