International Centre for Theoretical Sciences

TATA INSTITUTE OF FUNDAMENTAL RESEARCH

REPORT

SEPT 2007 - SEPT 2009

INTERNATIONAL
CENTRE *for*
THEORETICAL
SCIENCES

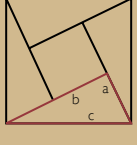
TATA INSTITUTE OF FUNDAMENTAL RESEARCH

The ICTS logo is the visual proof of the right-angled triangle theorem due to Bhaskara II, a 12th century Indian mathematician.*

In *Lilavati*, Bhaskara featured a pictorial proof of this theorem.

We are given the bottom right triangle $a \leq b$.
We construct a square by making three copies of the triangle, as shown.

The area of the large square is c^2.
The side of the small square is $(b - a)$,
and its area is $(b - a)^2$.
The area of all four triangles is $4 \times \frac{1}{2} ab = 2ab$.
Then the area of all four triangles
plus the area of the small square is
$c^2 = (b - a)^2 + 2ab$.
So $c^2 = b^2 + a^2$. Bhaskara's one-word proof was "Behold!"



*See, for example Georges Ifrah,
The Universal History of Numbers, Volume 2, Penguin, India (2005)

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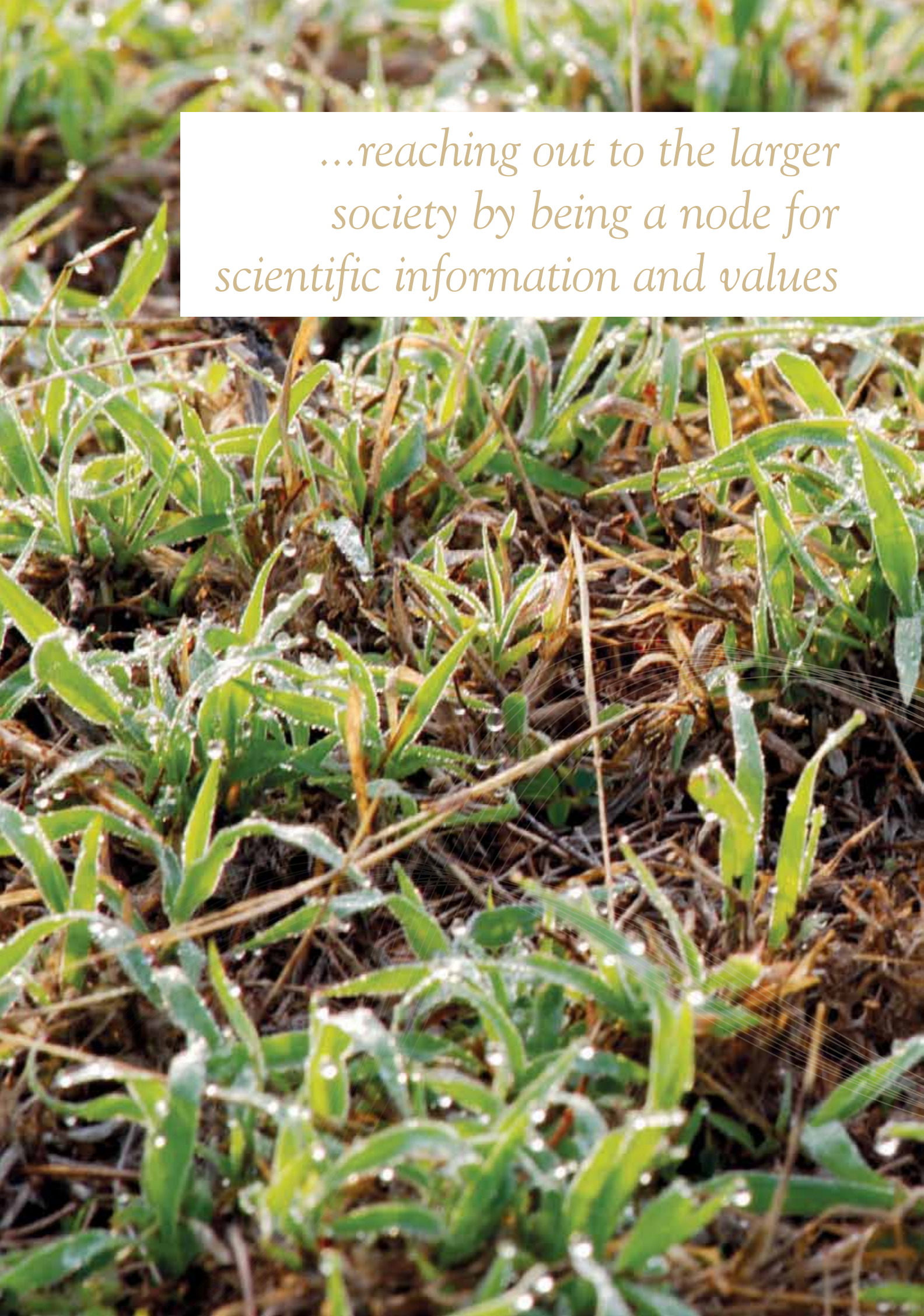
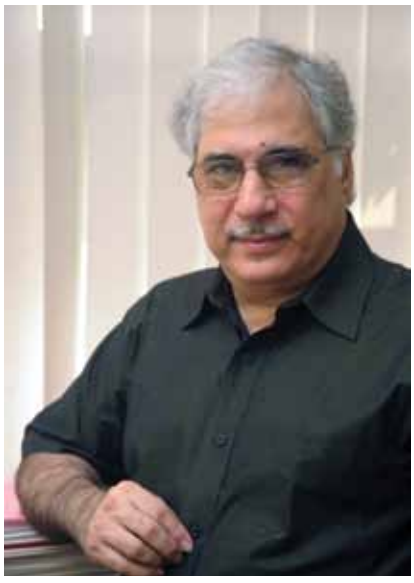


...reaching out to the larger society by being a node for scientific information and values

Director's Note



The idea of ICTS naturally grew out of a strongly felt need in the Indian scientific community to enhance the research and education eco-system of Indian science.

There is a need in India today, to create an institution where researchers from India and from abroad can meet and interact for critical periods of time, in a relaxed and conducive atmosphere. These periods depend on the type of activity at ICTS that can range from rapid response short duration workshops to programs lasting many months. Visits to ICTS can be even sabbaticals in which faculty members can bring along their students and post-docs.

The idea is to provide a facility that will enhance the creative process and lend a hand to the solution of some of the profound scientific problems of our times. As past experience has shown, major breakthroughs do occur when problems are seen in a different light; and at times when there is a heterosis (or hybrid vigor) when different core disciplines are brought to bear on a given problem.This is natural because as we all know, it is the limitation of the human mind that caused the division of scientific activity that we call mathematics, physics, chemistry, and biology! For these reasons, ICTS envisages running at least two parallel programs in nearby disciplines. Currently there is an enormous amount of work going on at the interface of physics, biology, mathematics and computer science in different combinations.

Besides its focus on being a facility to enhance research in the basic sciences, ICTS would like to contribute to the creation of scientific human resources. We plan to have programs for school and college teachers, to facilitate the development of educational material and also to employ modern technology in the dissemination of educational material. We are also exploring the idea where students under guidance grapple with solutions of real-life mathematical problems from diverse areas of science and technology.

ICTS is also aware of the importance of the interface of pure research, and applied science and technology, and of the importance of discussions of science and technology policy. All these diverse groups will be able to meet and interact at ICTS.

While it is true that ICTS is a science centre, it will also make an effort to integrate science into the larger fabric of human activity and knowledge. Hence we hope to invite people from the arts, humanities and civic society to give talks, spend time with us and enrich us.

ICTS Activities

As you will see in this report, ICTS started functioning from September 2007 and had a very active start. Between September 2007 and September 2009 it has organized 20 programs over more than 330 program days. Over 1000 people participated in these programs and close to half of this number were from outside India. 17 more programs are planned for the near future up to August 2010.

The programs range over many subjects: physics, astrophysics, cosmology, mathematics, computer science and their many branches.

We have had public lectures from a galaxy of speakers like Juan Maldacena, Lyman Page, Joe Silk and others. In addition, ICTS has initiated a series of lectures titled the "Subramanyan Chandrasekhar Lectures". Eminent academicians deliver these lectures on important new developments in their areas of specialty. The first lecture in any series is aimed at a general scientific audience, while the remaining is aimed at specialists. The first lecture series, "Extremal Black Holes in Strings Theory", was given by Ashoke Sen, in August 2009. The second series will be given by Andrew Strominger in January 2010. Future Chandrasekhar lecturers will include Dam Tranh Son and other eminent scientists.

Several academic members from various institutions in India are adjunct faculty members of ICTS. There is a large program committee of very active members who oversee the program proposals. The adjunct faculty, the program committee, and the future core faculty of ICTS will serve to catalyze a productive academic atmosphere.

Now a Word About How ICTS Happened

The genesis of ICTS owes itself to institutions like the Abdus Salam International Centre for Theoretical Physics (ASICTP) in Trieste, the KITP in Santa Barbara and the Newton Institute in Cambridge. Each of these institutions has overlapping but somewhat different missions. The ICTP was originally created by Salam to help bring developing-world scientists and students up-to-date in various areas of physics and mathematics. ICTP also organizes high-level research workshops and has a successful diploma program for bright students from developing countries. The KITP and the Newton Institute aim to promote scientific excellence and productivity at the highest level. At KITP educational and outreach activities also go side by side with the scientific programs.

Scientists from India have been regular visitors to these institutions and they and their students have benefited enormously from these institutions. The Indian science community has by now critical numbers in various areas to benefit from and most importantly also sustain a centre inspired by these institutions, but planned according to its resources and needs.

About two decades ago T.V. Ramakrishnan and I had suggested to the Department of Science and Technology of the Government of India to set up a centre to organize regular schools and workshops in variousareas in India. This did not materialize at the time, but about a decade ago there was a resurgence of this idea, with the difference that it was now felt that one should develop a national facility along the lines of ASICTP, KITP and the Newton Institute.

The first blueprint of this centre appeared in the course of a long conversation that I had with David Gross in October 2004, at Santa Barbara. The idea of the centre then evolved in discussions with colleagues both within and outside TIFR. It received a strong recommendation from the international visiting committee that reviewed the Department of Theoretical Physics of TIFR in September 2006. Edouard Brezin chaired the committee and members were M. Peskin, J. Polchinski, T.V. Ramakrishnan and A. Ukawa. The visiting

committee, chaired by Michael Atiyah, that reviewed the School of Mathematics of TIFR also made a strong recommendation for an interactive program for physicists and mathematicians.

On 13 October 2006, on behalf of the TIFR community, I was asked to make a presentation to the Council of Management of TIFR, outlining the concept of a 'National Centre for Theoretical Sciences'. The Council endorsed the idea of the Centre. On 2 August 2007, the Council of Management of TIFR recommended the setting up of a Centre with the name, "International Centre for Theoretical Sciences of TIFR", at a suitable location in India. Subsequently, in 2009, the permanent campus and infrastructure of ICTS was approved by the Council of Management of TIFR followed by the Atomic Energy Commission. In this context, I would like to thank Prof C.N.R. Rao, former AEC Chairman Dr Anil Kakodkar, the present AEC Chairman Dr S. Banerjee, and Director TIFR Mustansir Barma, who played a major role in helping ICTS to reach this stage.

Meanwhile, just as TIFR itself had started working in June 1945 without buildings of its own, ICTS programs also started in September 2007. ICTS programs and the ICTS logo were formally inaugurated by T. V. Ramakrishnan during the program, "Correlated Electrons and Frustrated Magnetism - 25 November - 4 December 2007, organized by K. Damle, S.K. Dhar, E.V. Sampathkumaran, T. Senthil and V. Tripathi.

Now a Word About Why We are Here in Bangalore

The simple answer is that at present there are, in my view, not many locations in India that have the academic eco-system (borrowing a term from Dr. Rama Rao) that can sustain ICTS. There was a sustained effort to find a suitable location that went on for close to two years. There was a confluence of circumstances which made Bangalore the appropriate location. The State Government of Karnataka allotted a site of about 18 acres in north Bangalore. In this effort we had the support of Prof. C.N.R. Rao, Dr. K. Kasturirangan and many others.

The year 2009 is the birth centenary year of Homi Bhabha. It is a befitting tribute to him that TIFR is taking several new steps during this centenary year: the setting up of a new campus in Hyderabad, partnering in the formation of a life sciences consortium in Bangalore, and now the ICTS in Bangalore.

This note would be incomplete without mention of the support, help and encouragement of many of my colleagues at TIFR Mumbai, NCBS, CAM, and IISc. I would especially like to thank NCBS and CAM for providing administrative and logistic support to ICTS. I thank TIFR for its support and guidance.

We look forward to more productive years ahead for ICTS.

- Spenta Wadia

The building itself is only a shell to make possible the work that is done inside it.
It is by the quality and volume of its scientific work that an Institute like this must be judged, by the extent to which it has helped to explore and push back the frontiers of knowledge, to open up new fields of knowledge, to provide the country with men highly trained in the newest fields of scientific endeavour and able to make their own contribution to the increase of scientific knowledge, and by its general impact on the scientific life of the country as a whole.

Homi Bhabha, from the speech at the inauguration of the new buildings of TIFR, 1962

...fostering research excellence and providing a platform for multi- and inter-disciplinary collaborations

Vision

ICTS Vision

Indian science and technology are presently poised for a leap forward. These goals are to be driven by new knowledge and a high level of skills. Hence, to assume a world leadership role in this area, it is crucial to inculcate an innovative and creative culture in science and technology. This is a complex and many-pronged process, and the setting up of ICTS has been conceived to contribute to this process. A TIFR led multi- and inter-disciplinary effort with a strong human resource development component, the main goals of ICTS are to foster research, be a resource for high level education and training, and reach out to the larger society by being a node for scientific information and values.

Fundamental research can only be judged by world standard. It is worthwhile only if one adds, in however small a way, to the sum total of human knowledge.

Homi Bhabha

Research

ICTS has a critical contribution to make to research excellence and strength in theoretical sciences through a well thought out, responsive, program of research activities and necessary education/training for the future. In this context, theoretical activities in traditional areas of the physical and mathematical sciences suggest themselves. However there is also an emphasis on activities in areas overlapping traditional fields of science, keeping in mind that strength in individual disciplines lends to fruitful interdisciplinary collaborations. These areas include for example biological physics, computational science, complex systems, fluids, the interface between cosmology, particle physics and string theory, new emergent areas of mathematics with applications to biology, finance and so on.

ICTS provides a platform and infrastructure to organize various activities in theoretical and mathematical sciences, at the forefront of knowledge. By planning for researchers to meet for critical periods of time that foster discussions and collaborations, the Centre aims to focus creative scientific energy both for national growth, and as a resource for global science and for this region of the world.

Education and Training

There is a profound need in India today to inspire students to take up careers in the basic sciences. One of the key ingredients in bringing this about (besides material issues) is the awareness among students of the fascinating questions science asks and tries to find answers to. The Centre can contribute to the flourishing of native talent by organizing interaction meetings of students and their teachers with visiting scientists and scholars. Some of the research level activities of the Centre will be preceded by an instructional workshop, to enable young Indian and foreign participants to make best use of the program. Students at the right stages of their career, who spend one or two semesters at the Centre, can benefit enormously from the activities of the Centre.

Outreach

An important aspect of ICTS, from the very beginning, will be to make freely available the proceedings of its activities in various formats. To facilitate this, the Centre has begun to maintain a Service Informatique. Lectures of ICTS programs will be made available to other institutions in the country via a broadband webcast. Access to video recordings of lectures will be made available on the ICTS website, and on CDs. As part of its programs, ICTS also organizes regular activities like public lectures in the sciences and other societal issues, with a view to seek active engagement and support for its activities from society. This will help foster an active interest in basic sciences in society.

Public–Private Partnership

Basic sciences form the core knowledge on which technology and industry is based. In order to sustain a healthy and productive interaction between these endeavours it is imperative to forge partnerships between basic science, technology and industry. Such partnerships play an important role in developed countries and it is important to induct them in India. ICTS can contribute to this forging by presenting platforms for interaction between scientists, technologists and leaders from industry. Mathematical finance, bio-technology, mathematical modeling, material science are a few of the areas where fruitful collaborations can be forged.

Campus

The city of Bangalore in the Southern state of Karnataka in India, because of the quality and diversity of its academic ecosystem, in every way fulfils the needs of ICTS.

A scientific institution, be it a laboratory or academy, has to be grown with great care like a tree… and the few outstanding ones always take at least 10 to 15 years to grow.

Homi Bhabha

TIFR already has a substantial presence in the city in the form of the National Centre for Biological Sciences (NCBS) and the TIFR Centre for Applicable Mathematics (TIFR-CAM). The Indian Institute of Science (IISc), the Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), the Raman Research Institute (RRI), the Indian Institute for Astrophysics (IIA), and the Indian Statistical Institute (ISI) are also located in this city and can provide critical support in the programming activities of ICTS.

ICTS will build on the academic resources of these institutes and become a hub for further collaborations between researchers. These institutions have shown enormous interest in ICTS. Over twenty researchers from these institutions have already accepted invitations to join as adjunct faculty of ICTS. They bring together several disciplines including physics, biology, mathematics, and applied mathematics. Together with the permanent faculty of ICTS, they will form the core group of researchers who will nucleate an attractive and world class facility.

Since ICTS began its programming activity in September 2007, the majority of its programs, and the most successful ones (outside of Mumbai) have been conducted in Bangalore. These include "From Strings to LHC-II"; "International Biomedical Modeling School and Workshop"; "Arithmetic Geometry"; "Randomness and Computation"; "Affine Algebraic Geometry"; "Heat Transport in Low Dimensional Systems"; and "Workshop on Financial Mathematics - Stochastic Volatility and Credit Risk". Four more very high-quality programs are planned in December 2009 and January 2010 in Bangalore. These include: the ICTS Inaugural Event -"Science without Boundaries"; "School and Conference on Multiscale modeling and Simulation of Hard and Soft Materials"; "New Directions in Applied Mathematics"; "School on Glass Formers and Glasses"; "Breaking Barriers from Physics to Biology"; and "Evolution of Complex Systems". Three satellite meetings of the International Congress of Mathematicians (ICM) 2010 are also planned in Bangalore, namely: "Geometry, Topology and Dynamics in Negative Curvature"; "Geometric Topology & Riemannian Geometry"; and "Algebraic and Combinatorial approaches to Representative Theory". This is a sign of the readiness of the academic ecosystem in Bangalore to provide the momentum needed for the ICTS permanent campus to begin work in full swing right from the beginning.

A site of 17.35 acres in Shivakote, Hessarghatta hobli, north Bangalore has been made available by the State Government of Karnataka on long lease for the ICTS permanent campus. The land has been transferred to ICTS and initial work on setting up the permanent campus has begun.

Inaugural Remarks by Professor T.V. Ramakrishnan

During ICTS program, "Correlated Electrons & Frustrated Magnetism"
2 December 2007

I am very happy to be an incidental cause of the formal start of the activities of the ICTS. As Spenta may tell you, it is the realization of a long held dream of many of us in the community of physicists in India. For example, about two decades ago, Spenta and I suggested that there should be a regular cycle of schools and workshops of this kind in India. When the indefatigable Spenta began talking about it again a few years ago, and convinced the Governing Council of the TIFR that they should support this, I was very happy, because given the strength, diversity and tradition of theoretical science in India, this is a highly necessary and desirable activity.

It is becoming clear that the activities will be of very high academic quality, that they will be spread over a wide range of academic interests and will involve and stimulate a large number of people in the country and outside. This is also in tune with historical realities; for example, the famous set of 100 verses called 'Nitisataka' by Bharatrihari, a poet king, in Sanskrit, begins with the following invocation:

दिक्कालाद्यनवच्छिन्न अनन्त चिमात्रमूर्तये।
स्वानुभूत्येकमानाय नमः शान्ताय तेजसे।।

"The one who is not broken up by space, time and so on, the one who is infinite, and is relatable (only) experimentally, to that silent brilliance I bow".

As a participant in this meeting, I am very happy to be here and welcome you all.

