Indian Academy of Sciences

Bengaluru

83rd ANNUAL MEETING

3 – 5 November 2017

NEHU, Shillong

ABSTRACTS OF LECTURES

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ABSTRACTS OF LECTURES

3 November 2017: 0930–1100

Venue: Multi Use Convention Centre

Session 1A: Inauguration and Presidential Address

Ram Ramaswamy
Jawaharlal Nehru University, New Delhi

The many flavours of synchrony

Although the phenomenon of synchronization has been described and studied since the 1660's, its full generality has only been realized in the past few decades following developments in the study of nonlinear dynamical systems. In particular, a variety of forms of synchrony are recognised, and in this talk these different flavours will be discussed.

In addition to complete or identical synchrony, there can be phase synchronisation, lag synchrony, projective synchrony, and so on, all of which can be subsumed in the notion of a generalized synchrony. This is probably the most widespread form of temporal correlations that occur in nature and it offers a unified framework within which such collective behaviour can be described. Examples from biological and other natural systems will be discussed to illustrate these ideas.

Speaker's Profile

Ramakrishna Ramaswamy, School of Physical Sciences, JNU, New Delhi, is President of Indian Academy of Sciences (2016–18). Ramaswamy's research interests are in the intersection of nonlinear science, statistical physics, and computational biology. He is also a Fellow of the Indian National Science Academy and of The World Academy of Sciences, (TWAS).

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Session 1B: Inaugural Lectures by Fellows

Venue: Multi Use Convention Centre
Chairperson: M M Sarin, PRL, Ahmedabad

3 November 2017: 1200–1220

Shailesh Nayak
Ministry of Earth Sciences, New Delhi

Towards the understanding of triggered earthquakes

Triggered earthquakes have been receiving increased attention from the scientific community the world over. Artificial water reservoirs are known to induce seismicity; this is known as Reservoir-Induced Seismicity. The Shivaji Sagar and later the Warna reservoirs at Koyna have induced earthquakes during the last 50 years, and many studies have been carried out to understand this phenomenon. However, the current models do not explain their genesis as direct observational data along the fault plane are lacking. To understand reservoir-induced seismicity, scientific deep drilling, approximately 5–7 km deep, has been undertaken at Koyna. An exploratory phase has been completed by drilling nine shallow boreholes (up to 1.5 km) and deploying seismometers. These observations provided hypocentral location and disposition of fault zones responsible for these earthquakes. Based on these data sets, a pilot bore-hole of up to 3 km has been drilled, recently. Geophysical measurements to characterise physical properties of rocks, hydrofrac measurements to measure stress regime, and more, were carried out. Geomicrobiological studies have also been undertaken.

The results of these studies and future study plans related to reservoir-trigger seismicity will be presented.

Speaker's Profile

Shailesh Nayak is a Distinguished Scientist in the Ministry of Earth Sciences, Government of India. He obtained PhD degree in Geology from M.S. University of Baroda in 1980. He was the Secretary of the Ministry of Earth Sciences, during 2008–2015. He set up the state-of-the-art tsunami warning system for the Indian Ocean and provided tsunami advisories to the Indian Ocean rim countries. He has pioneered applications of remote sensing to coastal and marine environments and has developed products for coastal management and services for fishery and ocean state forecast. He was instrumental in initiating studies related to reservoir-induced seismicity. He is a Fellow of the Indian Academy of Sciences (2014), the National Academy of Sciences, India (2015), the International Society of Photogrammetry & Remote Sensing and Academician of the International Academy of Astronautics. He was conferred the ISC Vikram Sarabhai Memorial Award in 2012.

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3 November 2017: 1225–1245

Gobinda Majumder
Tata Institute of Fundamental Research, Mumbai

A journey to the discovery of Higgs Boson

The Higgs Boson was predicted in 1964 to provide masses of the carrier of electro-weak interactions; it was ascribed a range of 0–1 TeV but was not attributed with a specific mass. In the nineties, experiments at Large Electron Positron (LEP) collider at CERN, Geneva, looked for the signature of Higgs Bosons and gradually ruled out Higgs with lower masses (>114.4 GeV). In parallel experiments on proton–proton collision at Tevatron, Fermi National Accelerator Laboratory (FNAL), USA also ended up with the null results. The Large Hadron Collider (LHC), at Geneva, was constructed mainly to look for this Boson, and within few years of operation, experiments at LHC led to the discovery of the Higgs Boson in 2012. In this talk, various steps of this journey will be summarised.

Speaker's Profile

Gobinda Majumder joined TIFR, in 1992, as a graduate student in experimental high energy physics, where he worked in the L3 experiment for his PhD thesis, 'Search for supersymmetric particle in e^+e^- collisions at LEP'. His major contribution, however, was in the choosing of the material for the CMS electromagnetic calorimeter, its size, shape, etc. The discovery of Higgs Boson from the CMS experiment came from that subdetector. After completing his PhD, he joined Syracuse University, New York, in March 1998 for Post-Doctoral work, where he developed software codes for the CLEO-III Ring Imaging Cherenkov detector and studied the feasibility of the proposed BTeV experiment at FNAL. He returned to TIFR as a Fellow (D) in December 2000. Initially, he worked for the BELLE experiment and was involved with the discovery of new charmonium resonances; he also changed the concept of physics with missing energy measurements at asymmetric e^+e^- machine. He had a crucial role in the construction, calibration and installation of the CMS outer hadron calorimeter. He is contributing to the study of the Standard Model physics at CMS experiment. He has also developed the complete INO simulation and reconstruction code from scratch and is taking part in an aspect of INO. At present, he is serving as a professor at TIFR. He was elected a Fellow of the Indian Academy of Sciences in 2015 and National Academy of Sciences, India (NASI) in 2016.

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Session 1C: Inaugural Lectures by Fellow/Associate

Venue: Multi-use Convention Centre
Chairperson: S Ananthakrishnan, Savitribai Phule Pune University, Pune

3 November 2017: 1400–1420

G D Yadav
Institute of Chemical Technology, Mumbai

Selectivity engineering in sustainable production of chemicals, fuels and energy from biomass and carbon dioxide

Biomass conversion technologies consist of sugar platform (biochemical/fermentation), extraction and chemical conversion (syngas) and it provides challenging opportunities. Biorefineries must adopt the Green Chemistry principles. The development of lignocellulose treatments will be key to unlocking a major sugar source for biological conversion into industrial products. Catalysis is the most pivotal principle of Green Chemistry, which inherently aims at reduction of waste, both, of material and energy. Cascade engineered multistep reactions along with complex multifunctional catalyst yield required process intensification at the molecular level. The multifunctional catalyst required for such reactions possess multi-functionality such as acid, base and metal sites. Reactions occur on these multiple sites in a concerted or sequential manner. New opportunities for the conversion of glycerol, co-product of biodiesel, into value-added chemicals have emerged, in recent years, as a result of glycerol's unique structure, properties, bioavailability, and renewability.

The principles of selectivity engineering and cascade engineering in the valorisation of biomass and bio-based products will be the central theme of this lecture.