T.V. Ramakrishnan
DAE Homi Bhabha Chair
Department of Physics, Banaras Hindu University, Varanasi 221 005

...forging partnerships by presenting platforms for interaction between scientists, technologists and leaders from industry

People

Management

The overall scientific direction and administration of the Centre is the responsibility of the Management Board and the Director ICTS. The Director ICTS and the ICTS Management Board (chaired by the Director TIFR) are assisted in this task by an International Advisory Council consisting of eminent scientists and persons with experience in running institutions with similar programs. A Program Committee consisting of acknowledged leaders in different areas of science helps the Director ICTS in selecting program proposals for the Centre to organize. The Program Committee and the Management Board membership will change at regular intervals so as to retain freshness and enthusiasm for the ideals of the Centre.

International Advisory Council

Michael Atiyah, University of Edinburgh

Manjul Bhargava, Princeton University

Roger Blandford, Kavli Institute for Particle Astrophysics and Cosmology, SLAC

Edouard Brezin, Ecole Normale Supérieure, Paris

Michael Green, University of Cambridge

David Gross, Kavli Institute of Theoretical Physics, Santa Barbara

M.S. Narasimhan, Centre for Applicable Mathematics, TIFR, Bangalore

T.V. Ramakrishnan, Banaras Hindu University, Varanasi &
the Indian Institute of Science, Bangalore

Subir Sachdev, Harvard University

Ashoke Sen, Harish-Chandra Research Institute, Allahabad

K.R. Sreenivasan, New York University

Raman Sundrum, Johns Hopkins University

S.R.S. Varadhan, Courant Institute of Mathematical Sciences, New York University

If a country neglects basic research it is doomed to be always a follower and not a leader, and it will lose its most talented young scientists who will go elsewhere. Healthy science is like a healthy tree: you cannot destroy the roots and hope that the branches will flourish.

- David Gross.

Management Board

Mustansir Barma, Director TIFR (Chair)
Vivek S. Borkar, TIFR
S.G. Dani, TIFR
Avinash Dhar, TIFR
J.N. Kayarkar, Registrar, TIFR
H.R. Krishnamurthy, IISc
Uma Mahadevan, TIFR, Member Secretary
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S. Ramakrishnan, TIFR
V.R. Sadasivam, Joint Secretary (Finance), DAE
K. VijayRaghavan, TIFR, Director NCBS
Spenta R. Wadia, TIFR, Director ICTS

ICTS Staff

Administration & Services

Sunil Damodaran, Consultant, Pre Project Activities
Mukesh Dodain, Project Administrative Officer
Mohan Gowda, Civil Engineer
Snehal Manjrekar, Project Assistant
Kuntal Roy Sharma, Technical Support Engineer
Janaki Subramaniyan, Filing Assistant

Administrative & Logistic Support Team

Prashanta K. Baruah, NCBS
H.M. Basavaraja, NCBS
Kishore Menon, TIFR
U.B. Poornima, NCBS
Ashok Rao, NCBS
V.R. Rengasamy, NCBS
T.M. Sahadevan, NCBS
Ajay Salve, TIFR
Mohan Shinde, TIFR
T.S. Viswanathan, TIFR-CAM

Program Committee

Adimurthy, CAM-TIFR | Vivek S. Borkar, TIFR | Avinash Dhar, TIFR | Deepak Dhar, TIFR
Rajesh Gopakumar, HRI | D. Narasimha, TIFR | Nitin Nitsure, TIFR | Madan Rao, RRI
Sreerup Raychaudhuri, TIFR | Srikant Sastry, JNCASR | Tarun Sauradeep, IUCAA
V. Srinivas, TIFR | R. Sujatha, TIFR | Mukund Thattai, NCBS | Sandip Trivedi, TIFR
Spenta R. Wadia, TIFR (Chair)

Adi Adimurthy

Centre for Applicable Mathematics – TIFR

Adimurthy's aim is to understand the system of conservation laws (Eg: Euler's equations) from the point of discontinuous uxes and try to develop a theory to solve such problems. He has done his PhD in Mathematics from University of Bombay (1984). He has also been awarded the JC Bose National Fellowship by the Department of Science and Technology, New Delhi, India. His work is divided into six parts:

1. Critical exponent problem in IR2.
2. Critical exponent problem in IRn, n # 3.
3. Sobolev, Trudinger-Moser inequalities.
4. Hardy-Sobolev inequalities.
5. Hamilton-Jacobi equations.
6. Conservation laws.

1. He is working on discontinuous uxes with more than two phases. That is system of conservation laws with discontinuous uxes and have obtained some partial results.

2. He has been working on 4th order problems (i.e bi-Laplacian). Here since maximum principle fails, the problem getting bounds are difficult. Here they have obtained some precise estimates for non compact eigen value problems coming from 4th order Hardy- Sobolev operators.

Vivek S. Borkar

Tata Institute of Fundamental Research

Vivek S. Borkar got his BTech in Electrical Engg. from Indian Institute of Technology, Mumbai, in 1976, MS in Systems and Control Engg. from Case Western Reserve Uni. in 1977, and PhD in Electrical Engg. and Computer Science from Uni. of California, Berkeley, in 1980.
He was with the Centre for Applicable Mathematics of the Tata Institute of Fundamental Research in Bangalore during 1982-1989, Indian Institute of Science, Bangalore during 1989-1999, and at Tata Institute of Fundamental Research, Mumbai, since April 1999, where he is a Senior Professor with the School of Technology and Computer Science. He has also held visiting positions in several institutions such as Uni. of Twente, MIT, Uni. of Maryland, Uni. of California, Berkeley, Uni. of Illinois at Urbana-Champaign, etc. He has won several national honors and is a Fellow of IEEE. His

research interests are in stochastic optimization and control - theory, algorithms, and applications.

1. Adaptive control
2. Distributed estimation
3. Markov decision processes
4. Controlled diffusions
5. Stochastic approximation
6. Reinforcement learning
7. Miscellaneous: He has also contributed to some of the early and widely referred works on hybrid control and control with communication constraints. In addition, he hascontributions to stochastic games, hypothesis testing, parameter estimation, etc.

Avinash Dhar

Tata Institute of Fundamental Research (TIFR)

Avinash Dhar is currently a member of the Management Board of the International Centre for Theoretical Sciences of the TIFR.

He has worked on topics in Qantum Field Theory and String theory. He developed a method of doing renormalization scheme independent calculations in perturbative QCD. He was among the first to discover a manifestly supersymmetric formulation of the Chapline-Manton theory. His work on renormalization flows and their connection with equations of general relativity in the context of noncritical strings anticipated the recent ideas of holographic RG. He was among the first to show that the Hawking decay rate in constituent models of black holes in string theory agrees with general relativity, a result that has implications for the resolution of the information puzzle. His exact operator formalism for bosonization of two-dimensional non-relativistic systems containing a finite number of femions solves the half-century old problem of Tomonaga.

His current research interests include holographic models of strong interactions and non-Lorentz invariant models with anisotropic scale invariance.

Deepak Dhar

Tata Institute of Fundamental Research

Deepak Dhar was born at Pratapgarh, UP on 30 October 1951. He obtained his BSc degree from the University of Allahabad in 1970, MSc (Phys.) from IIT Kanpur in 1972, and PhD in Physics from CalTech in 1978. After his doctoral studies, he returned to India, and joined TIFR as a post-doc, and became a member of the Department of Theoretical Physics in 1980. He has been with the department since then is now a Distinguished Professor.

His research is the area of statistical physics. He is known for his work on renormalization group studies of critical phenomena on fractals, exact results on the enumeration of directed branched polymers and directed animals, slow relaxation in disordered magnets, and exact solution of the abelian sandpile model of self-organized criticality. His current interests include models of proportionate growth in biology, dynamics of protein-folding, and theoretical models of super-cooled liquids and glasses.

He is a Fellow of IAS, INSA, NASI and TWAS. He is the recipient of several awards including the S.S. Bhatnagar prize in physics (1991), TWAS prize (2002) and the S.N. Bose medal of INSA (2001).

Rajesh Gopakumar

Harish-Chandra Research Institute, Allahabad

Rajesh Gopakumar is a theoretical physicist at the Harish-Chandra Research Institute, Allahabad. After his undergraduate degree in physics from IIT, Kanpur he went on to do his doctoral work at Princeton University. He received his PhD in 1997 under the supervision of Prof David Gross. After a few years a research associate at Harvard University, he joined HRI in 2001. He also held a visiting membership at the Institute for Advanced Study, Princeton from 2001-2004.

Space and time together constitute one of the most basic elements of physical reality. To most of us they are the arena on which events occurs. However, since Einstein, physicists have learnt that spacetime (the four dimensional entity which naturally combines space and time) is no passive stage on which events unfold. It too is is an active participant in the drama, so to say. The geometry of spacetime depends on the matter and energy in it. It is in this geometry that the force of gravitation is manifested.

At the same time, in the 20th century, it was also understood that physical reality is quantum mechanical in nature. Classically measured quantities like positions and velocities are merely averages of intrinsically fluctuating quantum "observables". How do we extend this understanding to the nature of spacetime itself ? It is very hard to understand how the basic notions of space and time can only be statistical averages. Which is why most attempts to consistently describe a quantum theory of spacetime have failed.

String theory, building upon hints provided from the physics of black holes, seems to be suggesting a radical new solution to this question. We are far from understanding the answer in general. But in a large family of spacetimes, there is a very definite proposal which seems to be entirely consistent and at the same time surprising. It involves understanding spacetime "holographically". At the same time this holographic connection has shed light on the physics of strongly interacting systems similar to those between quarks in the nucleus. I will describe some aspects of my work which aims to clarify the nature of this mysterious duality.

D. Narasimha

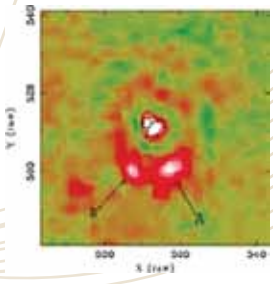
Associate Professor, Department of Astronomy and Astrophysics, TIFR

D. Narasimha is currently an Associate Professor for Department of Astronomy and Astrophysics, TIFR. He did his PhD (Mumbai University) in 1984 at TIFR with Prof Chitre.

Gravitational Lensing.
Some of the interesting problems he is working are the following:
(1) SDSS J091949.16+342304.0 is a 6 arcsecond radius Einstein Ring, which they discovered from Sloan Digital Sky Survey (work with K K Ghosh). It is the largest complete Einstein Ring, lensed by a Dwarf Spheroid at a very low redshift of 0.0375. This could provide valuable probes to the structures in the Universe, since atleast a galaxy of mass as much as that of the Milky Way is needed to produce the configuration. but we see only a dwarf spheroid, which too located so close by. (ApJ 692, 694, 2009)

(2) What is the origin of cosmic magnetic field?
They developed a method of Differential Farady Rotation and found that both Spiral and Elliptical galaxies have similar large scale magnetic field at high redshift; but at lower redshifts, elliptical galaxies lost coherence in magnetic field. (work with S.M. Chitre).

(3) Sunyaev-Zel'dovich effect is the depression at low frequencies in the Cosmic Microwave Background due to scattering by the intracluster electrons in a galaxy cluster en route. They are developing a possible technique to map the Sunyaev-Zel'dovich image of a galaxy-cluster 1E0657-56, which is popularly known as the Bullet cluster". (work with R. Subrahmanyan, RRI, Bangalore and S. Maloo, IUCAA Pune) This could become a valuable probe to the kinematics of the gas in galaxy clusters.



Nitin Nitsure

Tata Institute of Fundamental Research, Mumbai

Nitin Nitsure (b. 1957) is an algebraic geometer, specializing in the theory of vector bundles and related objects, and their moduli spaces. He is known for his construction of the moduli spaces for Hitchin pairs, logarithmic connections and D modules, and recently also for rank 2 unstable bundles on curves. He has proved results about the topology of these spaces, and also on the topology of conic and quadric bundles and related characteristic classes. Currently, Nitsure is a Professor in the School of Mathematics, TIFR, and a Member of the National Board for Higher Mathematics of the Government of India. His honours and recognitions include the ICTP Mathematics Prize, and Fellowship of the Indian Academy of Sciences.

Besides algebraic geometry and topology, Nitsure is interested in mathematical logic and the foundations of mathematics, as well as in mathematical physics. He has a special interest in mathematics education at the higher level.

Madan Rao

Raman Research Institute (RRI)

Madan Rao has been working in the broad area of Statistical Mechanics and Condensed Matter Physics, especially focussing on Nonequilibrium Phenomena and Soft Condensed Matter Physics. More recently my interests have moved into areas in Cell Biology. He holds an Adjunct Faculty Position at the National Centre for Biological Sciences where we have started an exciting program on Physics in Biology. He is also a Visiting Scientist in the Center for Condensed Matter Theory at the neighbouring Indian Institute of Science.

Theoretical Approaches in Cell Biology: Physics Of Active, Evolving Systems
The living cell is an active, self-organized medium comprising molecular processes fuelled by energy. Our group is interested in the organization, flow and processing of mass (molecules), mechanical stress, energy (mitochondria) and information (signaling) in living cells and tissues. These fluxes are coupled via interconnected networks of molecules en-gaged in biochemical reactions played out in this active dynamical medium. The structure of these networks allow for a coarse-grained approach involving new physical principles, unique to the living state. We are interested in the evolution of these molecular and force networks.

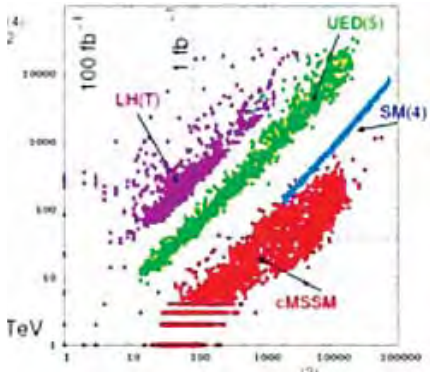
These new physical principles are a consequence of the novel response of cellular systems to local active (energy consuming) forces which maintain it away from equilibrium. These active forces arising from (i) the coupled dynamics of the cytoskeleton, motors and cytoskeletal regulatory proteins, and (ii) the active dynamics of fission and fusion of or ganelles, regulate the flux of mass, stress, energy and information. We have been engaged in developing a theoretical framework, called active hydrodynamics, to address the relationship between fluxes and forces in a variety of contexts, where activity plays a significant role. Using this framework we study the mechanical response, pattern formation, symmetry breaking and hydrodynamic instabilities in both in-vivo and in-vitro reconstituted active systems.

These principles can be carried over to the study of the dynamics of DNA and DNA-binding proteins embedded in the active nucleoplasm. There is much evidence that mechanical stresses propagate through the active milieu and affect gene expression. We have just begun work on this exciting area, in collaboration with G.V. Shivashankar.

Sreerup Raychaudhuri

Tata Institute of Fundamental Research

Sreerup Raychaudhuri is a high energy physicist, who works in the phenomenology of elementary particles and their interactions. Currently he is studying signals for new physics at the Large Hadron Collider (LHC) at CERN. With his collaborators, he is trying to develop techniques by which new physics

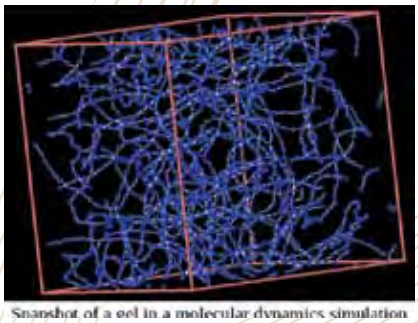


models which produce similar-looking signals at he LHC, could be distinguished from one another. The graph shows a recent study in which Raychaudhuri and his collaborators have shown that a correlation plot between certain variables easily measurable at the LHC could help disentangle isimilar signals arising from four popular new physics models. The four models map to essentially disjoint portions of the plot, while the experimental data, when available, will map to just one point on the plot (with some error bars), thereby indicating which of the underlying models is correct. It is expected that such plots will become of primary important as soon as enough data have accumulated at the LHC, about two years since the start of high energy collisions.

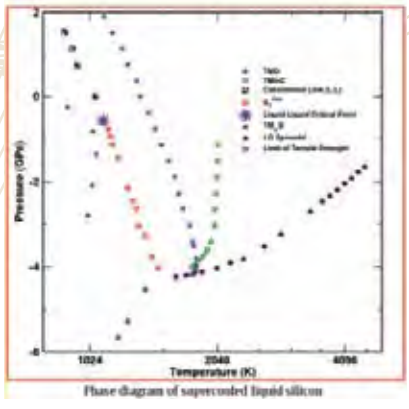
His main interest is in electroweak physics, in particular, new models which go beyond the Standard Model. Within this area, he has worked on topics as diverse as Higgs physics, flavour mixing, supersymmetry, and extra dimensions.

Srikanth Sastry

Jawaharlal Nehru Centre for Advanced Scientific research (JNCASR)



Snapshot of a gel in a molecular dynamics simulation



Phase diagram of supercooled liquid silicon

Srikanth Sastry is currently a Professor at the Theoretical Sciences Unit Jawaharlal Nehru Centre for Advanced Scientific Research. He completed his PhD in Physics from the Boston University in 1993. He is a recipient of the Shanti Swarup Bhatnagar Award, CSIR, India, 2008 and also the Prof C.N.R Rao Oration Award, JNCASR, 2001.

Statistical mechanics of liquids. Slow dynamics and routes to structural arrest in supercooled liquids and related systems (colloids, gels, granular material). Thermodynamics aspects of glassy systems. The energy landscape approach. The glass transition. Glass forming ability. Kinetics of phase transformations. Mechanical properties of glasses. Anomalous thermodynamic and dynamical properties, liquid-liquid phase transitions in water and other network forming liquids. Statistical mechanics of biomolecular systems. Computational study of phase behavior, equilibrium properties, dynamics and phase transformations in disordered condensed matter.

Tarun Sauradeep

Inter-University Centre for Astronomy and Astrophysics

Tarun is a Bachelor of Technology at IIT, Kanpur (1988). After a short stint in automobile design, he moved to research in cosmology.
He completed his PhD at IUCAA (1995). He held postdoctoral positions at CITA, Toronto, Canada and KSU, USA before joining IUCAA as a faculty in 2000.

Tarun Souradeep is a cosmologist who has made significant contribution to the important thrust area of Cosmic Microwave Background (CMB) anisotropy. Tarun's work has dwelt on the cosmological ramifications of physics in the early universe and he has searched CMB data for clues of possible connections between observations and early universe scenarios based on ultra-high energy physics over a wide spectrum of problems.

V. Srinivas

School of Mathematics, TIFR

Srinivas joined the TIFR, Mumbai as a Visiting Fellow in January, 1983. He was appointed as a Fellow at TIFR in August, 1983, and has been working there since then, currently as a Senior Professor. He had several PhD students, and has served on some National Committees, like the Program Action Committee for Math. Sciences of the DST, the Bhatnagar Awards Committee for the CSIR, the INSA National Committee for Mathematics, and is a member of some committees for the forthcoming International Congress of Mathematicians, to be held in Hyderabad in 2010. He has received several awards, including the INSA Medal for Young Scientists (1987), the Birla Award for Math. Sci. (1995), the Swarnajayanthi Fellowship of the DST (1998), the Bhatnagar Award (2003), the J.C. Bose Fellowship of the DST (2008), and the TWAS Mathematics Prize (2008). He is a Fellow of the Indian Academy of Science (Bangalore), and of the INSA.

Algebraic cycles and K-theory

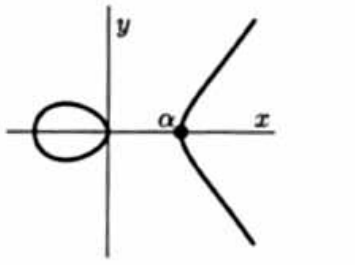
Srinivas has worked mainly in algebraic geometry. One of his abiding interests has been the study of algebraic cycles on singular algebraic varieties. Other themes in his work are on the interface with commutative algebra, for example, on projective modules, divisor class groups, unique factorization domains, and Hilbert functions and multiplicity. He has also worked on aspects of positive characteristic algebraic geometry. An important work of his, not on any of the above themes, is the solution of Zariski's problem (Riemann-Roch problem for surfaces), obtained together with Cutkosky.

R. Sujatha

Professor, School of Maths, TIFR

Sujatha is currently a Professor, School of Mathematics, Tata Institute of Fundamental Research. She completed PhD from TIFR / Bombay University.

My initial area of research was the algebraic theory of quadratic forms. Currently, I work in the area of non-commutative Iwasawa theory. My research interests also include the study of motives.