Speaker's Profile

Ganapati D Yadav is the Vice Chancellor and R.T. Mody Distinguished Professor at the Institute of Chemical Technology (ICT), Mumbai. He is a J.C. Bose National Fellow and Adjunct Professor at RMIT University, Melbourne, and University of Saskatchewan, Canada. He was conferred the Padma Shri by the President of India in 2016. He has provided inspiring leadership to the ICT, the Indian Institute of Chemical Engineers (IIChE), Catalysis Society of India, and Maharashtra Academy of Sciences. He is a Fellow of all the Indian Science academies (Indian Academy of Sciences, elected in 2017) and TWAS. He is the Founder President of the American Chemical Society, India International Chapter. He has been actively involved as Chairman/member of many committees of UGC, AICTE, NAAC, DST, DBT, CSIR, CII, FICCI, ICC, IIChE and ACS, among others.

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3 November 2017: 1425–1445

Abhishek Banerjee
Indian Institute of Science, Bengaluru

What is finiteness?

What is finiteness? We know about finite sets, about finitely generated vector spaces, finitely generated algebras and compact sets. Each of these conveys a notion of finiteness in a certain framework. But is there a single algebraic notion of finiteness that describes them all?

Speaker's Profile

Abhishek Banerjee is currently serving as Assistant Professor at the Department of Mathematics at Indian Institute of Science, since January 2014. During 2013, he was a Maître de Conferences at Collége de France. During 2009–2012, he worked as a postdoc at Institut des Hautes études Scientifiques (IHÉS), Bures-sur-Yvette, France, and Zassenhaus Assistant Professor at Ohio State University. He received PhD in 2009 from Johns Hopkins University in Baltimore, Maryland. His undergraduate degree was in Statistics, and he received BStat (Hons.) in 2005 from Indian Statistical Institute, Kolkata. He was selected as a Young Associate of the Indian Academy of Sciences in 2015.

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Session 1D: Symposium: "New Technologies Changing our Lives"

Venue: Multi Use Convention Centre

Chairperson: N Viswanadham
Indian Institute of Science, Bengaluru

Introduction

Science and technology are more important now than ever before. Agriculture, manufacturing, education, healthcare, entertainment and other services have all changed drastically in the last ten years. New technologies such as mobile internet, IOT, Cloud, Big Data Analytics, 3D printing, Blockchain, digital valets, drones, and driverless cars are creating new industry giants at the cost of old businesses. Start-ups in every area such as Edtech, Fintech, healthcare and entertainment are disrupting well-established institutions such as banks, hospitals, movies, universities, etc., WhatsApp and Twitter have replaced the telephone and email. Indeed, tweets by heads of countries have become the official communications. Agriculture is getting automation trends using driverless tractors, drones and algorithmic decision making for field preparation, fertilisers, sowing, weeding, irrigation and harvesting. Use of machine learning and AI is becoming the new norm for decision making, both in Government and Industry. The past ten years the prices of natural resources: energy, food, water, and materials (steel) are scarce, extraction is expensive. These innovations are creating jobless growth. Countries are becoming protectionist. Companies following asset-intensive, closed innovation models are either going bankrupt or getting acquired. Jobless growth is creating societal unrest. Schools, colleges and institutions of higher education should modernise themselves with the aim of employability of their graduates. Scientific research currently had been curiosity-driven basic research. It is important to be motivated to solve immediate problems, including job creation, using new technologies and resource constraints.

4 November 2017: 1530–1600

Navakanta Bhat
Indian Institute of Science, Bengaluru

PathShodh: A journey from science to product

Navakanta Bhat will describe the fascinating journey of PathShodh in the last few years, traversing through scientific discovery, engineering innovation, entrepreneurial venture and manufacturing scale-up to create one of its kind multi-analyte point of care diagnostic device for multiple chronic diseases including diabetes, kidney and liver disease, anaemia and malnutrition. This device is capable of performing five blood tests (Hb, HbA1c, Serum Albumin, Glycated Albumin, Glucose) and three urine tests (Microalbuminuria, Urine Creatinine and Urine ACR). The low-cost electrochemical sensing technology, which uses disposable test strips, can potentially bridge healthcare divide in the country with a capability to perform tests anywhere, anytime, in remote and resource-challenged areas.

Speaker's Profile

Navakanta Bhat received PhD in Electrical Engineering from Stanford University, Stanford, in 1996. He joined IISc, in 1999, where he is currently a Professor and Chair, Centre for Nano Science Engineering. His current research is focused on Nanoelectronics device technology, Biosensors for point of care diagnostics and Gas sensors for pollution monitoring. He was instrumental in creating the National Nanofabrication Centre (NNfC) at IISc. He is the recipient of several awards including the Young Engineer award, Swarnajayanti Fellowship, Prof. Satish Dhawan award, IBM Faculty award 2007 and Outstanding Research Investigator award. He is associated with IEEE in various capacities. He is the Chairman of the Human Resource Development and Infrastructure committee of the National Program on Micro and Smart Systems. He was a member of the committee set up by the Principal Scientific Advisor to Govt. of India to recommend strategies to develop semiconductor manufacturing ecosystem in India. He is the founder and promoter of a start-up, PathShodh Healthcare Pvt Ltd., which has developed a revolutionary multi-analyte point-of-care diagnostic device for diabetes and its complications.

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3 November 2017: 1600–1630

V Padmanabhan
Microsoft Research India, Bengaluru

Low-cost IoT to address societal challenges

The Internet of Things (IoT) promises to transform industries across the spectrum, by embedding sensing and communication capabilities in things that then push a steady stream of data to the cloud, where this data is converted into actionable intelligence. After surveying the landscape, the speaker in this talk will address the question of how IoT could play a transformative role in the socio-economic context of India and the challenges to be overcome, such as the need to keep costs low and not depend on always-on connectivity. The talk will focus specifically on two domains where research is being pursued at Microsoft Research India: road safety and agriculture. In the former, the speaker will present a system called HAMS that leverages smartphones and other low-cost sensors to monitor drivers and their driving, with a view to providing targeted feedback on unsafe behaviours. In the latter, he will discuss a system called FarmBeats that uses balloon-mounted airborne sensors together with ground sensors to enable data-driven farming.

Speaker's Profile

Venkat Padmanabhan is a Principal Researcher at Microsoft Research India, where he founded the Mobility, Networks, and Systems group in 2007. He was previously with Microsoft Research Redmond, USA, for nearly nine years. His research interests are broadly in networked and mobile systems, and his work over the years has led to highly cited papers and paper awards, technology transfers within Microsoft, and also industry impact. He received the Shanti Swarup Bhatnagar Prize and the inaugural ACM SIGMOBILE Test-of-Time paper award, both in 2016. Venkat holds a B.Tech. from IIT Delhi and an M.S. and a PhD from UC Berkeley, all in Computer Science, and has been elected a Fellow of the INAE, the IEEE, and the ACM.

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4 November 2017: 1630–1700

Amrutur Bharadwaj
Indian Institute of Science, Bengaluru

IoT framework for smart cities: A data-centric perspective

Horizontal data aggregation/dissemination from IoT devices will enable many new intelligent applications for smart cities. The speaker will describe his efforts in that direction, built on top of a hardware test bed consisting of smart street poles. The test bed will enable addressing some research challenges related to developing real-time, spatio-temporally constrained applications as well as larger problems related to smartX systems for cities (X=energy, water, etc.).

Speaker's Profile

Bharadwaj Amrutur obtained B.Tech. from IIT Bombay and MS and PhD from Stanford University. He has worked for ATT, Agilent, Greenfield Networks before joining IISc as faculty where he is a Professor in the ECE Department. He also heads the Robert Bosch Center for Cyber Physical Systems at IISc. His current research interests are in large-scale IoT systems and Cyber-Physical Systems.

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3 November 2017: 1700–1730

Jaywant H. Arakeri
Indian Institute of Science, Bengaluru

Technological and scientific issues related to precision agriculture

The need for increased productivity in agriculture with minimum use of water, fertilizers, pesticides and energy is being increasingly felt, especially in India. Broadly precision agriculture refers to giving the optimum amount of these inputs at the right times. Drip irrigation is an early example and is now widely used in India and the world. Increasingly, development of inexpensive sensor networks, IOT, etc., is leading to infusion of more technology into precision agriculture and is often being termed smart agriculture. There is an urgent need to develop precision agriculture systems for Indian conditions, which often pose unique challenges, like small land holdings and unreliable electrical power. A sorely missing but essential component for developing such technologies is an interaction between researchers from agricultural and biological and engineering sciences and also with the industry. The speaker will present some important scientific and technological issues relevant to precision agriculture in India. He will also present some work done in collaboration between IISc, JNCASR and University of Agricultural Sciences, Bengaluru in this area: development of a new type of ventilated greenhouse, aeroponics for potato tuber cultivation, intermittent drip irrigation, leaf mimic for measuring transpiration and X-ray imaging for detecting insect bores in plants.

Speaker's Profile

Jaywant H Arakeri has been a faculty in the Indian Institute of Science since 1988. He is currently a Professor in Mechanical Engineering and Centre for Product Design and Manufacture. His research interests are in fluid mechanics and heat transfer, in particular stability, transition and turbulence, unsteady flows, turbulent natural convection, solar energy and ventilation. Some of his recent work is related to flow and heat transfer in greenhouses, and moisture loss from leaves and soils. He obtained his BTech. (1979) from IIT Madras, ME (1981) from IISc and PhD (1987) from California Institute of Technology. He was elected a Fellow of the Indian Academy of Sciences in 2011.

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Session 1E: Public Lecture
Venue: Multi Use Convention Centre

Chairperson: Ram Ramaswamy, JNU, New Delhi

3 November 2017: 1800–1900

David R Syiemlieh
Union Public Service Commission, New Delhi

Percival Spear: Historian and Indophile

Indian history has, over the years, drawn the attention of discerning readers for a variety of reasons: its span in time, its geographical coverage, its people and institutions, the polities large and small, and in more recent times, Indian nationalism. Among the many fine historians who have contributed to the understanding of India's past, that of Percival Spear was enormous. As a teacher, he impacted many of his students and scholars. His readers have appreciated his presentation of the histories in a style that was his own. His coverage of Indian history spanned many centuries, up to more recent times. Histories he wrote were broad, seminal, fitting into a distinctive school of historiography and were fine works in literature. In more recent times, his studies have almost been set aside for more pointed and detailed research. Every age has its historians. Such are the histories Percival Spear worked on, that they require attention and appreciation for this great admirer of India, its people and its past.

Speaker's Profile

David R. Syiemlieh, formally a historian, joined as a Professor in the Department of History, NEHU, Shillong, in 1979. Concurrent with this position, he held at different times, Dean of Students' Welfare, Proctor, Director, College Development Council, and Head, Department of History, Controller of Examinations, officiated as Registrar and also was Pro-Vice-Chancellor, NEHU. He was appointed Vice-Chancellor of the RGU, Itanagar, Arunachal Pradesh, in 2011. During his tenure at RGU, Syiemlieh took several path-breaking initiatives in the field of administrative, academic and examination reforms. Awarded an M. Phil. in 1980, he continued research and was conferred with the PhD in 1985. He has received a number of prestigious academic fellowships including a Senior Fulbright Fellowship to Notre Dame University, USA; a Charles Wallace Grant for research in the UK and an Indo-France Cultural Exchange grant for research in Paris. He has authored several books including *On the Edge of Empire: Four British Plans for North East India*, and *Layers of History: Essays on the Khasi-Jaintias.* Syiemlieh was President of the North East India History Association, 2010-2011, an association specialising in the history of North East India. Former Honorary Director of the ICSSR-NERC, Shillong, he was Council Member for two terms of ICHR, New Delhi. He was also Council Member of the ICSSR, New Delhi. Syiemlieh was elected as President of the Modern India Section, Indian History Congress. He joined as Member, UPSC, in 2012 and in January, this year, he was appointed as Chairman, UPSC.

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Session 2A: Special Lecture

Venue: Multi Use Convention Centre
Chairperson: S Chandrasekaran, IISc, Bengaluru

4 November 2017: 0900–0940

R Bhatia
Ashoka University, Sonepat, Haryana

Averaging of positive definite matrices

Positive definite matrices arise in several areas – as covariance matrices in statistics, as density matrices in quantum information, as stiffness matrices in mechanics, as diffusion matrices in fluid flow, as kernels in machine learning. Often, it is required to have an averaging operation that respects some structure of the data set. The speaker will describe one such operation, and its connections with geometry. This geometric mean introduced about ten years ago is finding lots of applications in areas like image processing, brain–computer interface and smoothing of radar data.

Speaker's Profile

Rajendra Bhatia spent most of his professional life at Indian Statistical Institute, Delhi, and has recently joined Ashoka University. Much of his work is on analysis of matrices and operators and its connections with harmonic analysis, Riemannian geometry, approximation theory, numerical analysis, and physics. He has authored five books. He is the founder editor of the series *Texts and Readings in Mathematics*, which has published 75 books, and the series *Culture and History of Mathematics*, which has published 10 books. In 2016, he was awarded the Hans Schneider Prize in Linear Algebra. He was elected a Fellow of the Indian Academy of Sciences in 1993.