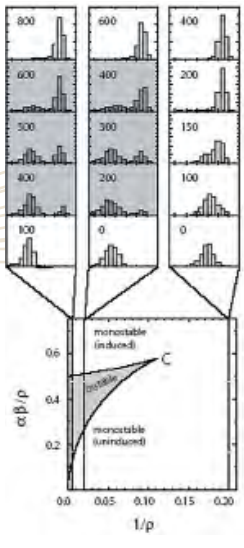


A Cubic Curve with Two Real Components

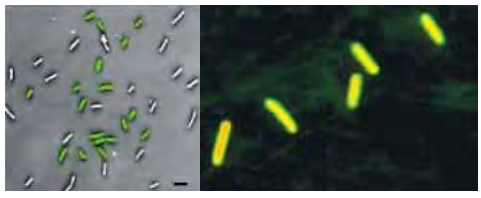
Mukund Thattai

National Centre for Biological Sciences (NCBS)

Mukund Thattai obtained a BA in Physics from Cornell University in 1999, and a PhD in Physics from the Massachusetts Institute of Technology in 2004. He began his graduate studies at MIT intending to work on condensed-matter theory, but his attention quickly turned to biological problems, particularly the study of stochastic processes in living cells. Immediately following his PhD, Mukund took up an independent position as a Young Investigator at the National Centre for Biological Sciences in Bangalore, India; he is currently a faculty member at the same Institute. Mukund's laboratory at NCBS combines experimental and computational techniques to study transcriptional regulatory networks and intracellular traffic networks.



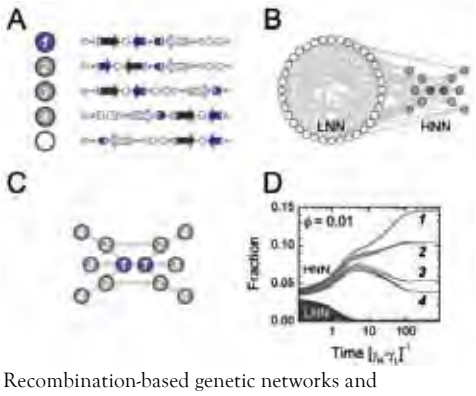
Modular analysis of sensory and regulatory networks



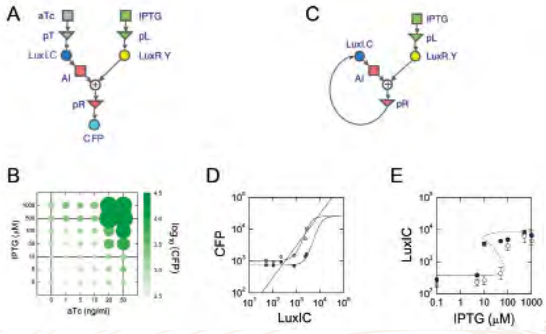
Prokaryotic signaling and gene regulatory networks

Computational Cell Biology: Exploring the organizing principles of transcriptional regulatory networks and intracellular traffic networks. He is interested in the complex properties of living systems which emerge through the local interactions of networks of genes and proteins.

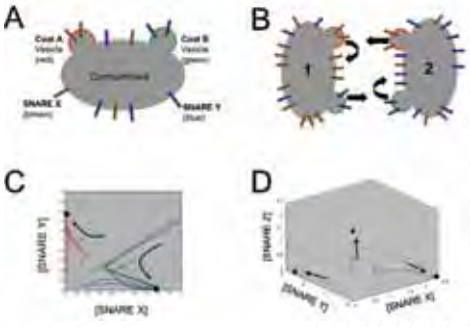
His group explores this phenomenon in two key cellular sub-systems. First, they develop tools to design and construct genetic networks to functional specifications, using standard parts such as transcription factors and promoters. Second, they study intracellular traffic systems in eukaryotic cells, investigating how dynamic organelles and traffic pathways can arise through basic processes such as cargo sorting and vesicle transport.



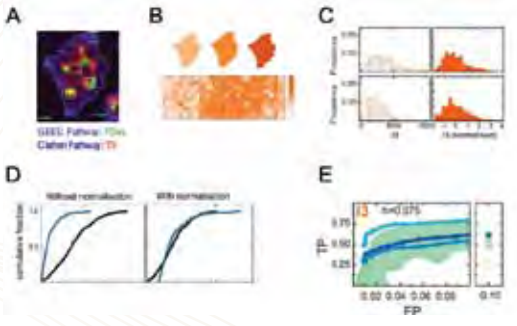
Recombination-based genetic networks and microbial consortia



Design principles of bacterial quorum-sensing systems



Modelling a self-organized multi-compartment traffic system



Applying a novel approach based on cell-to-cell variability to screen for components of the endocytic machinery (in collaboration S. Mayor, NCBS)

Sandip Trivedi

Tata Institute of Fundamental Research

Sandip Trivedi is currently a Professor in the Department of Theoretical Physics at the Tata Institute of Fundamental Research. He got his MS from the Indian Institute of Technology, Kanpur, and his PhD from the California Institute of Technology, Pasadena, USA. He was awarded the Swarnajayanti Fellowship in 2002, by the Department of Science and Technology, Government of India, and the Shanti Swarup Bhatnagar Award in 2005, by CSIR, Government of India. He is a member of the Indian Academy of Science.

He is interested in string theory, particle physics and aspects of cosmology. Currently in his research flux compactifications is a subject of considerable interest, especially simpler constructions of deSitter vacua and the the study of non-supersymmetric Anti-deSitter vacua and their duals. Extremal black holes, especially non-supersymmetric ones, are also a topic of interest. Another main theme in his on-going work is the attempt to use the AdS/CFT

correspondence to learn about strongly coupled field theories especially for physics beyond the standard model and possibly for condensed matter physics.

Spenta R. Wadia

Tata Institute of Fundamental Research (TIFR)

Spenta Rustom Wadia attended St. Mary's High School, obtained his BSc in 1971 while at St. Xavier's College, Mumbai, his MSc from IIT-Kanpur in 1973, and his PhD in Physics from the City University of New York in 1978. After his post-doctoral work at the University of Chicago in 1982 he joined the faculty of the Tata Institute of Fundamental Research where he is a Distinguished Professor. He is presently Chairperson of the Department of Theoretical Physics and Director of the International Centre for Theoretical Sciences of TIFR. He is a fellow of all the science academies of India and of TWAS. He is a recipient of the Steven Weinberg Prize of the Abdus Salam ICTP in 1995 and the TWAS Physics Prize in 2004. He is a Distinguished Alumnus of St. Xavier's College, Mumbai.

His main research contributions are in the areas of quantum field theory, string theory, quantum gravity and statistical physics. He has contributed to the understanding of the structure and dynamics of gauge theories and quantum field theories, especially in the large N limit; to the subject of non-critical string theory and matrix models and black holes in string theory. His research interests include fluid dynamics and mathematics.ity resolution in quantum gravity using the AdS/CFT correspondence.

1. String theory
2. Quantum gravity
3. Statistical Physics

Adjunct / Joint Faculty

Adimurthy, CAM-TIFR | Amit Apte, CAM-TIFR | Upinder Bhalla, NCBS | Vijay Chandru, Strand Life Sciences | Chandan Dasgupta, IISc | Justin David, IISc and HRI
Abhishek Dhar, RRI | Avinash Dhar, TIFR | Rohini Godbole, CHEP, IISc | E.D. Jemmis, IISC and IISER, Thiruvanathapuram | Ravi Kannan, Microsoft Research Labs, India
Yamuna Krishnan, NCBS | N. Kumar, RRI | Satyajit Mayor, NCBS | Seema Nanda, CAM-TIFR | Roddam Narasimha, JNCASR | Rahul Pandit, IISc | Mrinalini Puranik, NCBS
M. S. Raghunathan, TIFR | Sriram Ramaswamy, IISc | G. Rangarajan, IISc | Madan Rao, RRI | Srikant Sastry, JNCASR | Vijay Shenoy, IISc | Ajay Sood, IISc | P.N. Srikanth, CAM-TIFR | Mukund Thattai, NCBS | Spenta R. Wadia, TIFR and ICTS

TIFR	Tata Institute of Fundamental Research, Mumbai
CAM-TIFR-TIFR	Centre for Applicable Mathematics, Bangalore
NCBS,TIFR	National Centre for Biological Sciences of TIFR, Bangalore
IISC	Indian Institute of Science, Bangalore
IISER	Indian Institute of Science Education and Research
JNCASR	Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore
RRI	Raman Research Institute, Bangalore

Adi Adimurthy

Centre for Applicable Mathematics – TIFR

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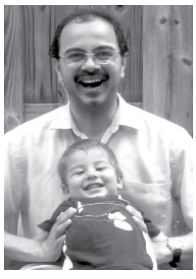
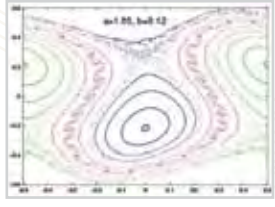


Amit Apte

Centre for Applicable Mathematics - TIFR



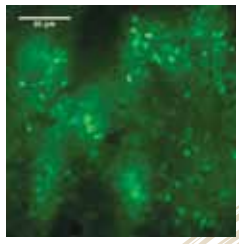
Amit Apte is a faculty at the TIFR Centre in Bangalore. He was a postdoc in MSRI (Mathematical Sciences Research Institute) and in Math at UNC Chapel Hill and at SAMSI (Statistical and A.M.S.I.), located in the Research Triangle in Durham. He completed his PhD in Physics at UT Austin.

Dynamical systems and their applications to physical problems have been the unifying themes of his research. One of the areas of great interest to him is that of data assimilation... the incorporation of noisy observations of a system into an incomplete dynamical model of that system. This problem is pertinent to a variety of applications, including weather and climate prediction. His other research interests are in Hamiltonian systems, specially, periodic orbit bifurcation phenomena and breakup of invariant circles in nontwist systems, such as the meandering jet of the gulf stream in the Atlantic ocean.

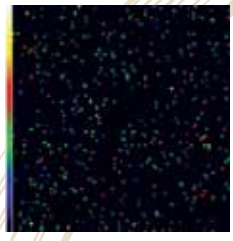
Upinder Bhalla

National Centre for Biological Sciences (NCBS)

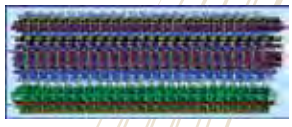
Upinder Bhalla studied Physics at IIT Kanpur and Cambridge. He did his PhD in biology at Caltech, on the topic of olfactory information processing. For his post-doctoral work he moved to Mount Sinai School of Medicine, where he began work on systems biology of memory. He has been at NCBS since 1996, combining experiments and theoretical work on brain computation.

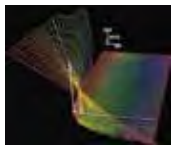


Olfactory physiology



Hippocampal connection-function models





Signaling and memory

We are interested in how the brain computes. This includes sensory information processing, circuit and cellular computations, and signaling in memory.

1. We study olfactory information processing in mammals, focussing on the questions of how animals localize odours, and how odour information is represented in the brain.

2. We are interested in how neural circuits are connected, and the resultant implications for network computation.

3. We study cellular computation especially at the interface of biophysical and biochemical events in memory.

We also develop computational tools such as simulators and databases to complement these research topics.

Vijay Chandru

Strand Life Sciences

Vijay Chandru (PhD, MIT 1982) is an academic entrepreneur. Professor Chandru's academic career in teaching and research in algorithms and computational mathematics, has spanned over twenty-five years - from 1982-1992 at Purdue University, 1992-2005 at the Indian Institute of Science and since 2003 as a Research Affiliate of the Lab for Information and Decision Systems at MIT in Cambridge, Mass. He has co-authored a book in computational logic and over seventy peer-reviewed research papers. He was elected a Fellow of the Indian Academy of Sciences in 1996. A founder of Strand Life Sciences, a computational biology company, he currently serves as Chairman & Chief Executive Officer. Strand specializes in applying decision sciences and systems modeling to drug discovery research. He is also a founder of the Association of Biotech led Enterprises (ABLE) and continues to serve as an executive council member. Professor Chandru was also a founder

of PicoPeta Simputers, a private limited company that commercialized the Simputer technology and brought it to market. PicoPeta was merged with Geodesic Ltd in 2006. As one of the inventors of the Simputer, Professor Chandru received the Dewang Mehta Award, the first time it was awarded in 2001 (it is India's highest award for innovation in information technology). For work with Strand and biotechnology, he was named a Technology Pioneer of the World Economic Forum in 2007, the Biospectrum Biotech Entrepreneur of 2007, For contributions to Science and Society, Professor Chandru was awarded the Hari Om Trust Award by University Grants Commission (MHRD) in 2003, the President's Medal of INFORMS in 2006, and was named in the 50 pioneers of change by India Today in 2008.

Vijay Chandru has broad research interests in algorithms and computational mathematics. His research contributions have been in combinatorial optimization and in the computational aspects of geometry, logic and biology.

Kedar Damle

Department of Theoretical Physics, TIFR

Kedar Damle was trained at IIT Bombay (B.Tech) and Yale University (PhD). After postdoctoral stints at Princeton University and Harvard University, and a stint on the faculty of Rice University, he joined the Department of Theoretical Physics at TIFR in 2004.

The interplay of strong inter-particle interactions, quantum fluctuations, and low temperature can lead to many interesting phenomena in condensed matter systems. Many of these are now well-understood in terms of standard theoretical paradigms such as Landau's Fermi Liquid Theory, the Bogoliubov description of superfluids, the BCS theory of superconductivity, spin-wave theory for magnetically ordered systems, and the scaling theory of localization in disordered electronic systems. However, there are many examples that do not fall into any of these known paradigms, and are therefore very poorly understood... examples include the unusual normal state of high-Tc superconductors, heavy fermion materials on the verge of a transition to a spin-density wave state and frustrated magnets with unusual spin-liquid ground states.

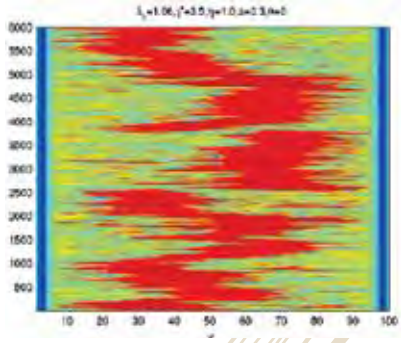
Over the last three years, we have organized three ICTS programmes in the broad area of condensed matter physics, which attempt to highlight these challenges to the field, in addition to having a pedagogical component aimed at acquainting students and postdocs with the standard paradigms that guide our research efforts.

1. Strongly-correlated systems
2. Frustrated quantum systems

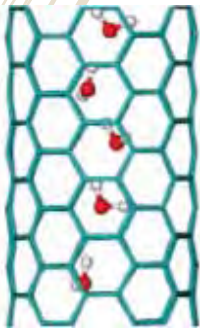
Chandan Dasgupta

Professor and Chairman of the Department of Physics, Indian Institute of Science (IISc)

Chandan Dasgupta's area of specialization is theoretical condensed matter physics with emphasis on statistical mechanics. His work elucidated the role of topological defects in various phase transitions.



Space-time plot of shear stress in the chaotic state of a sheared nematic fluid.



Chain of water molecules in a narrow carbon nanotube

He developed a real-space renormalization group method for studying one-dimensional systems with strong disorder, which has found applications in a wide variety of problems. Dasgupta's work has played an important role in the development of a theoretical understanding of the effects of quenched disorder in condensed matter systems. His studies of the equilibrium properties of vortex matter in high-temperature superconductors with different kinds of pinning have provided explanations of a variety of experimental results. Dasgupta has also made important contributions in the theory of the structural glass transition. He pioneered the use of density functional theory, finite-size scaling methods and replicated liquid-state theory in the study of the glass transition. He has taught many courses at undergraduate and graduate levels and mentored 12 PhD students and several postdoctoral associates. He has published more than 100 research articles in internationally reputed journals and several review articles and book chapters.

Supercooled liquids and the glass transition: existence of a growing length scale near the glass transition, finite size scaling of dynamic susceptibilities and relaxation times in glass forming liquids

Superconductivity and superfluidity: ginzburg-landau theory for superconductivity and unusual normal state behaviour in cuprate superconductors; "supersolid" behaviour in solid 4he from superfluidity in grain boundaries.

Dynamics of nonequilibrium systems: rheological chaos in sheared nematogenic fluids.

Physics at the nanoscale: dynamics of water and other small molecules in narrow carbon nanotubes; kinetics of growth of nanocrystals in the solution route of synthesis.

Justin David

Indian Institute of Science (IISc)

Justin David is currently the Assistant Professor at the Centre for High Energy Physics, Indian Institute of Science, Bangalore, India.

There are two distinct areas of string theory he is currently interested in: Understanding the physics of black holes in string theory.

The gauge/string duality.

Most of the successful understanding of black hole entropy in string theory involves black holes in highly supersymmetric N # 4 string backgrounds. The thrust of his current research is to understand black holes in less supersymmetric situations. Recently he has proposed a partition function for black holes which preserve half the supersymmetries in a class of N=2 string theories. In N=2 string theories there are interesting new sub-leading corrections to the entropy on the geometric side compared to the more supersymmetric N=4 case. The proposed partition function precisely reproduces these new corrections.

In the area of gauge/gravity duality he has pursued 3 areas, all of which involve aspects of the duality in which a 1+1 field theory is dual to a gravitational theory in 3 dimensions.

1. Applications of gauge gravity duality to understand strong coupling behaviour of 1+1 field theories.
2. Recasting partition functions of gravity in 3 dimensional Anti-de Sitter space as characters of the conformal algebra in 1+1 dimensions.
3. Using integrability and the symmetries of string theory in 3 dimensional Anti-de Sitter space to determine the S-matrix of the dual conformal field theory.

Recently they have shown that for a class of non-conformal field theories which admit gravity duals, the ratio of bulk viscosity to entropy density is the universal number, ¯h/4#kB. Here ¯h is the Planck constant and kB is the Boltzmann constant.

Abhishek Dhar

Raman Research Institute (RRI)

Abhishek Dhar joined Raman Research Institute as a Scientist in 2001 and is currently a Associate Professor in the Theorectical Physics Group at the Raman Research Institute in Bangalore, India.

He finished his PhD from TIFR in 1998.

His main current interest is in understanding thermal and electrical transport in low dimensional systems. Two different approaches that he was pursuing were :

(i) the quantum Langevin equation method and

(ii) the scattering theory approach. Some interesting questions were the role of interactions and disorder on transport properties.

His interests include understanding some very general results on nonequilibrium systems that have been obtained recently and are referred to as the fluctuation theorems. The full implications and generality of these results is not yet known.

Avinash Dhar

Tata Institute of Fundamental Research (TIFR)

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Amol Dighe

Department of Theoretical Physics, TIFR

Amol Dighe is an Associate Professor in Tata Institute of Fundamental Research, in the Department of Theoretical Physics. He works in the area of High Energy Physics.

Amol Dighe completed his B.Tech. in Engineering Physics (1992) from the Indian Institute of Technnology, Bombay. His M.S. And Ph.D. (1997) were from the University of Chicago, where he explored signals of charge-parity violation in particle physics interactions. Later he was a postdoctoral researcher in ICTP (Trieste, Italy), CERN (Geneva, Switzerland) and Max Planck Institute for Physics (Munich, Germany), before joining TIFR as a faculty member in 2003.

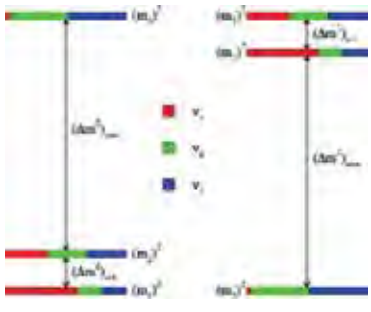
Amol was one of the first Indian Bronze Medalists in the International Mathematics Olympiad, held in Germany in 1989. He has received the Institute Silver Medal from IIT Bombay, and the Worldlab-CERN John Bell Scholarship. He has also been selected as the Leader of the Max Planck -- India Partner Group in Neutrino Physics and Astrophysics for five years.

His research in High Energy Physics has two main threads: astroparticle physics of neutrinos, and indirect searches of physics beyond the Standard Model of particle physics (SM) through the decays of B mesons.

In B Physics, his focus has been on precision measurements of the Cabibbo-Kobayashi-Maskawa matrix elements, the lifetime differences in neutral B systems, and analyses of leptonic decays.

His interest is in searching for new physics signals via deviations from robust SM predictions, and identifying the type of new physics that can give rise to such deviations.

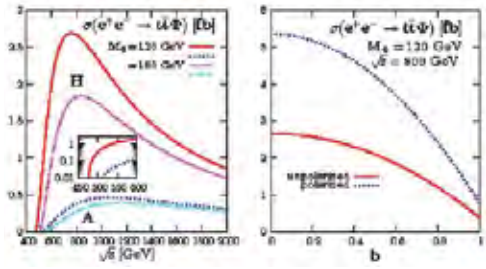
He is passionate about understanding the properties of neutrinos: their absolute masses, mass ordering, possible Majorana nature, the role they play in astrophysics and cosmology. Some of his most important work has been on studying the neutrino flavour conversions inside a core collapse supernova, and thereby extracting information on the neutrino mixing scenario and supernova dynamics. He also work on constructing models of neutrino masses and mixing, and their connection to the quark masses through unification.



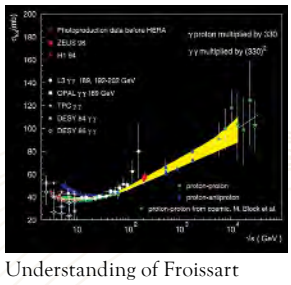
Rohini Godbole

CHEP, IISC

Rohini is currently a professor at Indian Institute of Science, Bangalore and also an adjunct faculty for TIFR, Mumbai.



Use of top-antitop-Higgs production for CP determination of the Higgs



Understanding of Froissart bound in a QCD based model with soft gluon resummation

'Lilavati's Daughters: Women Scientists of India

Works extensively on different aspects of particle phenomenology over the past three decades, authoring about 180 research publications so far. The work regarding hadronic structure of high energy (real and virtual) photons outlined a variety of ways to study it. This work also has had implications for the design of next generation electron positron colliders, due to the possible large hadronic backgrounds that the beamstrahlung photons being emitted in these colliders can cause. Suggested innovative ways to search for the top quark, Higgs bosons and other new particles and to explore physics beyond the standard model of particle physics at the LHC and the ILC. Co authored a book "Theory and phenomenology of sparticles: An account of four-dimensional N=1 supersymmetry in high energy physics" (Published by World Scientific, January 2005). Has supervised research of a number of students and post doctoral fellows.

1. New Particle Production at current and future colliders.
2. Physics at LHC and NLC.
3. QCD phenomenology: Structure Functions of a proton, photon and nucleus.
4. Supersymmetry and Electroweak Physics

Eluvathingal D. Jemmis

Indian Institute of Science Education and Research (IISER)

Eluvathingal D. Jemmis was born in Chevoor, Kerala and educated at the village school. After obtaining BSc (University of Calicut; University College, Trivandrum and St. Thomas College, Thrissur) and MSc (Indian Institute of Technology, Kanpur) Jemmis moved to Princeton University in 1973 to work with Prof. Paul von Rague Schleyer. During the formal Princeton years moving along with his supervisor, Jemmis spent a semester at the University of Munich (Fall, 1974) and four semesters at the University of Erlangen-Nuernberg (1976-77). After several collaborative projects with his supervisor and Professors Lee Allen and John Pople, a PhD degree was received from Princeton in 1978. A two year postdoc at Cornell University (Prof. Roald Hoffmann) followed. In 1980 Jemmis joined the then fledgling School of Chemistry,University of Hyderabad where he became a Professor in 1990. After 25 years in Hyderabad, Dr. Jemmis accepted an invitation from the Indian Institute

of Science, Bangalore and joined the Department of Inorganic and Physical Chemistry of IISc. Jemmis was a Visiting Fellow at the Research School of Chemistry, Australian National University, Canberra (1991) and a Visiting Professor at the Center for Computational Quantum Chemistry of the University of Georgia, Athens (2000). Jemmis is a member of the Editorial Advisory Board of the Journal of Computational Chemistry and a member of the Scientific Advisory Board of WATOC World Association of Theoretically Oriented Chemists and Honorary Professor at the Jawaharlal Nehru Centre for Advanced Scientific Research , Bangalore. Jemmis was elected Fellow of the Indian Academy of Sciences, Bangalore (1992), the Indian National Science Academy, New Delhi (1998), the National Academy of Sciences, India, Allahabad (2003) and the Academy of Sciences for the Developing World, Trieste, Italy (2004) and received many awards and honours (see biodata for details) including the Shanti Swarup Bhatnagar Prize, Council of Scientific and Industrial Research, CSIR, New Delhi (1994). Dr. Jemmis was awarded the J.C. Bose National Fellowship of the Department of Science and Technology, New Delhi, in 2006. Jemmis went on deputation to start IISER Thiruvananthapuram in June 2008.

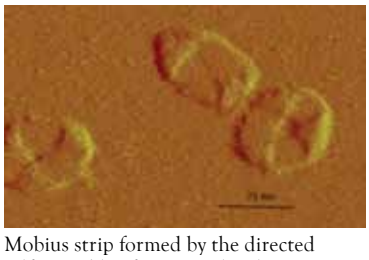
Applied Theoretical Chemistry, Structure and Reactivity of molecules and clusters.
They study the structure and reactivity problems of real life molecules, clusters and solids using theoretical techniques ranging from the simplest of molecular orbital methods to the sophisticated electronic structure theory depending on the system at hand and the questions that are to be answered. A constant attempt is made by us to find common threads between problems in one area to another, for example, between organic and organometallic chemistry, amongst the chemistry of various main group elements, between polymorphs of elements and their compounds and so on. They place great importance in not only getting numbers as an answer to a problem, but also in finding out why the numbers turn out the way they do, based on overlap of orbitals, perturbation theory, and symmetry, and in devising transferable models.

Manoj Gopalakrishnan

Tata Institute of Fundamental Research

Manoj Gopalkrishnan is a faculty member in the School of Technology and Computer Science at TIFR. He holds a PhD from the University of Southern California, and a BTech. from IIT Kharagpur.

Manoj studies the emergence of sophisticated behavior from autonomous interactions between simple objects. Directed DNA self-assembly provides a sandbox for the synthesis of such systems. The challenge is to engineer DNA molecules whose interactions direct their assembly towards the desired behavior. Such work has found applications in nanotechnology. In turn, the experiments have provoked several theoretical questions. What does the network of a system of reactions tell us about its dynamics? How hard is computing chemical equilibria? How much energy does a chemical computer need? What is a good programming language abstraction for describing the self-assembly of DNA molecules?



Mobius strip formed by the directed self-assembly of DNA molecules. Joint work with Nikhil Gopalkrishnan and Len Adleman.

Ravi Kannan

Principal Researcher, Algorithms Research Group, Microsoft Research Labs., India.

Ravi Kannan is a principal researcher in Microsoft Research India.
He is recipient of /Fulkerson /Prize in Discrete Mathematics in 1991

1. Theoretical Computer Science, Optimization
2. Massive Data Sets, Sampling
3. Clustering
4. Markov Chains
5. Linear Algebra Algorithms and Applications

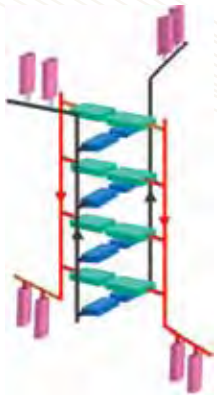
Yamuna Krishnan

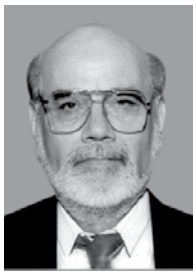
National Centre for Biological Sciences (NCBS)

Structure and Dynamics of Nucleic Acids

Bionanotechnology aims to learn from nature - to understand the structure and function of biological devices and to utilise nature's solutions in advancing science and engineering. Evolution has produced an overwhelming number and variety of biological devices that function at the nanoscale or molecular level. My lab's central theme is one of 'translational biology', which involves taking a biological device, component or concept out of its cellular context and harnessing its function in a completely new setting such as in materials or diagnostics. Our current research involves understanding the structure and dynamics of unusual forms of DNA and translating this knowledge to create DNA-based nanodevices for applications in bionanotechnology.

Structural DNA nanotechnology is an emerging field that uses the base-complementarity design principle of DNA to create ordered superstructures from a set of DNA sequences that self-assemble into regular, well-defined topologies on the nanoscale. With a diameter of 2 nm and a helical periodicity of 3.5 nm, the DNA double helix is inherently a nanoscale object. The specificity of Watson-Crick base pairing endows oligonucleotides with unique and predictable recognition capabilities. This makes DNA an ideal nanoscale construction material. Understanding and thereby controlling structure and dynamics in DNA is thus key to realizing its potential as a nanoscale building block for device applications of structural DNA nanotechnology. These DNA nanodevices may function as rigid scaffolds in 1D, 2D or 3D or as dynamic switches. We incorporate unusual nucleic acid motifs into structural DNA nanotechnology which endows DNA architectures with new function.





Narendra Kumar

Homi Bhabha Distinguished Professor, Raman Research Institute (RRI)

Narendra Kumar is currently the Homi Bhabha Distinguished Professor at the Raman Research Institute. He completed his PhD in Physics from IIT, Bombay in 1971 (Thesis: Theoretical Studies of Some Static and Dynamical Interactions in Magnetic Solids).

1. Classical Orbital Diamagnetism: The Bohr - van Leeuwen (BvL) Theorem Re-visited

The classical Langevin dynamics of a charged particle on a fnite but unbounded closed surface gives a non-zero diamagnetic moment in a magnetic field. This is attributed to the avoided cancellation consistent with the physical picture of Niels Bohr in which the diamagnetic moment associated with the amperean current of the completed orbits away from the boundary is cancelled by the the paramagnetic moment of the particles skipping the boundary in the opposite sense.

2. The interplay of spatial disorder (random scattering), background order (Bragg scattering), and dissipation (stochastic absorption):

The above interplay is shown to give counter-intuitive effects on the wave reflection, transmission, attenuation and the wave energy storage in such a medium.

Satyajit Mayor

National Centre for Biological Sciences (NCBS)

Satyajit 'Jitu' Mayor was born in Baroda, India and received his MSc in Chemistry from IIT, Mumbai. He obtained his PhD in Life Sciences from the Rockefeller University, New York, working in the Laboratory of Molecular Parasitology with George Cross where he studied the biosynthesis of GPI-anchors in the African sleeping sickness parasite, Trypanosoma brucei. He then moved to Department of Pathology at Columbia University, New York, to study endocytic trafficking of lipids and proteins in Frederick R. Maxfield's laboratory, where he developed tools to study the trafficking of GPI-anchored proteins in mammalian cells using quantitative fluorescence microscopy. In 1996, Satyajit Mayor moved to the National Centre for Biological Sciences, (NCBS) Bangalore, India where he is now Dean, and Professor in the area of Cellular Organisation and Signalling.

Mayor's work on the nanoscale pattering of an evolutionarily conserved tissue patterning morphogen, the Hedgehog protein, has also provided a new perspective to the understanding of this crucial signalling system, and this research could possibly have an impact on future cancer therapy.

Besides pioneering many new methods in nanometric imaging, Satyajit Mayor has been instrumental in establishing high resolution imaging technologies at NCBS in conjunction with leading mircoscopy companies. He has led industry and academia efforts to initiate NOMIC (NCBS-Olympus Microimaging Centre), a new experiment in running platform technologies in institutions in India. He is also co-chair of the Bangalore Microscopy Course,

a yearly affair organized jointly by 100X-Imaging and NCBS that attracts researchers who have pioneered the use of microscopy to solve outstanding problems in biology, to teach microscopy.

He currently serves on the editorial board of several international journals in his field of research: these include Cell, Molecular Biology of the Cell, Traffic, and Biochemica Biophysica Acta.

Membrane organization in cells; Imaging structure at the nanoscale;
Roles of cytoskeletal activity in patterning membrane shape and composition; Membrane dynamics in endocytic processes in Metazoa; Understanding the genome, proteome and lipidome of endocytic processes and organelles; Endocytic modulation of developmental programmes; Interdisciplinary approaches in cell and developmental biology.

Shiraz Minwalla

Department of Theoretical Physics, TIFR

Shiraz Minwalla is a recent Indian string theorist. Early on he became a Harvard Junior Fellow and subsequently an assistant professor at Harvard University and assistant professor at Tata Institute of Fundamental Research in Mumbai (his home town). He graduated from Indian Institute of Technology Kanpur in 1995, and was awarded the President's Gold Medal for topping the entire batch; he later moved to Princeton University to earn his PhD. He was awarded the Swarnajayanti Fellowship 2005-06 by the Department of Science & Technology, Government of India.

Notable Contributions to the field:
1. Analysis of primary operators on AdS4 and AdS7
2. Three-point functions in N=4 supersymmetric Yang-Mills theory and AdS/CFT
3. Noncommutative perturbative dynamics (with Nathan Seiberg and Mark Van Raamsdonk)
4. Noncommutative solitons (with Andrew Strominger and Rajesh Gopakumar)
5. OM-theory (with Nathan Seiberg, Andrew Strominger and Rajesh Gopakumar)
6. Stringy interactions in pp-waves
7. Some insights about tachyon condensation

Seema Nanda

Centre for Applicable Mathematics- TIFR

Seema Nanda is currently a reader at the Centre for Applicable Mathematics, Tata Institute of Fundamental Research.

Her broad research interests lie in mathematics as applied to real world problems. Within this, her focus has been to understand biological processes, especially as related to diseases such as cancer and diabetes.

The aim of her research is to build mathematical models based on in-vivo and in-vitro experiments with the aim of gaining some understanding and insight into phenomenon not well understood, such as drug resistance in cancer, or glucose metabolism in the case of diabetes mellitus. Working in conjunction with biologists is an emphasis here so that models developed are realistic.

In addition to the above research interests she has been working on mathematical problems in the application area of Finance. Most recently this has involved trying to model stochastic volatility. The entire option-pricing issue rests on good estimates of volatility. Volatility however is random and therefore to determine option prices that are close to market values one would like to be able to model volatility that is reflective of real world volatility, so that an options portfolio can be appropriately hedged.

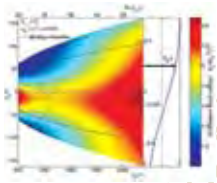
Roddam Narasimha

Chairman, Engineering Mechanics Unit, Jawaharlal Nehru Centre for Advanced Scientific Research

Roddam Narasimha is currently the Chairman, Engineering Mechanics Unit at JNCASR.

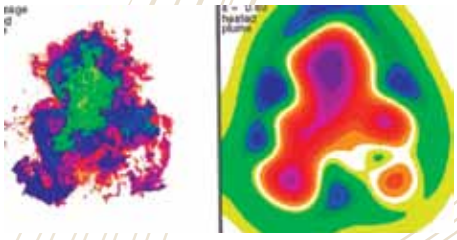
He completed his PhD from Caltech in 1961. He has been a Fellow of Royal Society (1992), awarded the Bhatnagar Prize in Engineering Sciences, CSIR (1976) and Trieste Science Prize (2008).

My major interests have been in fluid dynamical problems associated with aerospace technology and atmospheric sciences. A connecting link between the two is that turbulent fluid flow plays an important role in both fields.

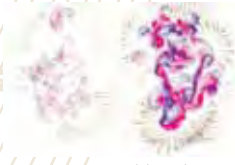


Relaminarization in Supersonic Flow

Linear Stability of a Mixing Layer



Heating Disrupts Order



Vorticty in Cold and Heated Jets

Reverse Transition

Transition from laminar to turbulent flow, as well as the less widely studied reverse transition from turbulent to laminar, have been a major area of my research. So has the question of memory of turbulent flows, and the general burstiness of turbulent fluxes. In the atmosphere turbulent flow in the tropics has a strongly convective character, and the laws governing eddy fluxes at low winds has been studied in field experiments and a new heat-flux scaling found. During the last ten to fifteen years a major interest has been cumulus clouds - in particular the simulation of their fluid dynamics in the laboratory and on the computer.

Rahul Pandit

Indian Institute of Science (IISc)

He is a Professor in the Department of Physics, Indian Institute of Science, Bangalore and Chairman of the Division of Physical and Mathematical Sciences.

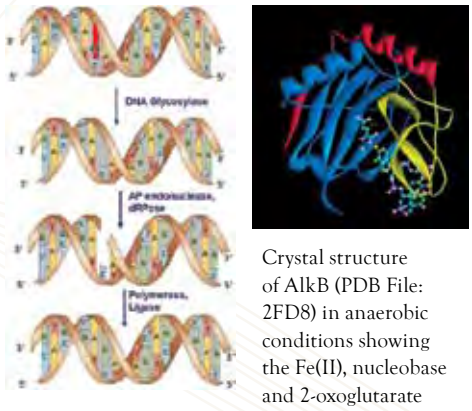
He has done research on a wide variety of problems in the statistical mechanics of condensed-matter systems. These include: surface phase transitions like wetting and multilayer adsorption; complex fluids like microemulsion, micellar, lamellar, and sponge phases in oil-water-surfactant mixtures and bilayer systems, and semiflexible, living and equilibrium polymers; quantum antiferromagnets and oxides that show strong-correlation effects like the colossal magnetoresistive manganites; systems of interacting bosons; the hysteretic behaviour of driven spin systems and magnets; turbulence and spatiotemporal chaos in extended, deterministic dynamical systems such as turbulence in fluids and spiral turbulence associated with cardiac arrhythmias like ventricular fibrillation.

http://www.physics.iisc.ernet.in/~rahul

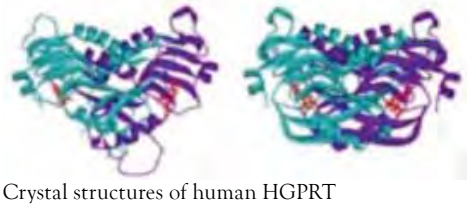
Mrinalini Puranik

National Centre for Biological Sciences (NCBS)

Mrinalini Puranik is a faculty member at the National Centre for Biological Sciences. She has Bachelor and Masters degrees in Physics from the University of Pune and was a visiting student at the Inter-university Centre for Astronomy and Astrophysics where she did her Master's research. She then moved to the Indian Institute of Science, Bangalore to pursue doctoral studies. There she worked on nanosecond dynamics of molecules involved in photosynthesis, called quinones, using time-resolved spectroscopy and quantum chemical modeling. This was followed by a post-doctoral stint at Princeton University where she studied the binding of small gas molecules like oxygen and carbon monoxide to hemeproteins. She set-up the first ultraviolet resonance Raman facility in India at the National Centre for Biological Sciences, Bangalore in 2004 to study structure and dynamics of proteins and nucleic acids. Current research in the Puranik laboratory is aimed at understanding



Crystal structure of AlkB (PDB File: 2FD8) in anaerobic conditions showing the Fe(II), nucleobase and 2-oxoglutarate (2OG) and methylated trinucleotide d(T-meA-T) bound to it.



Crystal structures of human HGPRT with bound GMP (Eads, J.C. et al., Cell 1994 PDB ID: 1HMP), left; and P. falciparum HGPRT bound to the transition state inhibitor immucillin (Shi et al., Biochemistry, 1999 PDB ID: 1CJB), right.

The ultraviolet resonance Raman laboratory.

the architecture and dynamical properties of enzymes that display substrate promiscuity while still retaining catalytic efficiency. The lab studies these properties in enzymes that are involved in a variety of cellular processes such as the repair of chemical damage in DNA and the recycling of nucleobases.

She is interested in the structure, dynamics and organization of biomolecules in the context of their function. The remarkable specificity of enzymes is attributed in part to the assembly of specific voids, termed active-sites, with properties complementary to the molecules they are designed to bind. It is now being appreciated that plasticity of enzymes is important for the assembly and modulation of the active-site environments via both, static and dynamic contributions. To address these issues they are studying a variety of nucleic acid binding enzymes with wide ranging substrate specificity using either the nucleobase or aromatic amino acids as intrinsic vibrational probes. Experiments techniques employed are ultraviolet resonance Raman spectroscopy, quantum chemical calculations and simulations.

Jaikumar Radhakrishnan

School of Technology and Computer Science

Jaikumar Radhakrishnan is a Professor in the School of Technology and Computer Science of the Tata Institute of Fundamental Research, Mumbai, India. He received his B.Tech. degree in Computer Science and Engineering from the Indian Institute of Technology, Kharagpur, in 1985, and his MS and PhD degrees in Computer Science from Rutgers University, USA, in 1991. From 1985 to 1986, he worked for CMC Ltd., Kolkata, developing software. He has been at the Tata Institute of Fundamental Research since 1991, and has spent a year at the Japan Advanced Institute of Science and Technology (1992-93), a year at the Hebrew University (1996-97), and two years at the Toyota Technological Institute at Chicago (1994-96).