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Session 2B: Inaugural Lectures by Fellows

Venue: Multi Use Convention Centre
Chairperson: Veena K Parnaik, CCMB, Hyderabad
4 November 2017: 0940–1000

S Sankararaman
Indian Institute of Technology Madras, Chennai

Restricting the rotation of triple bond through π-stacking interactions in molecular hinges

Restricting the rotation of carbon-carbon triple bonds is much more difficult than that of C-C single bonds, due to low activation barriers and lack of any steric hindrance due to substituents. Restricted rotation of C-C triple bonds is important from the point of view of molecular chirality of π extended biphenyls. Literature examples of restricted rotation of acetylenic bond in diphenylethyne derivatives deal with steric (repulsive) interactions among the bulky silyl and aryl substituents placed in the ortho positions of the phenyl groups. The question of interest is whether or not it is possible to restrict acetylenic bond rotation through weak non-covalent attractive forces such as $\pi - \pi$ interactions between large aromatic units. To address this issue the speaker and his group have designed and synthesised a series of molecular hinges with pyrene chromophore as wings. The first ever example of isolation and X-ray crystallographic structural characterisation of two conformers arising from rotation along a diacetylenic bond was, in fact, reported from their laboratory.

Speaker's Profile

Sethuraman Sankararaman completed B.Sc at the Hindu College, Tirunelveli, in 1979 and M.Sc from IIT Madras in 1981. He completed doctoral thesis in 1985 with Alfred Fischer at the University of Victoria, Canada. After five years of postdoctoral research with Jay K. Kochi at the University of Houston, USA, he returned to India in 1991 and took up a faculty position at IIT Madras. He is currently an Institute Chair professor at IIT Madras. He has received fellowships from the DAAD, INSA-DFG and the Alexander von Humboldt Foundation. He is interested in acetylene and olefin chemistry, the study of $\pi - \pi$ interactions and hydrogen bonding interactions and organic molecules in energy storage applications. He is also interested in PdNHeterocyclic carbene complexes and carbonylation. He authored a book on Pericyclic Reactions – a Textbook, published by WileyVCH in 2005. He has 26 years of teaching experience at IIT Madras. He was elected a Fellow of the Indian Academy of Sciences in 2017.

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4 November 2017: 1005–1025

Maneesha S. Inamdar
Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru

Stuck in traffic: Transport and energy regulation in blood stem cells

The mammalian blood system consists of distinct functionally specialised cell types that are replaced at the rate of over a million cells per second in adult humans. This continuous replenishment is a tightly controlled process that depends on the presence and health of stem cells in the blood. Stem cells can self-renew as well as differentiate to give rise to various precursor and mature cell types in the body. Molecular control of self-renewal and differentiation is key to maintaining blood cell homeostasis. Stress and ageing of the blood vascular system correlate to anaemia, decreased immunity and increased incidence of leukaemia. Despite their enormous clinical potential, mechanisms that regulate the vital properties of self-renewal and multipotency in stem cells are not completely understood. Using various model systems, the speaker and her group have identified molecular networks and processes that regulate blood stem cells. They have shown that cellular transport and energy machineries play an active role in controlling stem cell state and fate. Thus, their findings reveal additional points of control for maintaining stem cells.

Speaker's Profile

Maneesha Inamdar obtained PhD from TIFR, Mumbai, and postdoctoral training at the University of North Carolina, Chapel Hill. She is a Professor at the Molecular Biology and Genetics Unit, JNCASR, where she has established an integrated laboratory of stem cell biology using human embryonic stem cells, mouse and *Drosophila*. She is also an adjunct Professor at inStem, Bengaluru. Inamdar's research is centred on understanding cardiovascular development and physiology, an area that has application in prevention of congenital defects, adult disorders such as cardiovascular disease and cancer, as well as for regenerative therapies. She has established several new models of leukaemia, angiogenesis and cardiovascular development. She pioneered the use of human embryonic stem cell-derived models in the country, and has been instrumental in putting India on the stem cell map. She represents India in the International Stem Cell Initiative projects that include 22 countries and has several national and international collaborations. Her current focus is on disease models and stem cell engineering for cell-based therapies. She was elected a Fellow of the Indian Academy of Sciences in 2017.

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Session 2C: Symposium: "Earth Science of the North-East"
Venue: Multi Use Convention Centre

Chairperson: R Ramesh
National Institute of Science Education and Research, Bhubaneswar

Introduction

North-Eastern India, consisting of the seven sister states, offers a unique region for studying various Earth processes such as tectonism, mountain formation, ore geology, mantle processes such as magma generation and crustal assimilation, seismicity, and also paleo-environments on the surface of the Earth. In this symposium, four scientists will give lectures, which will give a flavour of diverse processes that are being studied here. Dr J S Ray will talk on carbonatites, a unique carbon-rich, mantle-derived, rock derived from the mantle. Dr R Bhutani will present isotope data combined with the elemental data to better constrain the sources and processes of origin of the rocks of the Indo-Burmese range. He proposes that the dominant magmatic rocks in the IMR, i.e., the serpentinized peridotite, represent the residual buoyant fore-arc mantle, which has been modified by the interaction of the subduction-zone fluids. Dr D K Walia will highlight seismic studies carried out in our host institution, while Dr A Bhattacharya will explain how we infer the past climate based on lake sediments and tree rings, for this interesting region.

4 November 2017: 1100–1130

Devesh Walia
North-Eastern Hill University, Shillong

Study on active tectonics of Shillong Plateau

Shillong plateau, a composite cratonic part of the Indian plate, is tectonically very active due to its collision with the Tibetan landmass in the North and the Shan Tenasserim block in the east. This physiographically uneven, seismically sensitive and geodynamically restless block is cited as a classic geotectonic domain of diversified history registering many tectonic events. The area has experienced two great earthquakes, in 1987 and 1950, and frequent earthquakes due to its nearness to the Alpine Himalayan folded mountain chain, Assam-Arakan-Yoma thrust belt and Dawki Thrust. Active tectonics play a very important role in the evolution of the physiography, drainage pattern, geomorphology and also the mineral resources localisation. The study of active tectonics in Shillong Plateau is carried out using various techniques including magnetotellurics, seismicity, global positioning system and radon emanation. The results of the study reveal active tectonics nature of the plateau, and the resultant compressional stress is being transmitted to the Shillong plateau. This is leading to dialation by opening across the compressional forces giving rise to North–South, Northwest–Southeast and Northeast–Southwest oriented fractures and features such as the Jamuna, Chedrang, Dudnoi, Kulsi, Kopili and Nongcharan faults. The convergent margins and collisional tectonics have given rise to east-west structures such as the Dawki Thrust, Main Boundary Thrust and Main Central Thrust.

Speaker's Profile

Devesh Walia is a Professor of Geology since 2011 and Head of the Department of Environmental Studies, NEHU. He has been collaborating with scientists from institutes such as Earth Observatory of Singapore, NTU, Singapore; IIG, Navi Mumbai; NGRI, Hyderabad; Institute of the Physics of the Earth, Russia. Although his basic area of expertise is structure and tectonics of NE Indian region, he has made significant contributions in magnetotellurics; radon emanation studies, micro-seismology, global positioning system, seismic disaster management and mitigation, and earthquake forecasting. Walia is faculty for the training imparted and building codes for the disaster resilient structural and non-structural elements. He is life Fellow of GSI and Indian Geophysical Union India and Indian Society of Remote Sensing and life member of a number of academic and professional bodies. He is the President, Earth System Sciences Section, Indian Science Congress Association (ISCA) (2017–2018) and Chapter Convener, Shillong Chapter, ISCA, Kolkata.

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4 November 2017: 1130–1200

Rajneesh Bhutani
Pondicherry University, Puducherry

Origin of Manipur Ophiolite Complex, Indo-Myanmar Range, North-Eastern India

The Indo-Myanmar Range (IMR) forms the eastern boundary of the Indian plate separating it from the Burmese plate. The IMR, in the states of Nagaland and Manipur, is characterised by the outcrops of ophiolite obducted during the Himalayan orogeny. However, the origin of these rocks has not been understood unequivocally. For the first time, Nd isotope data of the serpentinized peridotite of the IMR has been generated. These isotope data combined with the elemental data provide better constraints on the sources and processes of origin of these rocks. It is proposed that the dominant magmatic rocks in the IMR, i.e., the serpentinised peridotite represent the residual buoyant fore-arc mantle, which has been modified by the interaction of the subduction-zone fluids. The mafic plutonic and volcanic rocks in the IMR represent melt extracted to variable extents due to variable amounts of partial melting.

Speaker's Profile

Rajneesh Bhutani is a Professor at the Department of Earth Sciences, Pondicherry University, Puducherry, where he joined in 2002, after serving in the Geological Survey of India, Pune, for two years. He completed his PhD on Ar/Ar thermochronological studies of trans-Himalaya in the Ladakh sector from Physical Research Laboratory, Ahmedabad, and M.S. University, Baroda. He was awarded DST's Young Scientist Award during the 14th Group Monitoring Meet, February 2003. He has also been awarded DST's BOYSCAST fellowship to work on U/Pb zircon geochronology at the Washington University in St. Louis, USA, during April 2007 to March 2008. He was also awarded the best teacher award of the Pondicherry University based on the students' evaluation, six times, from the year 2010 to 2016. He has authored 29 papers in peer-reviewed journals, presented 35 papers in symposia and participated in 10 projects funded by various national funding agencies.

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4 November 2017: 1200–1230

Amalava Bhattacharyya
Birbal Sahni Institute of Paleosciences, Lucknow

Changes of vegetation *vis-à-vis* climate since last several thousand years at North-East India

The North-East states of India are not only significant strategically but also from a biodiversity point of view. It is a corridor of migration of plant taxa from the South-East Asia. Due to global warming, the entire region is facing increasing stress in terms of rapid changes in biodiversity. Pollen grains are known to be excellent biological proxy to understand past vegetation changes and climate. Pollen grains recovered from dated sediments could be translated in terms of extant vegetation and provide detailed environmental condition at the time of their incorporation. Their alterations, both qualitatively and quantitatively, provide a unique index for a particular type of vegetation, thus reflecting environmental and climate change. The speaker will present a review of palynological studies carried out from sites located in North-East India to unravel the past vegetation and climate change during the last several thousand years. The data reveals that a longer record of past vegetation dynamics with climatic changes is lacking in most parts of this region. To obtain this, high-resolution dated sediment profiles, along with quantitative analyses of pollen data covering more sites, need to be pursued to bring out the detailed vegetational history, vis-à-vis climate change.

Speaker's Profile

Amalava Bhattacharyya retired as an emeritus scientist from the Birbal Sahni Institute of Palaeosciences in 2012. He obtained BSc (Hons) in Botany from M.B.B. College, Tripura, and MSc from Science College both under the University of Calcutta. Later, he joined BSIP, Lucknow for research and was awarded PhD from the University of Lucknow in 1983. As a postdoc, for three years under Indo-US collaborative monsoon research program, he learned Dendrochronology from Tucson Arizona, USA. His research work is mainly on palaeoclimate based on pollen and tree ring data from the glaciated terrain of the Himalayan Region. He visited several countries, Switzerland, Germany, Poland etc., under INSA and other research programs. He has visited Antarctica twice for his research work. He was involved as a project-in-charge in several DST sponsored projects. Seven scholars obtained PhD under his supervision. He has published more than 90 papers in refereed journals and organised two international tree ring conferences at BSIP.

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4 November 2017: 1230–1300

Jyotiranjan S. Ray
Physical Research Laboratory, Ahmedabad

Cretaceous carbonatite-alkaline-basaltic magmatism in North-Eastern India and Gondwanaland breakup

Carbonate-bearing carbonatite magmas are commonly associated with alkaline silicate magmas. Many carbonatite–alkaline complexes are located within Large Igneous Provinces (LIPs), which often are linked to the breakup of supercontinents. While the genetic link between carbonatite and alkaline magmas is fairly well understood, the reason for their occurrence in LIPs remains elusive. The latter becomes important in the theory of (deep mantle) plume origin for LIPs with the general understanding that the former originate from the continental lithospheric mantle. The Cretaceous carbonatite–alkaline complexes of the Shillong Plateau, being associated closely with the Sylhet Traps in space and time, offer a unique opportunity to study and understand the genetic connection between the two and with the breakup of the Gondwanaland, the last known supercontinent of our planet. The speaker will discuss important results of geological, geochronological, geochemical and isotopic studies carried out during the last two decades on these complexes and shed light on the tectonic evolution of India, vis-á-vis Gondwanaland during late Early Cretaceous (120–105 million years ago).

Speaker's Profile

Jyotiranjan S. Ray is a Professor at the Physical Research Laboratory (PRL). He obtained M.Tech., in Applied Geology, from IIT Roorkee in 1992 and PhD from PRL in 1998. After spending four years in Canada and USA, for postdoctoral research, he returned to PRL as a research scientist in 2003. Ray is a geochemist by profession. He uses elemental and isotopic tracers to understand geological processes such as the evolution of earth's mantle through time, subduction zone magmatism and evolution of modern and ancient sedimentary basins. His contributions to the studies on carbonatite magmatism, the evolution of Vindhyan Supergroup and Andaman Subduction Zone are noteworthy. His efforts have been recognized with several national awards including the INSA Young Scientist Award in 2000, National Geoscience Award in 2009, PRL Award in 2013 and Shanti Swarup Bhatnagar Prize in 2015.

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Session 2D: Inaugural Lectures of Fellows/Associates

Venue: Multi Use Convention Centre
Chairperson: H M Antia, TIFR, Mumbai

4 November 2017: 1400–1420

Aditya Kumar
Tezpur University, Tezpur

Unveiling DNA structural properties of promoter regions of prokaryotic transcriptome and their role in gene expression

Gene expression is a fundamental biological process, in which the genetic information encoded in DNA is translated to create phenotypes. It is a multistep process, and it can be regulated at various levels such as transcription, RNA processing, translation and post-translational events. Transcription initiation is an important step of gene regulation process in prokaryotes. Promoters are a stretch of DNA sequences that are present in the upstream of transcription start sites, where RNA polymerase and other transcription factors bind to initiate the transcription. Next-generation sequencing studies have revealed that a variety of transcripts are present in the prokaryotic transcriptome. Identification and characterization of promoter regions associated with a different category of transcripts are crucial for the complete understanding of functional genomics. Promoter regions have been shown to have unique DNA structural properties compared to their flanking region, in organisms across all domains of life. In-silico analysis of DNA sequence-dependent structural properties like DNA duplex stability, protein-induced bendability and intrinsic curvature in the promoter regions of six different prokaryotic transcriptomes suggest that these features are distinctly present in the promoter regions associated with different categories of transcripts. Using these structural features, the speaker's group predicted promoters associated with different categories of transcripts such as mRNA, internal, antisense and non-coding RNA, which constitute the prokaryotic transcriptome. Additionally, it has also been found that these DNA structural features of promoter regions are linked with the expression of the associated gene.