Jaikumar Radhakrishnan works mainly in the area of Theoretical Computer Science. His work involves the application of combinatorial, probabilistic and information theoretic tools for studying the power and limitations for various models of computation. He has made contributions in the areas of Approximation Algorithms, Circuit Complexity, Communication Complexity and Quantum Computing. He is also interested in combinatorics and graph theory, where he has contributed results by employing mathematical tools and techniques.

M.S. Raghunathan

Tata Institute of Fundamental Research (TIFR)

Raghunathan is a Fellow of the three national science academies in the country as well as of the Royal Society of London. He is a recipient of the Bhatnagar Prize of CSIR and of the Third World Academy Prize for mathematics. Raghunathan has also been engaged in promotional activities for matheamtics: he headed the National Board for Higher Mathematics for 1987-2006 and currently continues as a member. He was a member of the Executive Committee of the International Mathematical Union during 1998-2006. Currently he is the Chair of the Governing Council of the Harish-Chandra Research Institute in Allahabad and the Steering Committee of the Kerala School of Mathematics in Calicut.

He continues to do research in Lie theory and has in recent times taken an interest in public outreach activities for mathematics.

M.S. Raghunathan is a mathematician working in the area of Lie Theory to which he has made important contributions. He is currently DAE Homi Bhabha Professor at the Tata Institute of Fundamental Research from which institution he retired as Professor of Eminence in 2006.

N. Raja

Tata Institute of Fundamental Research

N. Raja is with the School of Technology and Computer Science, Tata Institute of Fundamental Research, Mumbai, India. He completed his Master's degree at the Indian Institute of Science, Bangalore, India, and his PhD at the Tata Institute of Fundamental Research.
He has held visiting positions at the University of Nijmegen, Netherlands; Ecole Polytechnique Federale de Lausanne, Switzerland; and the University of Paris, France. He is a member of the "Association for Symbolic Logic", the "Association for Automated Reasoning", and the "Association for Logic Programming".
He is an editorial board member of the journal "Logica Universalis", and a guest editor of "Sadhana" the Engineering Journal of the Indian Academy of Sciences. His research interests include Logic and Foundations of Mathematics, Type theory and Interactive Theorem Proving, Formal Methods, and Models of Interacting Processes. More details of his research activities may be found on his homepage: http://www.tcs.tifr.res.in/~raja

1. Models of Concurrent and Interacting processes.
2. Logic and Foundations of Mathematics.
3. Automated and Interactive Theorem Proving.
4. Programming Paradigms and Languages.
5. Formal Methods and Semantics of computation.

C.S. Rajan

Tata Institute of Fundamental Research

C.S. Rajan did his undergraduate studies at IIT Kanpur. He joined TIFR in 1984 to do his graduate studies. His thesis done with M.S. Raghunathan, was on proving some cohomological vanishing theorems for a class of automorphic vector bundles. He did his postdoctoral studies at McGill University with M. Ram Murty when his interests shifted to more arithmetical questions.

His reasearch interests are centred around arithmetic geometry and automorphic forms. Two themes that he has recently worked on are the relationship between the spectrum and arithmetic of locally symmetric spaces, and algebraic properties of characters of irreducible rational representations of algebraic groups. Apart from mathematics, he has keen interest in Indian classical music, hiking and homeopathy.

Sriram Ramaswamy

Indian Institute of Science (IISc)

Sriram Ramaswamy is currently a Professor, Centre for Condensed Matter Theory Department of Physics, Indian Institute of Science. He completed his PhD in Physics from the University of Chicago in 1983.

He is interested in soft-matter physics, nonequilibrium statistical mechanics, and biological physics. Currently, he is working on the mechanics and statistics of living matter, sedimentation and electrophoresis in suspensions, the glass transition in confined liquids, and granular monolayers as analogues to self-propelled systems.

G. Rangarajan

Department of Mathematics, Indian Institute of Science (IISc)

Govindan Rangarajan completed his PhD from University of Maryland, College Park. Later he was a Staff Scientist at the Lawrence Berkeley Lab, UC Berkeley. He returned to India in 1992 and joined as an Assistant Professor in the Indian Institute of Science (IISc), Bangalore.
He is currently a Professor in the Department of Mathematics and Chairman, International Relations Cell, IISc. He is also the Convener of the IISc Mathematics Initiative and DST Centre for Mathematical Biology. Previously he was the Chairman of Department of Mathematics.

Rangarajan works at the interface between mathematics, physics and biology. His research interests include nonlinear dynamics and chaos, first passage time problems, time series analysis and its applications to neuroscience and brain machine interface.

Madan Rao

Raman Research Institute (RRI)

Please refer to page 22

Srikanth Sastry

Jawaharlal Nehru Centre for Advanced Scientific research (JNCASR)

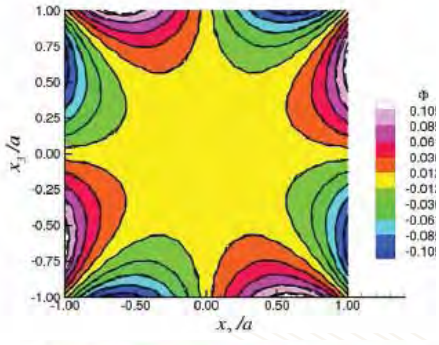
Please refer to page 23

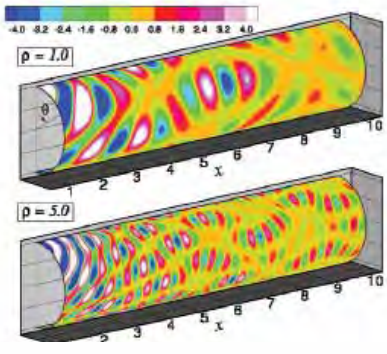
Vijay Shenoy

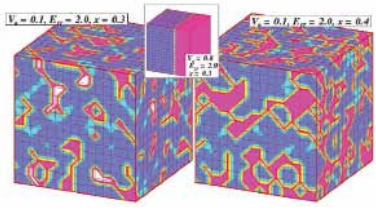
Indian Institute of Science (IISc)

Vijay Shenoy is currently an Assistant Professor at the Centre for Condensed Matter Theory Department of Physics, Indian Institute of Science. He completed his PhD from Brown University in 1998.

1. Physics of materials with strong electron correlations
2. Nanoscience
3. Pattern formation and complex phenomena in soft thin films







Ajay Sood

Indian Institute of Science (IISc)

A.K. Sood is a Professor in Department of Physics at Indian Institute of Science, Bangalore. He was Chairman of Division of Physical and Mathematical Sciences at IISc from 1999 till March 2008. He has published more than 250 papers in refereed international journals and holds 2 US patents and 4 Indian patents. The patent on the gas flow induced voltage generation on semiconductors and nanotubes, an effect popularly known as Sood Effect has been licensed to a company. His work has been recognized by way of many honors and awards. These include Fellowships of Indian Academy of Sciences, Indian National Science Academy, The National Academy of Sciences, India and the World Academy of Sciences (TWAS). He is recipient of many awards which include S.S. Bhatnagar Prize, G.D. Birla Award, TWAS Prize in Physics, FICCI Prize, Goyal Prize, M.N. Saha Award and Millennium Gold Medal of Indian Science Congress, Sir C.V. Raman Award of UGC, Homi Bhabha Medal of Indian National Science Academy, DAE Raja Ramanna Award of JNCASR and National Award in Nanoscience and Nanotechnology by Government of India. He is one of the Executive Editors of an International Journal Solid State Communications. He is Vice President of Indian National Science Academy and is currently holding the prestigious Bhatnagar Fellowship of CSIR.

His research interests include Physics of Nano systems like nanotubes and graphene, strongly electron correlated systems and physics of soft condensed matter. The latter includes shear induced instabilities like spatio-temporal chaos and electric field induced ordering

P.N. Srikanth

Professor and Dean, School of Mathematics, TIFR Centre for Applicable Mathematics

P.N. Srikanth is a member of the organizing committee of the ICTS workshop on New directions Applied Mathematics. Jointly with Professors Borkar and Rangarajan we are working to make this conference a great success.

His research during the last few years is centered around using topological information of one of the most important tools of nonlinear functional analysis “Mountain Pass Theorem”. Using the information on Morse Index of the critical point obtained using this theorem, interesting results on concentration phenomena and break of symmetry have been obtained in the following papers. Also the first paper combines information on Hopf Fibration in a very novel way to obtain the results of the paper.

1. Singularly perturbed elliptic equations with solutions concentrating on lower dimensional orbits (jointly with B. Ruf), to appear in JEMS.

2. Bifurcation and symmetry breaking for a class of semilinear elliptic equations in an annulus (jointly with Pacella), preprint. His area of Research interest is Nonlinear Functional Analysis and Applications in the study of Differential Equations. More specific interests are in questions of existence, multiplicity, Uniqueness, Concentration, Break of Symmetry of Solutions of Semi-linear Elliptic Problems.

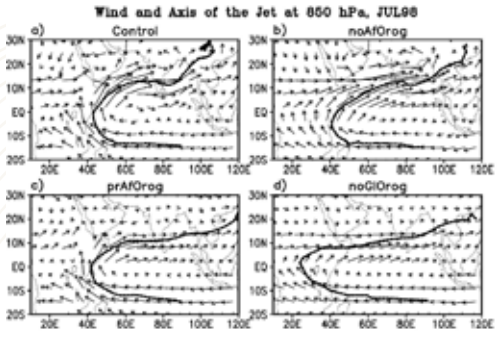
J. Srinivasan

IISc, Bangalore

Srinivasan received his B.Tech degree in Mechanical Engineering from Indian Institute of Technology, Madras in 1969 and his Master's degree from State University of New York at Stony Brook in 1971 and his Phd from Stanford University in 1975.
He is at present the Chairman of the Divecha Centre for Climate Change and Professor in the Centre for Atmospheric and Oceanic Sciences as well as Mechanical Engineering at Indian Institute of Science, Bangalore

He was faculty member in Mechanical Engineering Department at Indian Institute of Technology , Kanpur from 1975 to 1982. He joined the Indian Institute of Science in 1982. He was the Chairman of Mechanical Sciences Division at Indian Institute of Science during 2005-2009. He was a NRC Senior Resident Research Associate at NASA, Langley from 1993 to 1995.

- Double Diffusive Convection
- Monsoon Models
- Monsoon Variability
- Simple Climate Models
- Satellite Meteorology



V. Srinivas

School of Mathematics, TIFR

Please refer to page 24

Mukund Thattai

National Centre for Biological Sciences (NCBS)

Please refer to page 25

T. N. Venkataramana

School of Mathematics, TIFR

Professor, School of Mathematics, TIFR, Mumbai.
PhD 1990: "on Superrigidity and Arithmeticity in positive Characteristic" from Bombay University. Thesis Advisor: M.S.Raghunathan.

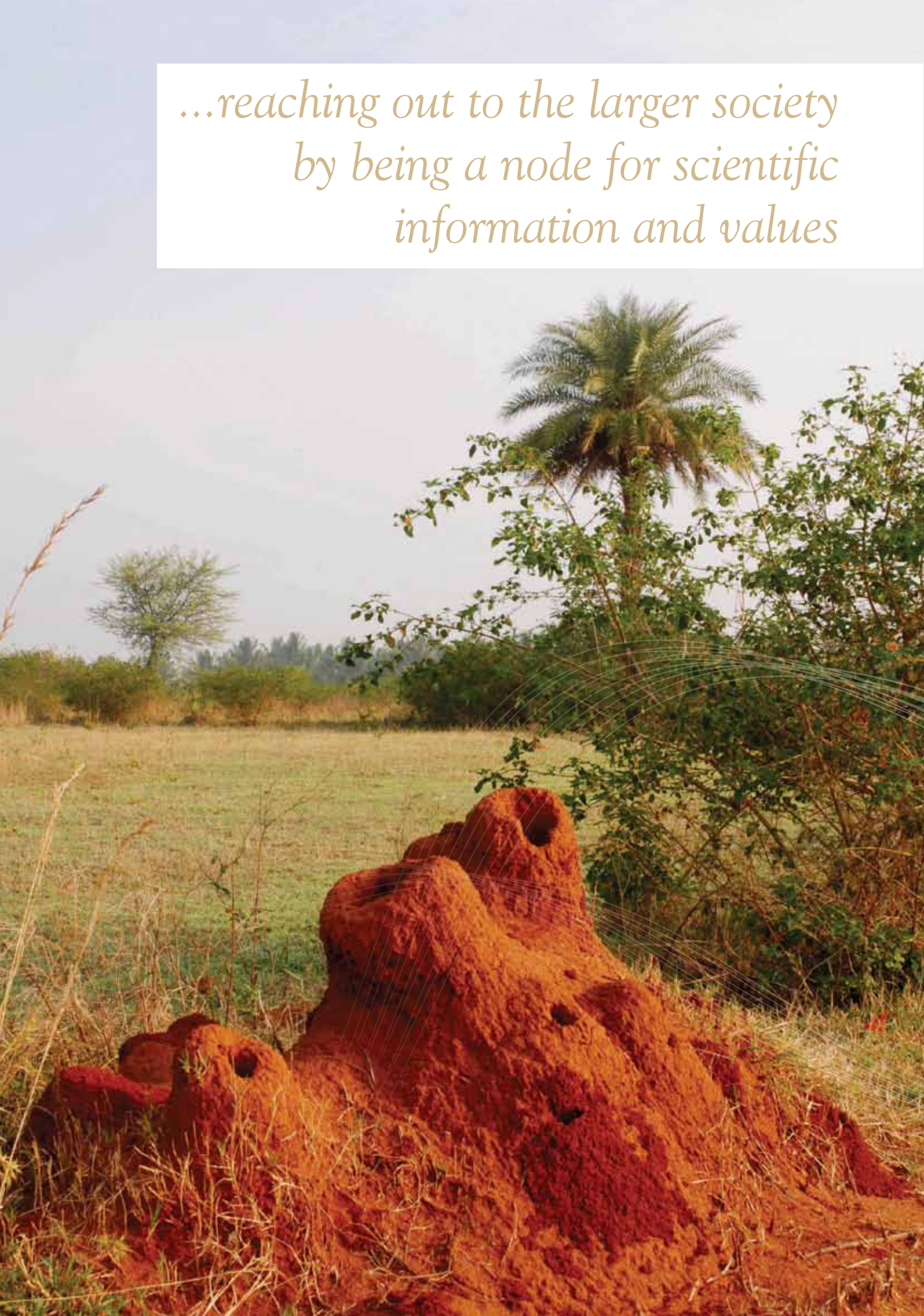
He is been interested in the "Oda style" restriction maps from the cohomology of locally symmetric spaces to smaller locally symmetric spaces. In the case of locally hermitian symmetric varieties, a fairly workable characterization in terms of representation theory can be obtained. In the case of non-hermitian symmetric spaces, there is no such criterion as yet and he is interested in using representation theory (in particular some branching laws) to draw conclusions about cohomology restrictions. He is also interested in questions of non-vanishing of cohomology of compact locally symmetric spaces and using methods of the theory automorphic forms to deduce non-vanishing results.

Spenta R. Wadia

Tata Institute of Fundamental Research (TIFR)

Please refer to page 27

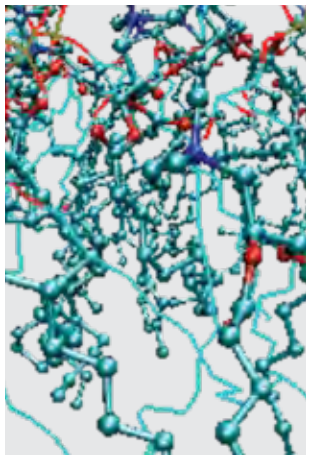
...reaching out to the larger society by being a node for scientific information and values



Activity Report

Organising a Program

ICTS encourages programs in areas overlapping traditional fields of science, keeping in mind that strength in individual disciplines lends to fruitful interdisciplinary collaborations. Besides the traditional areas of activity in mathematical and theoretical sciences, and their interconnections, activities in biological physics, complex systems and computational sciences are encouraged. An important character of the centre is its flexible response to organizing activities in emerging new areas of science.



The Centre will also support activities that contribute to raising the level of scientific knowledge among Indian university students and faculty. Some of the high level activities will be preceded by instructional workshops, to enable young participants to make the best use of the programs. The aim of these type of activities is to contribute to human resource development in the basic sciences.

Anyone holding a faculty position at any research and educational institution can apply for organizing a program at the ICTS. However, until the ICTS campus comes up, its programs must be organized at other places in India. For this reason, at present, it is preferable to have at least one of the organizers from an existing institution in India. A typical proposal for organizing a program is expected to have two or more organizers.

The organizers should fill up a form for making a preliminary proposal. This form is available on the ICTS website. The proposals are scrutinized by a Program Committee of the ICTS. Successful programs receive appropriate academic, financial and administrative support from ICTS, including support for uploading audio-visual material collected from lecturers, etc. It should be emphasized that ICTS is not a funding agency for conferences and workshops. It is an organization for facilitating interactive activities of researchers with a strong educational component. The organizers must keep this in mind while submitting proposals for programs.

For all programs supported and organized by ICTS, organizers are required to submit all the audiovisual material collected during the course of the program to the Service Informatique of ICTS. This service will ensure that the material is appropriately disseminated. The organizers are also required to submit a summary report within a month of the end of the program. There is no specific format for this report at present, but it would be useful if it contains inputs from the program participants and lecturers, in addition to those of the organizers.

Program proposal form on ICTS Website

Prospective program organizers can submit proposals by filling up this form any time of the year. The application will be immediately acknowledged and every effort will be made to respond fast to the proposal.

PROGRAM NAME

ORGANIZER DETAILS Organizer Name | Affiliation | Email Address

PROPOSED DURATION & POSSIBLE DATES OF PROGRAM

PROGRAM DESCRIPTION

Please give a brief description of the Program. You may upload this in a file on the ICTS website (.doc, .rtf, .txt, .ps, .odt, .pdf) by clicking on "Browse..." above. It would help if you could include in your description (i) names of possible lecturers, (ii) targeted participants and their number, (iii) rough budget and (iv) any other relevant information. You can also print the above form and send it, duly filled, by ordinary mail. In this case, please use separate sheets for a brief description of your proposal.

FAQ's for Writing ICTS Program Proposals

Who can submit a proposal?

Anyone holding a faculty position at any research and / or educational institution can submit a proposal for organizing a program at the ICTS. A typical proposal for organizing an effective program is expected to have two or more organizers. All successful Program Proposals will eventually be organized in the ICTS campus, which will come up in north Bangalore in the next 2-3 years. However, until that happens, ICTS programs must be organized at other locations in India. For this reason, at present, it is preferable to have at least one of the organizers from an existing institution in India.

What are the possible research areas of a program?

Program proposals can be submitted in any of the traditional areas of the physical and mathematical sciences, as well as in overlapping areas, which include the interface between cosmology, particle physics and string theory; new emergent areas of mathematics with applications to statistical physics, string theory, biology, finance and so on; computational science; complex systems like climate, fluids etc.

Where does one submit a proposal?

Proposals for organizing programs can be submitted on the ICTS website (http://www.icts.res.in) by following the link "ORGANIZE A PROGRAM".

How are successful programs proposals selected?

All program proposals are scrutinized by a Program Committee of the ICTS. It consists of acknowledged leaders in different areas of science. Successful program proposals must have a positive recommendation from this Committee.

What does the Program Committee look for in a proposal?

To receive a positive recommendation from the Program Committee, a program proposal must have the following:
1. A description of the theme and objectives, explaining the scientific case and its timeliness and a list of specific topics to be covered in the program.
2. Duration of the program and its justification in terms of expected research benefits and human resource development.
3. A list of possible speakers and participants (preferably after consultations with a few of them). The Program Committee looks for quality participants and researchers in this list. It also tends to encourage strong participation by students.
4. A detailed budget consisting of itemized estimate of expenses (travel, board and lodge, organizational expenses, etc).

What should is the typical duration of a program?