Speaker's Profile

Aditya Kumar graduated with a Master's degree in molecular biology and biotechnology from Tezpur University, Assam in 2008. He then joined the Molecular Biophysics Unit, IISc, for PhD and obtained his doctoral degree in 2016 on in silico analysis of DNA sequence-dependent structural properties of promoter regions in prokaryotes. He also did post-doctoral work at IISc. He has been a faculty member of the Department of Molecular Biology and Biotechnology at Tezpur University since April 2017. He was selected as Young Associate of the Indian Academy of Sciences in 2017.

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4 November 2017: 1425–1445

Devendra Ojha
Tata Institute of Fundamental Research, Mumbai

Star formation in the Milky Way Galaxy

Understanding how stars form within the Universe is one of the fundamental questions in modern astrophysics and is central to many other fields, including the evolution of galaxies and the formation of planets. In this talk, the speaker will present his work on the formation of stars within the Milky Way galaxy, where one can study the processes of star formation in much greater detail than in more distant galaxies. The speaker and his team lead extensive multi-wavelength surveys of the Milky Way from visible wavelengths, through the infrared, millimetre and submillimetre, and radio wavelengths. The major goals in star formation research are to study the earliest stages in the formation of massive stars and to determine the importance of triggering processes in star formation. Also, they are heavily involved in design, development and operation of infrared instruments for ground- and space-based Indian observational facilities used for star formation studies.

Speaker's Profile

Devendra Ojha received PhD degree from Strasbourg University, France, in 1994 in Astronomy and Astrophysics. He joined TIFR, Mumbai in 1997, after postdoctoral positions at IUCAA, Pune and IAP, Paris, France. He is currently the Chairperson of the Department of Astronomy and Astrophysics at TIFR. His research area encompasses a wide range, viz., galactic structure, interstellar medium, star formation, as well as design, development and operation of astronomical instruments. These include the operation of 100 cm TIFR balloon-borne far-infrared telescope, development of an instrument for the small satellite mission of ISRO for carrying out Infra-Red Spectroscopic Imaging Survey, and development of near-infrared spectrometer and imaging cameras for ground-based Indian telescopes. He was elected a Fellow of the Indian Academy of Sciences (2015) and NASI in 2015.

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4 November 2017: 1450–1510

Giridhar U. Kulkarni
Centre for Nano and Soft Matter Sciences, Bengaluru

From mud cracks to optoelectronic devices – our efforts in translating invention to technology

Visibly transparent, yet electrically conducting materials, are rare. Conventionally used tin-doped indium oxide (ITO) glass plates are not only expensive but are also not suitable for flexible displays due to brittle nature of the coating itself. In recent years, many alternative transparent conductors are being developed, some important ones being doped ZnO and conducting polymer films, graphene, carbon nanotube networks, metal nanowire networks and lithographic patterns. In the recent past, a method that makes use of crack network in desiccated colloidal layer as a template for growing metal nanowires has been developed. From early efforts of optimising the method to fabricating and successfully demonstrating almost all optoelectronic devices without the aid of ITO, has been a journey filled with excitement and challenges. The recipe has been extended to many other devices, essentially realising a world of transparent electronics; the most recent example is a transparent and flexible supercapacitor. The presentation will begin with an introduction to the topic providing an overview of the efforts being made in the literature to replace ITO, followed by a description of the various results obtained from the laboratory including a theoretical understanding of the process. The talk will also bring out efforts involved in translating this invention into a technology potentially attractive to industry.

Speaker's Profile

G U Kulkarni is the Director of Centre for Nano and Soft Matter Sciences (CeNS), and is a Professor (on lien) at Chemistry and Physics of Materials Unit, JNCASR. He received PhD from IISc in 1992 and has held visiting/adjunct positions at Cardiff, Tokyo, TASC-INFM, Trieste; Scuola Normale Superiore, Pisa; Purdue, etc. His research interests are focused on new strategies in the synthesis of nanomaterials, nanopatterning and nanodevice fabrication including of molecular systems. His group strives to translate nanoresearch findings into affordable technologies. Apart from over 265 research articles and several national and international patents, Kulkarni has contributed to 13 books and coauthored a book, *Nanocrystals*. He has to his credit, Sir C. V. Raman Young Scientist award, the MRSI-ICSC Superconductivity and Materials Science Annual Prize and Bangalore Nano National Award, among others. He is a Fellow of NASI (2013), Indian Academy of Sciences (2014), and Asia Pacific Academy of Materials.

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4 November 2017: 1515–1535

Y Dhandapani
Indian Statistical Institute, Bengaluru

Geometry and topology on random point clouds

From a theoretical and applied viewpoint, there is interest in understanding the topology and geometry of random point clouds. Given a point cloud, one can construct a sequence of growing spaces (called the Boolean model) by placing balls of radius r centred at the points and letting r grow. In this talk, the speaker will address some recent and ongoing work on understanding the topology and geometry of Boolean model built upon random point clouds on Euclidean spaces. Also, briefly touch upon the influence of the spatial distribution of point clouds on their qualitative and quantitative features.

Speaker's Profile

Y Dhandapani obtained PhD from University of Paris VI in Applied Mathematics and then pursued postdoctoral research at Technion, Israel, before joining Indian Statistical Institute, Bengaluru. His research interests are mainly centred on studying geometric and topological structures on random point clouds. He was selected as a Young Associate of the Indian Academy of Sciences in 2016.

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Session 2E: Public Lecture
Venue: Multi Use Convention Centre
Chairperson: Ram Ramaswamy, JNU, New Delhi

4 November 2017: 1800–1900

Sanjoy Hazarika
Commonwealth Human Rights Initiative, New Delhi

Dilli door Ast? The margins, memory and identity

The many competing groups of the region that is called the North-East may be strangers to each other, but they are no strangers to history. History is a close and, at times, terrible and unforgiving companion. Attitudes are formed by experiences, narrated in stories; these stories become texts, embedded in books and taught to generations who pass on the word. The volume of words become a torrent of cement and brick, building high walls of division. Those inside the wall believe they are specially privileged. Those outside are the 'bahiror' 'mahuh', the outsiders. For long, this region has been viewed as being at the margins – yet these very margins have forged a narrative over decades that have forced New Delhi and all of India to listen and take notice of their demands.

Speaker's Profile

Sanjoy Hazarika is the Director, Commonwealth Human Rights Initiative. He was the founder Director, Centre for North-East Studies and Policy Research, Jamia Millia Islamia, New Delhi and also holds Dr Saifuddin Kitchlew Chair. He is the founder and managing trustee of North-East Studies, which runs the pioneering boat clinics on the river Brahmaputra in Assam providing medical access to marginalised communities. Hazarika received Dr Jean Mayer Global Citizenship Award from Tufts University and is one of North-East India's best-known commentators. He holds a number of advisory positions both in Central and State Government Committees and Universities. He is also the Chairperson, governing board of the Society for Environmental Communications, which publishes *Down to Earth*. A prolific author and writer, Mr Hazarika has authored a number of books on the North-East of India and its people and writes for major Indian and international media.

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Session 3A: Inaugural Lectures of Associates/Fellow

Venue: Multi Use Convention Centre
Chairperson: S Sivasanker, IIT Madras, Chennai
5 November 2017: 0900–0920

K Yhoshu
Nagaland University, Lumami, Nagaland

Remote sensing and GIS application for geohazard studies

Usage of spatial technologies such as remote sensing and GIS have created immense scope for monitoring and proper mitigation of hazards. These spatial tools have played a vital role in identification and mapping of geo-hazard regions. Geo-hazards such as landslides are triggered by various factors such as anthropogenic activities, rainfall, geology, etc. Mitigation, therefore, becomes crucial especially in hilly terrains which are unstable and prone to slope failures. Earthquakes pose a serious threat owing to its unpredictable and destructive nature. The entire North-East India is located in a high hazard risk zone owing to its active tectonic, geology and topographic setting, torrential rainfall besides the expansion of human habitat which has further aggravated the already fragile environment. The region falls under seismic zone V, which is highly vulnerable to seismic activity. Use of remote sensing satellite imagery has helped in the identification and mapping of hazards. The susceptible area has been demarcated and assigned certain weights to create hazard zonation map. The zonation map has been ranked based on its susceptibility which helps in proper remedial and mitigation process.

Speaker's Profile

Kedovikho Yhoshu is an Assistant Professor in the Department of Geography, Nagaland University. He received a Gold medal in B.Sc Geography (Kohima Science College, Nagaland University) in 2007, in M.Sc Geography (Kumaun University) in 2009 and a distinction in M. Tech RS and GIS (Andhra University) in 2012. He is a member of Indian Society of Remote Sensing, Geographical Society of North-Eastern Hill Region and International Society for Photogrammetry and Remote Sensing-Student Consortium. His research interests are in the study of geohazards, RS and GIS application in geosciences, planetary sciences, physical geography. He was selected as a Young Associate of the Indian Academy of Sciences in 2017.

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5 November 2017: 0925–0945

Ashutosh Ghosh
University of Calcutta, Kolkata

Hetero-metallic complexes derived from N_2O_2 donor ligands: Molecular shapes, supramolecular structures, catalysis and magnetism

The symmetrical and unsymmetrical N_2O_2 donor salen type di-Schiff base complexes of Cu(II) and Ni(II) can conveniently be used as 'metalloligands' as the oxygen atoms of the chelated Schiff base often coordinate to a second metal ion. Using the metalloligands, [CuL] or [NiL], several heterometallic complexes incorporating various metal ions along with some anionic coligands have been synthesised. The complexes are obtained in different shapes, which have been determined mostly by the coordination modes of the anionic coligands. Some fundamental solid state phenomena like 'isomerism' (linear-bent, coordination position and supramolecular isomerism) 'polymorphism', 'cocrytallization' are observed in such trinuclear complexes due to the flexibility in the coordination mode of, both, the metal and anionic co-ligands. Most heterometallic compounds satisfy non-zero spin ground state hence show ferrimagnetic exchange interactions. The coupling usually occurs through diphenoxido bridge between the metal centres. However, the anionic coligand can also take part in bridging to modulate the bridging angles and hence the coupling constant. Moreover, some of these compounds, consisting of $Cu^{II}{}_2Dy^{III}$, Cu_2Tb^{III} etc. are found to behave like Single Molecule Magnets, and the shapes of the molecule are found to have a considerable effect on the SMM behaviours. The catalytic oxidase activities, e.g., catechol-oxidase- and phenoxazinone-synthase-like activities of some of these heterometallic complexes are found to be very high presumably due to heterometallic cooperative effect.

Speaker's Profile

Ashutosh Ghosh received PhD from IACS in 1987. His research work focuses on the synthesis, structural characterisation, magnetic properties, and catalytic activities of homo- and heterometallic polynuclear complexes of 1st transition metal ions. He has served as a UNESCO Fellow at Charles University, Czechoslovakia, a MONBUSHO Fellow at Nagoya University, Japan, a JSPS Fellow at Tsukuba University, Japan and also as a Visiting Scientist at the University of Utah, USA, and the University of Dusseldorf, Germany. He has been conferred the Rheometric Scientific-ITAS Award in 1995 and the CRSI Bronze Medal in 2016. He is a Fellow of the West Bengal Academy of Science and Technology (2013) and of the Indian Academy of Sciences (2017).

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5 November 2017: 0950–1010

Subhro Bhattacharjee
International Centre for Theoretical Sciences, Bengaluru

Quantum matter: Life beyond symmetries

The paradigm of symmetry breaking is central to our present understanding of different conventional phases of condensed matter such as magnets and superconductors. Modern condensed matter physics has, however, revealed a class of quantum condensed matter whose description crucially requires an understanding of the subtle interplay of long-range quantum entanglement and symmetries. In this talk, citing specific examples of topologically ordered as well as symmetry protected topological phases, the speaker will discuss the currently developing generalised framework for describing such new classes of quantum ordered matter, some of which may form the basis of future technology.

Speaker's Profile

Subhro Bhattacharjee is a condensed matter theorist currently working at the International Centre for Theoretical Sciences. His primary research interest is in the field of quantum many-body physics. Over the last few years he has been working on unconventional phases and phase transitions in quantum condensed matter, which require a description beyond the paradigm of symmetry breaking. These include various frustrated quantum magnets and correlated metals. He completed BSc from Presidency College, Kolkata, MS and PhD from IISc, and was a postdoctoral fellow at University of Toronto and Max Planck Institute (MPIPKS). He was selected as a Young Associate of the Indian Academy of Sciences in 2016.

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Session 3B: Inaugural Lectures of Associate/Fellows

Venue: Multi Use Convention Centre
Chairperson: S N Tandon, IUCAA, Pune

5 November 2017: 1045–1105

Piyush Srivastava
Tata Institute of Fundamental Research, Mumbai

Structure recovery in graphical models

This talk will offer a brief introduction to the problem of recovering block structures in graphical models from observed labellings. Such problems arise, e.g., in the general paradigm of community detection, where one knows that a system consists of components that can be divided into two different communities, but needs to find which community each component is in, by looking at some observed behaviours of the individual components. After a brief introduction to the classical statistical approaches for modelling this problem, we will look at a recent approach inspired from statistical mechanics that is based on a variant of the Ising model. We will then see how the phase transitions in this Ising model relate to the statistical problem of recovering block structures.