1. Full length proposals usually run for 6-12 weeks. Examples of past full length program are:
   (a) Monsoon Workshop in String Theory (http://icts.tifr.res.in/sites/strings)
   (b) Cosmology with cosmic microwave background (http://icts.tifr.res.in/sites/cmb/index)

2. Short duration program proposals for 2-4 weeks covering important developments in an area that requires a focused response. A case needs to be made for this in the proposal. Examples of short duration programs are:
   (a) From Strings to LHC (http://theory.tifr.res.in/stringslhc/)
   (b) Indian Condensed Matter Program (http://www.icts.res.in/program/icmp09)
   (c) School and conference on Multi scale Modeling and Simulations of Hard and Soft Materials (http://www.icts.res.in/program/mmsm2009)
   (d) International Program on Quantum Information (http://www.icts.res.in/program/IPQI)

3. Mini program proposals covering exciting new developments which require timely response can be submitted as very short duration programs of 1-2 weeks length. A case needs to be made for this in the proposal. Examples of very short duration programs are:
   (a) Workshop on Supernovae and Gamma Ray Bursts
   (http://icts.tifr.res.in/sites/Sgrb/Page_0)
   (b) International School and Conference on Cold Atoms and Ions
   (http://www.icts.res.in/program/iccia10)

A short conference in which recent results in the topics which are planned to be covered in a program can be included as a part of a full length (6-12 weeks) or short duration (2-4 weeks) program.

What is not covered by the ICTS mandate?
ICTS is not a conference funding agency. Proposals for organizing conferences and workshops, as well as requests for partial funding of these, are outside the mandate of ICTS.

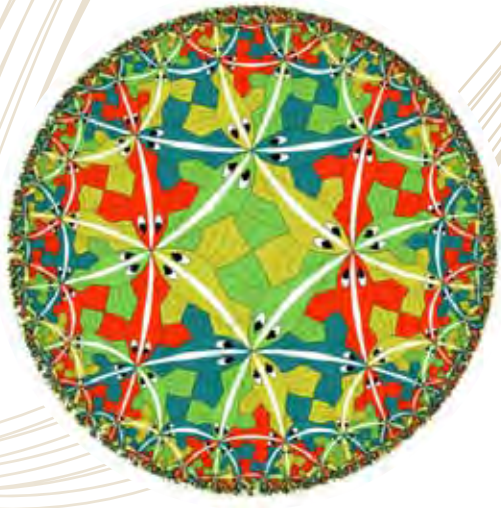
All programs supported by ICTS must be organized entirely as ICTS programs, including preparation of a webpage for the program on the ICTS website, uploading instructional material generated by the program on the webpage, etc. For further information please visit our website: www.icts.res.in or email us at: icts@theory.tifr.res.in.

Completed Programs

September 2007 - September 2009

PROGRAM	GALOIS REPRESENTATIONS AND MODULAR FORMS http://www.cmi.ac.in/galois
DATE	24 September - 5 October 2007
ORGANIZERS	V. Balaji (CMI, Chennai) | R. Balasubramanian (IMSc, Chennai), C.S. Dalawat (HRI, Allahabad) | E. Ghate (TIFR, Mumbai) R. Sujatha (TIFR, Mumbai)
VENUE	Chennai Mathematical Institute, Chennai

Purpose



Links between Galois representations and modular forms had been one of the cornerstones of research in Arithmetic Geometry for over fifty years. In 1972, J.P. Serre suggested that all two dimensional, odd, irreducible representations of the Galois group of the field of rationals over a finite field must arise from some modular form. This was now referred to as Serre's conjecture.

The workshop was aimed at introducing the techniques associated with Galois representations and modular forms. The eventual goal was to understand the proof of Serre's conjecture, which was recently completed by Chandrashekhar Khare and Jean-Pierre Wintenberger. The programme was a success, and almost all the younger participants stressed how useful it had been for them to participate as they had learnt some of the latest techniques and methods being used in frontier areas of research in Arithmetic Geometry. It should be particularly mentioned that the younger Indian participants were very enthusiastic participants and reiterated that this programme had given them a chance to interact with other researchers from the country in a rather intense manner.

Speakers

U.K. Anandavardhan, IIT Bombay

Debargha Banerjee, TIFR

Chandan Singh Dalawat, HRI

Soumya Das, IISc

Laurent Ducrohet, CMLS, France

Satadal Ganguly,
State University of New Jersey

Topics

Statement of Serre's conjecture (Weight) / Existence of minimal lifts

Elliptic modular forms

Deformation theory / Modularity lifting theorems

Decomposition, inertia, ramification subgroups

Moret-Bailly's theorem

Hilbert modular forms

Eknath Ghate, TIFR	Overview of the proof in the level 1 case / Overview of the proof in the general case
Amit Hogadi, TIFR	Moret-Bailly's theorem
Arati Khairnar, TIFR	Elliptic modular forms
Tejaswi Navilarekallu, Vrije Universiteit, Amsterdam	Deformation theory
Supriya Pisolkar, TIFR	Local and global fields, Infinite Galois theory
C.S. Rajan, TIFR	Classification of p-divisible groups
Brundaban Sahu, UCD School of Mathematical Sciences, Ireland	Hilbert modular forms
Chandrakant Sarma, TIFR	Galois representations attached to Hilbert modular forms
Parvati Shastry, Mumbai University	Evidence: level 1 and p = 2, 3
R. Sujatha, TIFR	Statement of Serre's conjecture (Level/Character) / Potential Serre
Sarah Zerbes, University of Exeter	p-adic Hodge theory
Najib	Compatible systems

PROGRAM	CORRELATED ELECTRONS & FRUSTRATED MAGNETISM http://theory.tifr.res.in/cefm07/home.htm
DATE	25 November - 5 December 2007
ORGANIZERS	Kedar Damle (TIFR) | S.K. Dhar (TIFR) | E.V. Sampathkumar (TIFR) T. Senthil (MIT) | V. Tripathi (TIFR)
VENUE	International Centre, Dona Paula, Goa, India

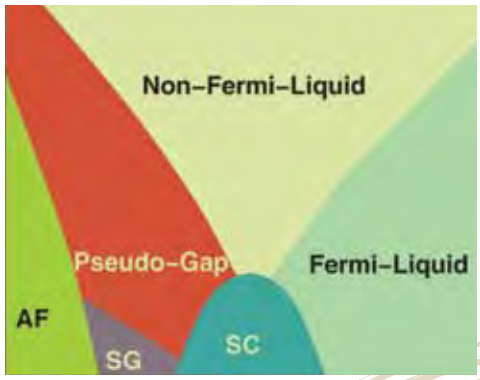
Purpose

CEFM07 was an attempt to bring together people engaged in such a broad cross-section of activity, but focused on two closely related classes of materials: Frustrated quantum magnets and strongly correlated itinerant electron systems.

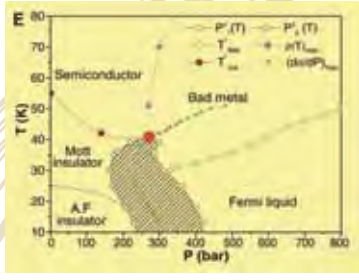
These two classes of system have a natural synergy: The physics of strongly correlated conducting materials in which electron-electron interactions play a dominant role in determining the low temperature properties is extremely closely related to the physics of insulating strongly correlated materials in which magnetic exchange interactions lead to rich and interesting low temperature spin physics. This is of course because local magnetic moments in metallic systems owe their very existence to strong correlation effects and both kinds of behavior are often seen in the same family of materials as the doping level or pressure is varied.

Structure

The program was split into two parts: For the first eight days of the program, there was a relatively low density of pedagogical lectures in which eight participants gave 3 lectures each aimed at providing an overview of work in both areas to non-experts from related fields. This part of the program had plenty of free time that was devoted by the participants to informal interactions that potentially formed the seed of future collaborations.



In addition, an attempt was made in this part of the program to highlight the work of young Indian origin postdocs in this area by giving them the opportunity to present special seminars on their work. This also served as a recruiting tool for several Indian institutions: It allowed senior people working in India to evaluate these postdocs in an informal setting and we hope this will play a useful role in the event any of these postdocs apply to Indian institutions in the near future for a regular position.



The last three days had a higher density of talks reviewing recent developments in the two fields and served a dual purpose: On the one hand, it allowed physicists working in these areas in India to hear of the latest developments at leading laboratories abroad as reported in talks by the foreign participants.

On the other hand, it also provided an opportunity to showcase the excellent work done in many Indian groups in the field.

Speakers

1) Pedagogical Lecture Courses

Natan Andrei (Rutgers) | Assa Auerbach (Technion) | John Chalker (Oxford) | Rodreich Moessner (Oxford) | Christoph Geibel (Dresden) | Mohit Randeria (Ohio) | Subir Sachdev (Harvard) | T. Senthil (MIT)

2) Seminar Speakers

James Annett (Bristol) | G. Baskaran (IMSc) | S. Dattagupta (SNB) | Arun Grover (TIFR) | Stephen Julian (Toronto) | Avinash Mahajan (IITB) | Shiraz Minwalla (TIFR) | Catherine Pepin (Saclay) | T.V. Ramakrishnan (BHU) | S. Ramasesha (IISc) | Sumathi Rao (HRI) | Pratap Raychaudhuri (TIFR) | Tanusri Saha-Dasgupta (SNB) | E.V. Sampathku | Maran (TIFR) | D.D. Sarma (IACS) | Diptiman Sen (IISc) | Krishnendu Sengupta (Saha) | R. Shankar (IMSc) | Joel Moore (Berkeley) | V. Shenoy (IISc) | Avinash Singh (IITK) | Arghya Taraphder (IITKG) | Alan Tennant (HMI Berlin)

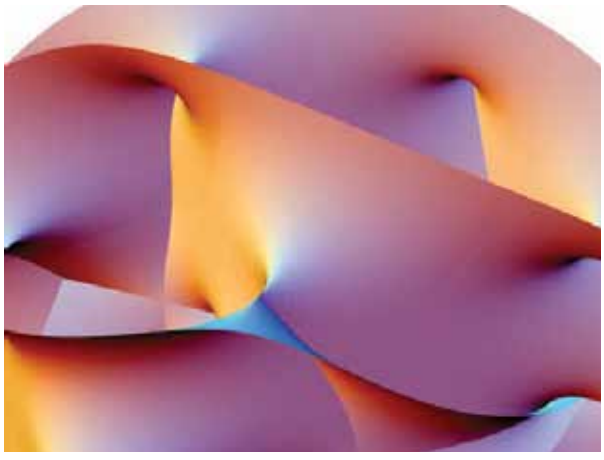
3) Indian Post-docs whose Work was Highlighted

Indra Dasgupta | Ribhu Kaul | Subroto Mukerjee | Indranil Paul | Nayana Shah | K.J. Thomas

Participants

Ganesh Adhikary | Manjusha Inamdar | A.K. Nigam | Argha Banerjee | Somnath Jana | R.V. Pai | Sumilan Banerjee | Devang Joshi | Nandan Pakhira | M. Barma | B. Koteswararao | Sudhir Kumar Pandey | Subhro Bhattacharjee | Panchanan Khuntia | Swapnil Patil | Preeti Bhobe | Mukul Laad | Swati Pawar | Somnath Bhowmick | Vinu Lukose | Kalpataru Pradhan | Samarth Chandra | P. Anil Kumar | S. Ramakrishnan | Kedar Damle | Moitri Maiti | Debanand Sa | Nabyendu Das | Saptarshi Mandal | Tridib Sadhu | Chandan Dasgupta | Sudhanshu Mandal | Arijit Saha | Mandar Deshmukh | Srimanta Middey | Arijit Saha | Tusharkanti Dey | Niharika Mohapatra | Srijan Kumar Saha | Deepak Dhar | Shreyoshi Mondal | Prabuddha Sanyal | S.K. Dhar | Anamitra Mukherjee | Arnab Sen | Kusum Dhochak | Sourin Mukhopadhyay | Jesse Silverberg | Arindam Ghosh | R. Nagalakshmi | Vivekanand Singh | Shamik Gupta | H.R. Naren | Vikram Tripathi | S.R. Wadia

PROGRAM	FROM STRINGS TO LHC - II http://theory.tifr.res.in/stringslhc
DATE	11 - 23 December 2007
ORGANIZERS	R. Godbole (IISc/TIFR) | S. Mukhi (TIFR) | K. Sridhar (TIFR) S. Trivedi (TIFR)
VENUE	Fireflies Ashram, Bangalore, India



Purpose

From Strings to LHC II was aimed at bringing together researchers working in the different sub-areas of high-energy physics: string theorists, particle theorists and experimentalists, in anticipation of the data that is expected soon from the Large Hadron Collider (LHC) in CERN, Geneva. The Large Hadron Collider is a proton-proton collider which will access the highest energies ever reached in collider experiments and it is expected that some manifestation of new physics will show up in this hitherto unexplored domain of energies. Indeed, theorists have good reasons to believe that the currently accepted paradigm of high-energy physics will make way for a new theoretical framework and have been for several years proposing and studying candidate theories which will supersede the Standard Model. A couple of years ago it was felt that it would be important to bring the high-energy physics community together with a view to discussing the nature of the new physics that the LHC is likely to discover. It was with this intention that the "From Strings to LHC" series of meetings was initiated.

Structure

This was organised more in the format of a Topical Workshop with a small pedagogical component. An Advanced School was organized from 11 - 18 December 2007 and a Topical Conference from 19 - 23 December 2007.

Advanced School Lectures

Rohini Godbole, IISc, Bangalore
Rajiv Gavai, TIFR
Christophe Grojean, CERN
Romesh Kaul, IMSc
Shiraz Minwalla, TIFR
Tim Morris, Southampton
Sunil Mukhi, TIFR
Sandip Trivedi, TIFR
Ashoke Sen, HRI
Raman Sundrum, Johns Hopkins
Bryan Webber, Cavendish

Topics

SUSY at Colliders
Quark-Gluon Plasma
Alternate Electroweak Scenarios
Naturalness & Electroweak Symmetry Breaking
AdS/QCD
Gauge Theory Amplitudes
Introduction to Supersymmetry and Supergravity
Supersymmetry Breaking
Introduction to String Theory
Brane Worlds
LHC Simulations

Topical Conference Speakers	Topics
B. Allanch, DAMTP, Cambridge	Dark Matters and constraining constrained SUSY
S. Ananth, Albert Einstein Institute	Perturbative relations between gauge theory and gravity
T. Azuma, TIFR, Mumbai	Monte Carlo studies of the GWW phase transition in Large-N Gauge theories
G. Bhattacharya, SINP, Kolkata	Lightest SUSY Higgs mass bound in extra dimension
J. Conlon, Cambridge University	Mirror Mediation
A. Datta	Distinguishing BSM scenarios at the Large Hadron Collider
A. Dedes, Univ. of Ioannina and Univ. of Durham	Seesaw Mechanism in the Sneutrino sector & its consequences
A. Dhar, TIFR, Mumbai	Tachyon Condensation and Quark Mass in modified Sakai-Sugimoto Model
P. Franche, McGill University	D3/D7 inflation in the throat
R. Godbole, IISc, Bangalore	CP Properties of the Higgs at Colliders
C. Grojean, CERN, Geneva	Strongly interacting light Higgs
M. Guchait, TIFR, Mumbai	Dark Matters and LHC
S. Gupta, TIFR, Mumbai	Fluctuations of conserved quantities at the LHC
J. Kalinowski, Univ. of Warsaw	Delving into the-ino sector of the MSSM
P. Kanti, Univ. of Ioannina, Greece	Mini black holes: Creation and Evaporation
A. Kumar, IOP, Bhubaneshwar	Supersymmetric SU(5) Model with stabilixed moduli
A. Kundu, Calcutta University, Kolkata	Universal extra dimension: A challenging Higgs sector at the LHC
A. Maharana, DAMTP, Cambridge	Effective Actions in II B flux compactifications
N. Mahmoudi, Uppsala University	KK gluon production at the LHC
B. Mukhopadhyaya, HRI, Allahabad	Right-handed neutrinos in a supersymmetric world
K. Narayan, CMI, Chennai	Cosmologies with big-bang singularities & their gauge theory duals
P. Nath, Northeastern University	The Sparticle landscape in SUGRA,strings and branes and their signature space at the LHC
S. Panda, HRI, Allahabad	Moduli stabilization and brane inflation
A. Rajaraman, University of California, Irvine	From String theory to Phenomenology: Hints from intersecting brane models
V. Ravindran, HRI, Allahabad	Three loop soft gluon corrections to di-lepton and Higgs productions at the LHC
M. Schwartz, Johns Hopkins University	The extraordinary predictive power of holographic QCD
S. Sengupta, IACS, Kolkata	Cosmological constant, brane tension and large hierarchy in a generalised Randall-Sundrum scenario
J. Skittrall, University of Cambridge	Z boson decay to photon plus Kaluza-Klein graviton in large extra dimensions
R. Sundrum, Johns Hopkins University	Anomaly-mediation and sequestering in string and field theory
S. Vempati, IISC, Bangalore	SYSY GUTs and Dark Matter
B. Webber, Cavendish, Cambridge	SUSY vs. UED spins at the LHC
I. Zavala (IPPP, Durham University)	Spinflation

Advanced School / Topical Conference Participants

B.Allanch (DAMTP, Cambridge) | Sudarshan Ananth (Albert Einstein Institute) | B.Ananthnarayan (IISC, Bangalore) | Takehiro Azuma (TIFR, Mumbai) | Arjun Bagchi (HRI, Allahabad) | Priyotosh Bandyopadhyay (HRI, Allahabad) | Nabamita Banerjee (HRI, Allahabad) | Shamik Banerjee (HRI, Allahabad) | Aoife Bharucha (IPPI, Durham) | Biplob Bhattacharjee (Univ. of Calcutta, Kolkata) | Gautam Bhattcharya (SINP, Kolkata) | Jyotirmoy Bhattcharya (TIFR, Mumbai) | Sayantani Bhattcharya (TIFR, Mumbai) |

Sudhansu Biswal (IISC, Bangalore) | F. Borzumati (NCU, Taiwan) | S. Chatterjee (IISC, Bangalore) | Utpal Chattopadhyay (IACS, Kolkata) | Carlos Coimbra-Araujo (Campinas State Univ. Brazil) | J. Conlon (Cambridge University) | A. Dedes (Univ. of Ioannina and Univ. of Durham) | Avinash Dhar (TIFR, Mumbai) | Bobby Ezhuthachan (TIFR, Mumbai) | Paul Franche (McGill University) | R.V. Gavai (TIFR. Mumbai) | Rohini Godbole (IISC, Bangalore) | David Grellscheild (IPPP, Durham University) | Christophe Grojean (CERN, Geneva) Manoranjan Guchait (TIFR, Mumbai) | Sourendru Gupta (TIFR, Mumbai) | Sachin Jain (IOP, Bhubaneshwar) | Dileep Jatkar (HRI, Allahabad) | J. Kalinowski (University of Warsaw) | Panagiota Kanti (University of Ioannina, Greece) | Romesh Kaul (IMSC, Chennai) | Alok Kumar (IOP, Bhubaneshwar) | Anirban Kundu (Calcutta University, Kolkata) | Bum-Hoon Lee (Sogang University) | K. Madhu (IISC, Bangalore) | Swapna Mahapatra (Utkal University, Bhubaneshwar) | Anshuman Maharana (DAMTP, Cambridge) | Nazila Mahmoudi (Uppsala University) | Ipsita Mandal (HRI, Allahabad) | Shiraz Minwallla (TIFR, Mumbai) | N.K. Mondal (TIFR, Mumbai) | Tim R. Morris (Southampton University) | Sunil Mukhi (TIFR, Mumbai) | Biswarup Mukhopadhyay (HRI, Allahabad) | K. Narayan (CMI, Chennai) | Pran Nath (Northeastern University) | Rahul Nigam (TIFR, Mumbai) | Binata Panda (HRI, Allahabad) | Sudhakar Panda (HRI, Allahabad) | A.Rajaraman (University of California, Irvine) | Kumar Rao (PRL, Ahmadabad) V.Ravindran (HRI, Allahabad) | K.Rolbiecki (University of Warsaw) | Anjishnu Sarkar (IIT, Mumbai) | B.Sathiapalan (IMSC, Chennai) | Mathew Schwartz (Johns Hopkins University) | Ashoke Sen (HRI, Allahabad) | Gautam Sengupta (IIT, Kanpur) | Soumitra Sengupta (IACS, Kolkata) | Jordan Skittrall (University of Cambridge) | K. Shridhar (TIFR, Mumbai) | Raman Sundrum (Johns Hopkins University) P.K. Tripathy (IIT, Madras) | Sandip Trivedi (TIFR, Mumbai) | V. Umesh (IISC, Bangalore) | Asnin Vadim (Hebrew University) | Sudhir Vempati (IISC, Bangalore) | B. Webber (Cavendish, Cambridge) | K.P. Yogendran (CQueST) | Ivonne Zavala (IPPP, Durham University)

PROGRAM	QUANTUM INFORMATION PROCESSING http://icts.tifr.res.in/sites/QIP2008
DATE	5 December 2007 - 4 January 2008
ORGANIZERS	J. Radhakrishnan (TIFR, Mumbai) | P. Sen (TIFR, Mumbai).
VENUE	Indian Institiute of Technology, New Delhi and TIFR, Mumbai

Purpose

Quantum information processing is a thriving area of research that attempts to recast information processing in the quantum mechanical framework. The ICTS program on Quantum Information Processing was successful in bringing together an outstanding set of researchers and exposing the audience to the latest work. The visits to TIFR by these researchers helped in obtaining a deeper understanding of these results and the techniques used in obtaining them.