Speaker's Profile

Piyush Srivastava is currently at the School of Technology and Computer Science at the Tata Institute of Fundamental Research. His research is largely on probabilistic structures in computation. His current interests include the study of sampling problems, often those related to probabilistic graphical models. A large part of his recent work has focused on understanding the connections between phase transitions in statistical physics, and algorithms and computational complexity. He was selected as a Young Associate of the Indian Academy of Sciences in 2017.

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5 November 2017: 1110–1130

Kaustuv Sanyal
Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru

Molecular evolution of the process of chromosome segregation: Lessons from fungal pathogens

Each eukaryotic chromosome carries a centromere, the unique DNA locus, which is essential for faithful transmission of the genetic information during mitosis and meiosis. Despite playing this conserved function, the centromere DNA sequence is rapidly changing across all forms of eukaryotic life. Centromeres in many budding yeast species are specified by the DNA sequence. In most other eukaryotes, centromeres are not strictly dependent on the underlying DNA sequence. Over the years, we studied the process of chromosome segregation in *Candida* and *Cryptococcus* species. These two groups of pathogens are known to cause most deaths by fungal infections in immune-compromised patients. Combining live cell confocal microscopy, mutational approach and computational simulation, the speaker's group has developed a comprehensive model and identified mechanistic conservation and divergence in the process of chromosome segregation in these two fungal phyla. The centromeres of a number of closely related *Candida* and *Cryptococcus* species have also been identified and characterised. It was demonstrated that centromere sequences are rapidly evolving among closely related species in both these fungal phyla. The results of their studies reveal that centromere formation in *Candida albicans* is strictly epigenetically regulated, while RNAi seems to play a role in the structural evolution of centromeres in the *Cryptococcus* species complex.

Speaker's Profile

Kaustuv Sanyal obtained PhD from Bose Institute and postdoctoral training at the University of California, Santa Barbara on yeast molecular genetics. He joined JNCASR in the late 2005 as Assistant Professor and promoted to the rank of Professor in Molecular Biology and Genetics Unit. Since his graduate studies, the major focus of his research is to understand the mechanism of chromosome segregation using various yeasts, both pathogenic and non-pathogenic, as model systems. He has been awarded the prestigious Tata Innovation Fellowship and National Bioscience Award by the Department of Biotechnology (India). He is a Fellow of the Indian Academy of Sciences (2017), NASI, and a member of the Faculty of 1000 (F1000Prime), UK. Currently, he leads a large group of graduate students and postdoctoral researchers, and actively collaborates with many research groups across the world.

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5 November 2017: 1135–1155

Swapan K. Datta
Visva-Bharati University, Santiniketan

Biofortified rice with enhanced nutrition

The speaker will talk about his studies involving the transgenic rice line with soybean ferritin gene, which showed accumulation of about 2.5 times more iron content in their endosperm, when compared with a non-transformed control of the same variety. Here, an over-expression vector containing the ferritin gene (cloned from rice) under control of endosperm-specific glutelin/globulin promoter was used to transform rice cultivar. He will also discuss successful attempts that were made to generate marker-free high carotenoid transgenic lines of Indica rice that accumulates carotenoids in seed endosperm. The presentation will also explore the process of transformation of local rice variety, Swarna Sub1, which was done with a constructed RNAi vector containing *lox* gene under aleurone tissue-specific eosin promoter to stabilise the levels of carotenoids in polished rice. To improve the bioavailability of iron and phosphorus from rice, reduction of phytic acid content in rice seeds plays an important role. The talk will also explore the importance of reduction of phytic acid content in rice seeds and bioengineering methods employed to achieve this. Engineered rice with high iron, low phytate and enhanced pro-vitamin A could serve as dream rice for better nutrition rich staple rice – food for the people who need it most.

Speaker's Profile

Swapan Datta has vast experience in plant biotechnology and agricultural science. Associated with Prof. Wenzel as DAAD Fellow at Institute of Resistance Genetics, Germany, Prof. Ingo Potrykus at ETH-Zurich and Prof. Gurdev Khush at IRRI, Philippines (1985-2005), he developed genetically improved rice, e.g., Golden Indica rice, high iron rice, sheath blight resistant rice, DH wheat, barley and rice, etc. He is the recipient of several awards including Paul Johnnes Brouhl Memorial Medal (2009) and Panchanan Maheshwari Medal for significant contributions in embryogenesis and plant biotechnology. He has published over 150 research papers, many of which have appeared in *Nature*, *Science*, *Nature Biotechnology*, *Nature Genetics*, *Plant Journal*, etc. He has supervised more than 34 PhD scholars from different countries. He was elected a Fellow of the Indian Academy of Sciences in 2017.

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Session 3C: Special Lecture
Venue: Multi Use Convention Centre

Chairperson: S S Krishnamurthy, IISc, Bengaluru
5 November 2017: 1200–1240

Lalit Kumar
All India Institute of Medical Sciences, New Delhi

Targeted therapy for cancer treatment: Have we found the magic bullet!

With the development of newer techniques and better understanding of the Biology of cancer cells, in the past two decades, a number of new drugs or molecules have been developed. These are small molecules and monoclonal antibodies that are more specific and are called targeted therapy. They block the molecular abnormality or target(s) in the cancer cells and stop its further growth. A number of monoclonal antibodies have also been developed in the past few years which can selectively kill/ block the cancer cells. More recently, research into the tumour microenvironment and T-cell-mediated downregulation of anti-tumour immunity has led to the development of antibody-based interventions by targeting immune checkpoints such as programmed cell death protein 1 (PD-1) on T lymphocytes and its principal ligand (PD-L1) on tumour cells. This is the most exciting development in the field of Oncology and Immunology. Contrary to traditional cytotoxic chemotherapy, these novel molecules are devoid of toxicities like – alopecia, nausea/vomiting. However, these new molecules have unique side effects, e.g. fatigue is common, other side effects, e.g., hypertension, skin toxicity, and diarrhoea also may occur in some patients. Some patients have also developed resistance after an initial response. The speaker will discuss the initial experience of treating patients with advanced cancer or those who have failed chemotherapy and/or radiation with these novel molecules. The talk will also include specifics of current investigations on how to combine or sequence these novel agents (anti-angiogenic agents, immune-checkpoint inhibitors, etc.) with cytotoxic chemotherapy or radiation in the treatment scheme.

Speaker's Profile

Lalit Kumar is currently Professor and Head of Medical Oncology at AIIMS. He has played a leadership role in the development of cost-effective stem cell transplantation programme at AIIMS. His group has made seminal contributions to the field of gynecologic oncology and multiple myeloma. Kumar has published more than 350 research papers in refereed journals. He is a Fellow of the Indian Academy of Sciences (2010), and National Academy of Medical Sciences, New Delhi. He is a recipient of ICMR Novartis Oration Award, Dr BC Roy National Award, and Ranbaxy Science Foundation Award (2007). Kumar was conferred the Padma Shri in 2014.

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