Structure

The program was split between two locations: TIFR, Mumbai, and India International Centre, New Delhi. Experts were invited, who had made significant recent contributions, especially

in areas where there is strong interest in TIFR, e.g. Quantum Information Theory, Quantum Algorithms, Quantum Communication Complexity, Quantum Interactive Proof System, Quantum Lower Bounds.

In addition, a workshop was organized in New Delhi. This workshop called QIP 2008, was the eleventh in the series of QIP workshops. This event will feature ten invited talks showcasing the most significant work in the area in the last year.

Seminar Speakers (at TIFR)

1. Ronald de Wolf, CWI Amsterdam (5 - 11 December 2007).
Seminar: Fault-tolerant data structures
(10 December 2007)

2. Avi Ben-Aroya, Tel-Aviv University (23 - 25 December 2007)
Seminar: Quantum expanders (24 December 2007)

3. Frederic Magniez, LRI Orsay (22 - 28 December 2007)

4. Rahul Jain, University of Waterloo (23 December 2007 - 4 January 2008)
Seminar: Direct-product theorems in quantum communication complexity

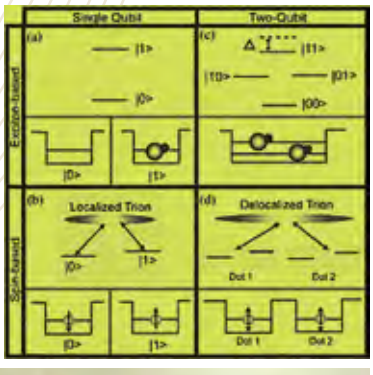
5. Hartmut Klauck, University of Frankfurt
(23 December 2007 - 4 January 2008)

Conclusion

The ICTS program on Quantum Information Processing was successful in bringing together an outstanding set of researchers and exposing the audience to the latest work. The visits to TIFR by these researchers helped in obtaining a deeper understanding of these results and the techniques used in obtaining them. Everybody who attended the events thought highly of the program. The complete archives of the talks has been uploaded on the website at http://icts.tifr.res.in/sites/QIP-2008

Participants

Kishor Barman, TIFR | Chirag Dhara, TIFR | Chinmoy Dutta, TIFR | M.V. Panduranga Rao, TRDDC | Jaikumar Radhakrishnan, TIFR | Pranab Sen, TIFR



PROGRAM	INTERNATIONAL BIOMEDICAL SCHOOL AND WORKHOP http://www.ncbs.res.in/events/BMSW2008
DATE	27 February – 2 March 2008
ORGANIZERS	M. Bachar (University of Graz, Austria) | J. Batzel (University of Graz, Austria) F. Kappel (University of Graz, Austria) | S. Krishna (NCBS, TIFR, Bangalore) S. Nanda (CAM, TIFR, Bangalore)
VENUE	National Centre for Biological Sciences, Bangalore

Purpose

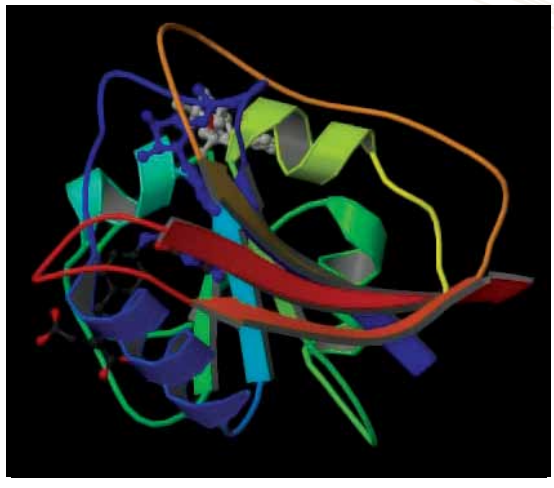
The scientific focus of the Biomedical Modeling School was on introducing the school student to the theory and practice of modeling processes in human disease and physiology with applications to cancer, diabetes and cardiovascular and respiratory control systems. The purpose of both the School and the Workshop was to bring together experts in the scientific disciplines of mathematics, medicine and physiology, physics and engineering to develop insights into modeling processes in human disease and physiology with special emphasis on developing cross disciplinary collaborations. Courses were designed for postdoctoral researchers, PhD and masters students, and established scientists to help them to gain insight into the area of modeling physiological systems. The talks in the workshop covered a wider spectrum of mathematical–biology topics and served to broaden the scientific perspective of participating students and help them to develop connections in new and exciting areas of research.

Structure

School: 27 - 29 February 2008.

Lectures in: Modeling Techniques, Diabetes Modeling, Cancer Modeling and Cardiovascular Modeling

Workshop: 1 - 2 March 2008. Talks by experts on their recent research work



Pedagogical Lecture Courses

Modeling Theory

- Franz Kappel (University of Graz)
- Susanne Ditlevsen (University of Copenhagen)
- Sai Jagan Mohan (Strand Life Sciences, Bangalore, India)

Modeling Cardiovascular and Respiratory Systems

- Jerry J. Batzel (Univ. of Graz)
- Johnny T. Ottesen (Univ. of Roskilde)

Parameter Estimation Theory and Practice

- Hien T. Tran (North Carolina State University)
- Andrea De Gaetano (CNR, Rome, Italy)

Modeling Cancer

- Allesandro Bertuzzi (Istituto di Analisi dei Sistemi ed Informatica "A. Ruberti" CNR, Rome, Italy)

Insulin Glucose Control

- Mostafa Bachar (Univ. of Graz)
- Andrea De Gaetano (CNR, Rome, Italy)

Seminar Speakers

Muthuswamy Balasubramanium (Madras Diabetes Research Foundation, Chennai, India) | Alesandro Bertuzzi (Istituto di Analisi dei Sistemi ed Informatica "A.Ruberti" CNR, Rome, Italy) | Joseph Bull (University of Michigan, Ann Arbor, Michigan, USA) Narendra Dixit (Indian Institute of Science, Bangalore) | Namrata Gundiah (Department of Surgery, University of California San Francisco and the San Francisco VA Medical Center, San Francisco, CA, USA) | Peter Kotanko (Renal Research Institute, New York, New York, USA) | Sudhir Krishna (National Center for Biological Sciences, TIFR, Bangalore) | Onoja Mathew Akpa (Redemption University, Lagos, Nigeria) | Sai Jagan Mohan (Strand Life Sciences, Bangalore) | Johnny T. Ottesen (Roskilde University, Denmark) | Vijay Rajagopal (Auckland University, Auckland, New Zealand) | Hannah RajaSinghe (Norwegian University of Life Sciences, Norway) | Yves Rozenholc (University of Paris, Descartes, France) | Adelaine Samson (University of Paris, Descartes, France) | Ram Rup Sarkar (Centre for Cellular and Molecular Biology, Hyderabad) | Elissa Schwartz (Washington State University, Pullman, Washington, USA) | Kalyanasundaram (Kas) | Subramanian (Strand Life Sciences, Bangalore) | Prabhakar G. Vaidya (National Insitute of Advanced Studies, Bangalore)

Poster Presenters

G. Aruna (Centre for Excellence in Genomic Sciences, Madurai Kamaraj University, Tamil Nadu) | Sandeep Banerjee (Birla Institute of Technology and Science (BITS) Pilani, Rajasthan) | Sonali Das (Strand Life Sciences, Bangalore) | Md Mobashir (Jamia Millia Islamia, New Delhi)

| Sushil Ronghe (CADD Group, Connexios Life Science, Bangalore) | Rahuman Sheriff (Bharathidasan University, Tiruchirapalli, Tamil Nadu, and Center for Cellular and Molecular Biology, Hyderabad)

Participants

Aekta Aggarwal | Muskan Kukreja | S. Satish Kumar | Aadil Ahmed | Suganthi. L | D. Vinoth Madhavan | Amit Apte | Onoja Matthew, AKPA | Md. Mobashir | I. Mohamed | Ariff Harikiran Nistala | Vignesh R | Anwesha Banerjee | Hannah Rajasingh | Sushil V Ronghe Sandip Banerjee Yves Rozenholc | Amit Kumar Sachan | Parit Bansal | Adeline Samson | S. Saranya | D.K. Bharti | Subir Sen | Tavpritesh Sethi | Anupama Rajan Bhat | Rahul Sharma | M Rahuman Sheriff | Jyoti Balhara | Ravi Shankar Prasad Singh | Sumeet Pal Singh | Sonali Das | Abhinav Singla | Prashant K Srivastava | Ashvini Kumar Debey | Kartik Subramanian | T. Senthil | Siva Subramnian | Md. Asif Ikbal | Vishnu Vivek G | Wahajuddin Mohammad Azhar Kamal | S. Mohamed Yacin

PROGRAM	VECTOR BUNDLES http://icts.tifr.res.in/sites/bundles
DATE	3 - 15 March 2008
ORGANIZERS	I. Biswas (TIFR, Mumbai) | A. J. Parameswaran (TIFR, Mumbai) S. Subramanian (TIFR, Mumbai) | V. Trivedi (TIFR, Mumbai)
VENUE	Tata Institute of Fundamental Research (TIFR), Mumbai

Purpose

This Workshop was organized to learn about some newly developed tools to study vector bundles via homological methods, like stability conditions, theory of stacks, and some new developments in the traditional but very active and relevant areas like principal bundles. The workshop component was aimed to introduce the technical tools like theory of stacks, stability conditions, triangulated categories for advanced graduate students and researchers working in the related areas in mathematics and other interested mathematicians and physicists. Another purpose of this activity was to enhance and enrich the already existing interaction between researchers from various centers in India and also researchers from outside India,working in Vector Bundles and closely related areas.

Structure

There were three lecture courses, consisting of a total of 12 lectures. All the three courses culminated in research talks in their respective topics. There were a total of 19 conference talks.

Pedagogical Lecture Courses

(a) Stability conditions in derived categories:

i. Triangulated categories with duality by V. Srinivas (1 talk)

ii. Bridgeland Stability conditions by S. Mehrotra (1 talk)

iii. Stability conditions on K3 surfaces by E. Macri (2 talks)
iv. Stability conditions in the non-algebraic settings by P. Stellari (2 talks)
v. Moduli stacks and invariants of semistable objects on K3 surfaces by Y. Toda (1 talk)

(b) i. Introduction to stacks by T. Gomez (2 talks)
ii. Moduli stacks of principal G-bundles on a curve by N. Hoffmann (2 talks).

c) i. Moduli of prinicipal bundles and compactifications by V. Balaji (1 talk)

Seminar Speakers	Topics
Luis Alvarez-Consul, CSIC, Spain	Moduli of sheaves from moduli of Kronecker modules
Alvaro Anton, CSIC, Spain	Triviality and fixed points of G-Higgs bundles.
V. Balaji, CMI, Chennai	Moduli of principal bundles and compactification (2 talks)
U. Bhosle, TIFR, Mumbai	Picard groups of seminormal varieties
Jishnu Biswas, ISI, Bangalore	Vector bundles on the cubic and quartic threefolds
Tomas Gomez, CSIC, Spain	Introduction to Stacks (2 talks) and Principal Higgs sheaves
Norbert Hoffmann, Gottingen, Germany	Moduli stacks of principal G-bundles on acurve (3 talks
Jacques Hurtubise McGill University, Canada	Isomonodromy and Hamiltonian flows
Akira Ishii, Hiroshima University, Japan	Stability conditions on A_n singularities
Martin Kool, Licoln College, UK	Moduli of Equivariant and Invariant Sheaves on Toric Varieties
Marina Logares, Porto, Portugal	A Torelli type theorem for the moduli space of parabolic Higgs bundles
Emanuele Macri, Universitat Bonn, Germany	Stability conditions on K3 surfaces (talks I and II) and Equivalences of K3 Surfaces and Orientation I - The Twisted Case (talks III)
Sukhendu Mehrotra, Sheffeild University, UK	Bridgeland Stability Conditions (talk I) and Induced stability conditions (talk II)
Frank Neumann, University of Leicester, UK	Multiplicative cohomology and Cheeger-Simons differential characters for differential stacks
G.V. Ravindra	A generalised Noether-Lefschetz theorem.
V. Srinivas, TIFR, Mumbai	Triangulated categories with duality (talk I) and The diagonal problem (talk II)
Paolo Stellari, Universita degli studi di Milano, Italy	Stability conditions in the non-algebraic setting (talks I and II) and Equivalences of K3 Surfaces and Orientation II - The Projective Case (talk III)
Yukinobu Toda, University of Tokyo, Japan	Moduli stacks and invariants of semistable objects on K3 surfaces (talks I and II)
Kazushi Ueda, Osaka University	Brane tilings and toric stacks (joint work with Akira Ishi)
Hokuto Uehara, Tokyo Metropolitan University, Japan	Tilting generators on algebraic varieties

Highlighted Works

Stability conditions, Theory of stacks, Moduli of principal bundles Moduli stacks of prinicipal G-bundles.

Conclusion

We had three advanced lecture courses ending with research talks. For this, national and international mathematicians working in these areas were invited to give lectures. This was

followed by a series of research level talks in related areas. Participants included students from the country who are working in related areas and also some students from abroad working in this area. As participants, we also had pioneers in the area of Vector Bundles, like M.S. Narasimhan and C.S. Seshadri.

Participants

Alvaro Anton (CSIC, Spain) | Pabitra Barik (CMI, Chennai) | Umesh V. Dubey (IMSC, Chennai) | Johannes Huisman | (Univ.de Bretagne Occidentale, France) | M.S. Narismhan (TIFR, Bangalore) | Tarakanta Nayak (Dept. of Math., NIT, Rourkela) | Sarbeswar Pal (IMSC, Chennai) | Swagata Sarkar (IMSC, Chennai) | C.S. Seshadri (CMI, Chennai) | Thakur Ajay Singh (IMSC, Chennai) | Rohith Verma (CMI, Chennai)

PROGRAM	ARITHMETIC GEOMETRY
DATE	23 - 29 March 2008
ORGANIZERS	J. Coates (Cambridge) | E. Ghate (Mumbai) | C.S. Rajan (Mumbai) R. Sujatha (Mumbai) | J.P. Wintenbeger (Strasbourg).
VENUE	NCBS, Bangalore,India

Purpose

The area of Arithmetic Geometry is one of the rapidly growing areas in Number theory. While Wiles' proof of Fermat's last theorem in the mid 1990's was one of the highlights in this area, the last decade has seen further progress by Taylor and others in the Modularity conjecture. In recent years, substantial progress has been made in other related areas like Serre's conjecture and p-adic Langlands programme. The aim of the Workshop and conference was to have a series of lectures which would expose the researchers and PhD students in India to recent advances in these areas.

Structure

There were three mini-courses in the mornings which consisted of a series of lectures by leading experts and the research lectures were scheduled for the afternoon. In all, there were 25 lectures.

Pedagogical Lecture Courses

1. Speakers: John Coates and Ralph Greenberg
Title: p-adic L-functions
Abstract: The four lectures will discuss the construction of p-adic L-functions attached to elliptic curves and modular forms without assuming any prior knowledge.
Greenberg's two lectures will discuss the construction given by Mazur and Swinnerton-Dyer and some subsequent developments.
Coates's two lectures will discuss the one and two variable p-adic L-functions attached to elliptic curves with complex multiplication, and possibly a little of the first known results (due to Kakde) on the existence of non-abelian p-adic L-functions.

2. Speakers: Laurent Berger, Kiran Kedlaya, Jean-Pierre Wintenbeger
Title: p-adic local Langlands and the Fontaine-Mazur conjecture

3.Speakers: Ritabrata Munshi
Title: Analytic number theory for modular forms and applications
Abstract: In these instructional lectures,discussion of several basic aspects of the analytic theory of modular forms and of the associated L-functions along with a discussion of the existing techniques: these include the various manifestations of the spectral gap property, the non-vanishing problem and the subconvexity problems for central values of L-functions. In particular,some consequences of these results to study on the distribution properties of "quadratic cycles" on various arithmetic quotients related to modular forms (for instance Heegner points on a modular surface or closed geodesics on it) were explained.

Seminar Speakers

Laurent Berger (Lyon) | Jordan Ellenberg (Wisconsin) | Ritabrata Munshi (Rutgers) | Massimo Bertolini (Milan) | Ralph Greenberg (Seattle) | Tadashi Ochiai (Osaka) | Chandan Dalawat (Allahabad) | Kiran Kedlaya (Boston) | B. Ramakrishnan (Allahabad) | Fred Diamond (London) | Minhyong Kim (London) | V. Suresh (Hyderabad) | Bas Edixhoven (Leiden) | Shin-ichi Kobayashi (Nagoya) | Jacques Tilouine (Paris)

Participants

Anandavardhanan (IIT Bombay) | Ashay Burungale (ISI Blr) | Shane D'Mello (TIFR) | Najib Ouled Azaiez (TIFR) | L. Ducrohet (TIFR) | C.W. Erickson (Cambridge, UK) | Kalyan Banerjee (ISI Blr) | Satadal Ganguly (TIFR) | Somnath Jha (TIFR) | Debargha Banerjee (TIFR) | Jishnu Biswas (ISI, Blr) | Arati Khairnar (TIFR, Bombay) | Aniket Krishna (CAM-TIFR, Blr) | Ioulia Baoulina (HRI) Narsimha Kumar (TIFR) | R. Barman (IIT Guwahati) | Jung-Jo Lee (HRI) | Filippo Nuccio (Rome) | Chandrasheel Bhagwat (TIFR) | Vijay Patankar (Microsoft, Blr) | Balchand Prajapati (IIT Delhi) | Harald Helfgott (Univ. of Bristol) | Soma Purkait (ISI Blr) | Arijit Sehanobish (ISI, Blr) | Gautam Borisagar (IIT Bombay) | Chandrakant Sharma (TIFR) | Ramesh Sreekantan (TIFR) | Parvati Shastri (Mumbai University)

Highlighted Works

- Recent advances in Iwasawa theory, Hida theory.
- Recent advances and results of Kisin, Colmez on the p-adic Langlands programme
- Recent advances on the Fontaine-Mazur conjecture
- Recent advances in the theory of Galois representations associated to modular forms
- Recent advances in the Galois cohomology of function fields of curves

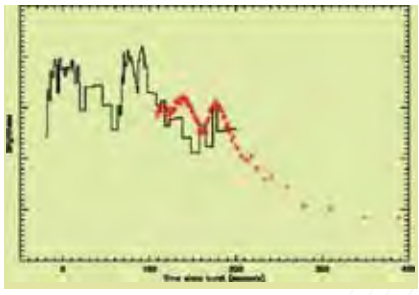
Conclusion

The programme, especially the series of lectures, were deemed very useful by the younger participants from India. There was quite a lot of interest in the programme by students outside of India and a few of them attended the programme. Also, as the programme brought together a diverse group of people working in the area of Arithmetic Geometry, it generated lively discussions and interactions among the participants. On the whole, the event was greatly appreciated by all the speakers an participants.

PROGRAM	SUPERNOVAE & GAMMA-RAY BURSTS http://icts.tifr.res.in/sites/Sgrb
DATE	23 - 29 May 2008
ORGANIZERS	A. Ray (TIFR,Mumbai) | G.C. Anupama (IIA,Bangalore)
VENUE	Darjeeling, West Bengal, India.

Purpose

In this program, Sne and GRBs from massive stars in the local and present day universe (low redshifts) were discussed as also the effects of these stellar explosions on the structures within which they formed and how they enriched their surroundings with heavy elements when the early Universe was undergoing Reionization. The Workshop brought together a small group of about 50 senior researchers, young faculty, post-docs, and students, both from India and overseas.



The Program consisted of two parts: a School with pedagogical lectures for PhD students and researchers working in these and related fields; and a Workshop for researchers of these fields. The Workshop will bring together scientists from several countries working in these fundamental areas of astrophysics.

Topics of the Workshop

- SNe, GRBs in massive stars in the present day local universe and in the Era of Reionization of the universe.
- Stochastic acceleration processes of particles in SN shocks and SN remnants.
- Interaction of SNe/GRBs with the surrounding media.
- Progenitors of SNe and GRBs.
- Explosion mechanisms,neutrinos from stellar collapse.

Structure

The Program consisted of a School during 23 - 25 May with pedagogical contents and a Research Workshop for the subsequent days. The School had 18 lectures (each about an hour long) given by 10 astrophysicists that introduced students and researchers to these fields. The Workshop had 31 talks (including the Summary talk – see below) of various durations ranging from 25 minutes to 50 minutes. Participation was by invitation; however there was scope for both scientists and students from research institutes and universities to introduce themselves and their students and request participation. There were approximately 15-18 lectures at the School during the three days (23 - 25 May 2008). Almost all lectures were of 50 minutes duration followed by a 10 minute discussion period. The broad areas and the titles of the talks and the lecturers who delivered these are given below.

A - Supernovae and their Circumstellar Interaction
Three lectures by Richard McCray, to be extended further by Kevin Heng and G.C. Anupama.
1. Basic physics of shocks, blast waves, and circumstellar interaction. Shock hydrodynamics, shock radiation. X-ray emission.
2. Basic physics of supernovae and their light curves: energetics, radioactivity, internal shock waves, light curves of thermonuclear and core collapse supernovae.
3. Basic physics of supernova spectrum formation: photospheric spectrum, nebular spectrum, spectrum from external shocks. Line ratios and line profiles.

B - Particle Acceleration in Astrophysical Shocks Including Magnetic Field Amplification and effects of large fields on non-thermal X-rays. (Don Ellison: 2 lectures)
4. Basics of nonlinear particle acceleration in collisionless shocks. Major nonlinear aspects of diffusion shock acceleration and how nonlinear effects influence the spectra and composition of cosmic rays.
5. Diffusion shock acceleration and magnetic field amplification : A new and important aspect of diffusive shock acceleration (DSA) is the realization that efficient DSA may lead to the amplification of magnetic turbulence. Since the magnetic field is the most important parameter controlling DSA, this results in a strongly nonlinear system. The basics of this process will be introduced.

C - Gamma ray emission processes specialized to SNR and Gamma ray telescopes, especially GLAST, HESS, Milagra and proposed successors emphasizing what they might observe.
(Roger Blandford: 2 lectures)

D - Core Collapse SNe explosion mechanisms and signatures
(Chris Fryer and Firoza Sutaria: 2+1 lectures)
10. Core-Collapse Explosion Mechanisms and the Fate of Massive Stars
11. Progenitors of Gamma-Ray Bursts and Supernovae
12. Neutrinos and Gravitational Waves from Supernovae

E - Gamma Ray Bursts (Tsvi Piran: 2 lectures)
13 & 14. GRBs: Sky and Temporal distributions; relations with SNe in massive stars and "collapsars"; explosion and fireball, central engines; GRB afterglows and their detections; a few special GRBs.

F - First stars and First Supernovae (Andrea Ferrara: 3 lectures)
15. The formation and physics of the first stars
16. Observational signatures of the first stars
17. Feedback processes during the Dark Ages

Highlights

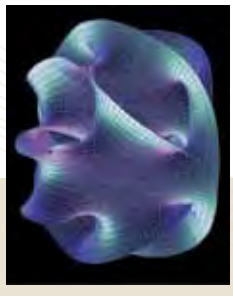
Some of the Workshop highlights were (according to Richard McCray): the gathering evidence for a class of relatively prompt SNIa's; a report by S.P. Reynolds on the youngest SN in the Milky Way, especially the confirmation by radio observations and thereby determining the age; the prospects for GLAST, including the GRB-SN correlation, the connection with HESS etc., and the evidence from Chandra of non-thermal X-rays from shock acceleration by SN blast waves; the work presented by Carlos Badenes about how the spectra of ancient SNRs at maximum

were recovered through their light echoes, and correlating that with abundances in SNR ejecta determined through their present X-ray spectra. The Workshop was held at a propitious time, as the GLAST (Gamma Ray Large Area Space Telescope) whose prospective science was disussed in detail at the meeting was successfully launched a few days later.

According to Don Ellison who summarized the Program, the theme of the Workshop was the role of supernovae (SNe) in seemingly distinct areas of astrophysics, such as the formation of the very first stars (at $z \sim 6$), re-ionization of the early universe, galaxy structure formation, gamma-ray bursts (GRBs), and cosmic ray origin. Topics also included recent and well-studied SNe (e.g. SN 1987A, SN 1993J, SN 2006gy and SN 2008D) and supernova remnants (SNRs), including the youngest known SNR in the Milky Way (G1.9+0.3). The workshop contained a strong diversity of topics but all were connected in significant ways to the supernova phenomenon. From the time of the first stars to today, SNe and SNRs are proving to be a critically important part of astrophysics. More exotic, but more distant, extra-galactic objects will never be studied as well as SNe and SNRs in the Milky Way. The fact that important physical processes, particularly those associated with collision less shocks and magnetic turbulence, should scale to more extreme objects means that progress in some of the most exciting areas of astrophysics, e.g., cosmology, galaxy and cluster formation, and GRBs, can be advanced in important ways by studying local SNe and SNRs.

Participants

Manjari Bagchi (TIFR) | Swastik Bhattacharya (TIFR) | Anya Choudhury (TIFR)
Sovan Chakraborti (SINP) | Somenath Chakraborti (Visva Bharati) | Jishnu Dey (Presidency College, Calcutta) | Mira Dey (Presidency College) | Srirupa Dasgupta (SINP)
Taparati Ganguly (Presidency College) | Anders Jerkstrand (Stockholm Univ)
P. Ramya (IIA, Bangalore) | Tushar Prabhu (IIA) | Rupak Roy (ARIES, Naini Tal) | Jaya Sahu (Pandit Ravishankar Univ, Raipur) | Sheetal Sahu (PRU, Raipur) | Devendra Sahu (IIA) | Bharat Bhushan Singh (TIFR, Panchmarhi) | Ashok Singhal (PRL, Ahmedabad)



PROGRAM	MONSOON WORKSHOP ON STRING THEORY http://icts.tifr.res.in/sites/strings
DATE	2 June - 8 August 2008
ORGANIZERS	R. Gopakumar (HRI, Allahabad) S. Minwalla (TIFR, Mumbai)
VENUE	TIFR, Mumbai

Purpose

The main purpose of the proposed workshop was to provide an environment that facilitates unplanned interaction between the participants,and encourages the initiation of new collaborations. The workshop brought together a broad spectrum of researchers working in currently active topics in String theory.

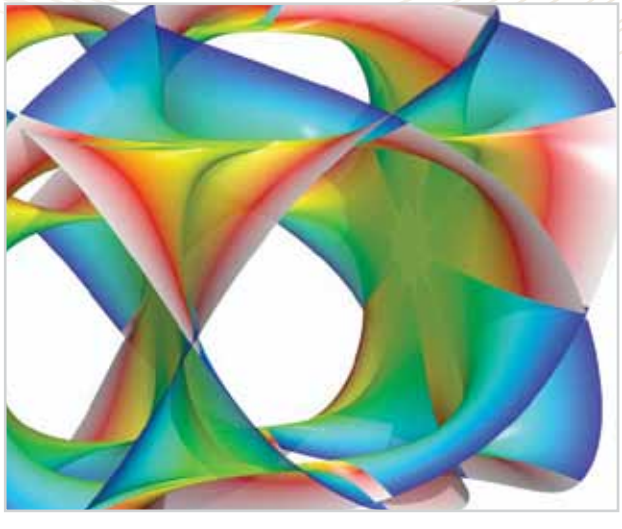
Topics

The academic structure of the workshop was as follows:
There was a monsoon workshop talk from 11.30 am - 1 pm every working day of the 10 week period of the workshop; these talks were usually held in TIFR. In addition a more informal discussion session was also organized 2-3 times a week, over the duration of the workshop. Discussion sessions were held in the Homi Bhabha Auditorium Foyer. Finally, an intensive 2 day Monsoon Workshop conference was held on the 11th and 12th of July, 2008. In addition, Juan Maldacena delivered a public talk on the Gauge Gravity Correspondence.

While participants were largely free to choose the period of their attendance at the monsoon workshop based on their convenience,certain focus periods were designated in order to maximize the intersection of people with similar interests. The designated focus periods were as follows:

String Phenomenology and Cosmology:	Weeks 1 - 3 (2 - 22 June)
Worldsheet Aspects of String Theory:	Weeks 2 - 3 (9 - 22 June)
Counting of Black Hole Microstates:	Weeks 4 - 6 (23 June - 13 July)
Gravitational Aspects of String Theory:	Weeks 5 - 7 (30 June - 20 July)
The AdS/CFT Correspondence:	Weeks 6 - 10 (7 July - 8 August)

Speakers	Topics
Aharony	Chern Simons gravity duality
Antoniadis	String phenomenology
Dabholkar	Precision counting of Black Hole micro states
Denef	N = 2 walls of marginal stability
Dhar	Phenomenology from string theory
Drukker	N = 4 correlators from supersymmetry
Emparan	Black Holes in higher dimensions
Hartnoll and Herzog	Applications of ADS/CFT to Condensed Matter Systems
Mandal	Black Hole micro states
Minwalla	ABJM Chern Simons theory
Mukhi	Bagger Lambert theory, The ABJM brane construction
Raychaudhuri	LHC Physics for String theorists – I and II
Trivedi	String theory and GUTS, String phenomenology
Yaffe	N = 4 Plasma Dynamics from super gravity



Organisers' Feedback

In our opinion the monsoon workshop worked very well. The talks, discussions sessions and informal discussions were all of uniformly high quality. In addition workshop participants seem to have found that the environment conducive to free wheeling discussion, brainstorming and collaborative research. A couple of months after the end of the workshop,all workshop participants were sent mails requesting them to send their feedback on the meeting Note that several workshop participants assert that the

monsoon workshop was one of the best workshops they have ever attended; and some of these participants have attended scores of such meetings. Note also that several participants point to specific collaborative projects that were initiated over the course of the Monsoon workshop. This has also been acknowledged in a number of publications that appeared in the following months.

Participants

Aharony | Alishaniha | Bagchi | Balasubramanian | N.Banerjee | S.Banerjee | Berkooz | Biswas | Candelas | Castro | Chen | Cheng | Craps | Dabholkar | Das | David | De La Ossa | Denef | Dorey | Drukker | Dutta | Emparan | Gaberdiel | Ghoshal | Goldstein | Gupta | Gutperle | Hartnoll | Hashimoto | Herzog | Hirata | Hori | Hubeny | Intriligator | Janik | Kar | Kaura | Kim | Kitazawa | Kumar | Kundu | Lahiri | A. Maharana | J. Maharana | Maldacena | Majumder | I. Mandal | Marolf | Mikhailov | Mukhopdhyay | Mukherji | Murthy | Narayan | Nishioka | B. Panda | S.Panda | Paramchev | Papadodimas | Pioline | Van Raamsdonk | Rama | Ramadevi | Ramgoolam | Ray | Rangamani | Razamat | Rodrigues | Gomez | Reall | Roiban | Roychowdhury | Sachdev | Sahoo | Schomerus | Sen | Singh | Siwach | Spradlin | Srivastava | Surowka | Suryanarayana | Takayanagi | Tong | Tripathy | Wecht | Wiseman | Yaffe | Yin | Zwiebach

PROGRAM	INITIAL CONDITIONS IN HEAVY ION COLLISIONS http://theory.tifr.res.in/~qcdinit/
DATE	1 - 19 September 2008
ORGANIZERS	R. Gavai (TIFR) | F. Gelis (CERN) | S. Gupta (TIFR) | R. Venugopalan (BNL)
VENUE	International Center Dona Paula, Goa

Structure

The Structure of the program was geared towards discussions; there were generally two talks and a structured discussion session every day. The rest of the day was available for individual discussions. The structure was much appreciated by all the research workers who attended the program.

Two papers have already resulted from this meeting:
1) High energy factorization and long range rapidity correlations in the Glasma, F. Gelis, T. Lappi, R. Venugopalan. Oct 2008. 4pp. e-Print: arXiv:0810.4829 [hep-ph], submitted to PRL

2) Two introductory lectures on high energy QCD and heavy ion collisions, Debasish Banerjee, Jajati K. Nayak, Raju Venugopalan. Oct 2008. e-Print: arXiv:0810.3553 [hep-ph], to be published by Springer, in proceedings of Quark Matter Winter School (2008).

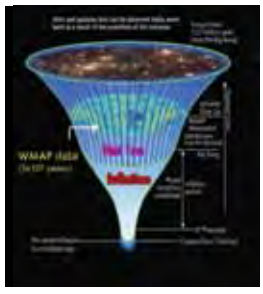
The first week of the program was devoted largely to structure functions and the third week mainly to heavy- ion physics. The second week was a school with 7 courses given to 22 participants.

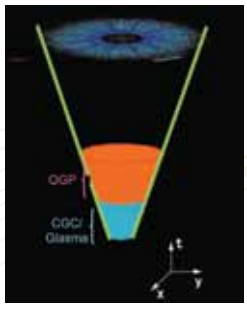
Speakers	Topics
R. Venugopalan (BNL)	Low-x physics
P. Mathews (SINP)	Unparticle physics
A. Cooper Sarkar (OXFORD)	Low-x and parton densities for LHC
R. Godbole (IISC)	QCD at the LHC
S. Gupta (TIFR)	A toolset for QCD at LHC / The phase diagram of QCD
K. Itakura (KEK)	Plasma instabilities
K. Fukushima (KYOTO)	Initial conditions
D. Bodeker (BIELEFELD)	Thermalization in HIC
S. Sarkar (OXFORD)	Thermalization in the early universe
G. Soyez (BNL)	Jets at RHIC and LHC
C. Marquet (COLUMBIA)	Jets from AdS/CFT
N. Mathur (TIFR)	Structure functions from lattice
R. Basu (IMSC)	Azimuthal correlations of jets
S. Datta (TIFR)	Finite-T results for Nc>3
M. Asakawa (OSAKA)	Fluctuation probes and the critical end point
G. Moore (MCGILL)	Bulk viscosity / Transport coefficients
R. Bhalerao (TIFR)	Viscous hydrodynamics: some results
A.K. Chaudhuri (SINP)	Viscous hydrodynamics
D. Molnar (PURDUE)	Open problems in hydro and transport
R. Chatterjee (VECC)	Photon elliptic flow
F. Arleo (ANNECY)	Direct photons and gluon densities
A. Vuorinen (CERN)	Heavy quarks in N=4 SYM plasma
F. Gelis (CERN)	Charm production
P.S. Saumia (IOP)	Acoustic fluctuations
R.V. Gavai (TIFR)	Free chiral quarks at finite chemical potential
A. Srivastav (IOP)	Acoustic fluctuations
D. Srivastava (VECC)	Direct photons in HIC

Comments

There was positive feedback from students about the school. Several of the participants had attended schools in the subject of heavy-ion physics in previous years, and appreciated the fact that there was a high-level school as a follow up. Some of the students had previous exposure only to high-energy physics phenomenology, and appreciated the fact that such a school dealt with different aspects of collider phenomenology. Applications to cosmology was another aspect of this school which was appreciated by all present.

Other physics benefits of a program such as this are strong, but somewhat intangible. The record of talks, papers published, and future possible publications are a surface aspect of a much deeper benefit in the exchange of ideas. The importance of programs such as this for such intangible benefits was strongly appreciated by participants.





Participants

Neelima Agarwal (Allahabad)
J. Alam (SINP)
F. Arleo Annecy (ANNECY)
M. Asakawa (OSAKA)
Abhishek Atreya (IOP)
Debasish Banerjee (TIFR)
R. Basu (IMSC) | Lusaka Bhattacharya (SINP) | S. Bhattacharya (DELHI)
R. Bhalerao (TIFR) | D. Bodeker (Bielefeld) | Rupa Chatterjee (VECC) | Sandeep Chatterjee (IISC) | S. Chattopadyaya (VECC) | Asis Choudhury (SINP) | A. Copper Sarkar (Oxford) | Santosh K. Das (SINP) | S. Datta (TIFR) | K. Fukushima (Kyoto) | R. Gavai (TIFR) | F. Gelis (CERN) | Uma Shankar Gupta (Allahabad) | R. Godbole (IISC) | M. Guchait (TIFR) | S. Gupta (TIFR) | K. Itakura (KEK) | Vinod C. Joshi (IIT-K) | T. Lappi (SACLAY) | R. Loganayagam (TIFR) | Ranjita Mahapatra (IOP) | G. Majumdar (TIFR) | Aarti Manhas (Jammu) | C. Marquet (Columbia) | P. Mathews (SINP) | N. Mathur (TIFR) | Ananta Mishra (IOP) | Payal Mohanty (VECC) | D. Molnar (Purdue) | G. Moore (MCGILL) T. Nayak (VECC) | Jagmohan Rana (Garhwal)
V. Ravi Shankar (IIT-K) | V. Ravindran (HRI) | Anirban Saha (TIFR) | S. Sarkar (Oxford) | Sayantan Sarma (TIFR) | P.S. Saumia (IOP) | G. Soyez (BNL) | A. Srivastav (IOP) | D. Srivastava (VECC) | R. Venugopalan (BNL) | A. Vuorinen (CERN) | Vivek Tiwari (Allahabad) | Pritwish Tribedy (VECC) | Anurag Tripathi (HRI)

PROGRAM	WORKSHOP ON REINFORCED RANDOM WALKS & RANDOM WALK IN RANDOM ENVIRONMENTS http://icts.tifr.res.in/sites/rw
DATE	5 - 8 December 2008
ORGANIZERS	Vivek Borkar (TIFR, Mumbai) | S. Juneja (TIFR, Mumbai) J. Radhakrishnan (TIFR, Mumbai) | P. Sen (TIFR, Mumbai)
VENUE	Stat-Math Unit, Indian Statistical Institute, Bangalore Centre

Purpose

The main aim of the Workshop was to understand the research area of Random Walk in Random Environments and Reinforced Random Walks.

Structure

Each speaker gave 3 talks and chaired 1 problem session:

Antar Bandhyopadyay spoke on Random Walks in Random Environment.
Mike Keane spoke on Once Reinforced Random Walks.

Vlada Limic's three lectures were on Strongly Reinforced Random Walks:
(i) The time-line construction and attracting edge on bipartite graphs;
(ii) An alternative martingale technique; and
(iii) Attracting edge for increasing weights on general graphs.

Balint Toth's lectures were on Models of self-interacting random walks with long memory:
(i) The Ray-Knight approach in one dimension;
(ii) The Brownian Web and construction of the "true self-repelling motion"; and
(iii) Diffusive bounds.

The four speakers consequently covered a large area of research that is being conducted in this field. Interspersed between the talks were question answer and open problem sessions. In these sessions there was time set aside for students to ask questions from the speakers as well. Another key aspect that was achieved at the meeting was the interaction and the collaborations that have started within the Indian probability community and outside.

Participants

Antar Bandyopadhyay, Speaker | Tamal Banerjee, Student | Anup Biswas, Student
Ravichandra C.L., Researcher | Bhupendra Gupta, Faculty | Rajat Hazra, Student
Srikanth Iyer, Faculty | Kavita Jain, Faculty | Rajeeva L. Karandikar, Researcher
Mike Keane, Speaker | Manjesh Kumar, Student | Ananya Lahiri, Student
Vlada Limic, Speaker | Pallavi Manohar, Student | Srilax Minarayana, Student
Krishanu Maulik, Faculty | Jeganathan P., Faculty | Smruti Padhya, Student
B. Rajeev, Faculty | Mallikarjuna Rao, Faculty | Rahul Roy, Faculty | Ali Saeb, Student
Farkhondeh Sajadi, Student | Anish Sarkar, Faculty | Prabodh Shukla, Faculty
Ravi Sreenivasan,Faculty | Rama Subramanian, Faculty | Rajesh Sundaresan, Faculty
Debleena Thacker, Student | Balint Toth, Speaker

PROGRAM	SCHOOL ON FINITE ELEMENT MODELLING 2008 http://icts.tifr.res.in/sites/School%20on%20Finite%20Element%20Modelling%202008/index
DATE	3 - 14 November 2008
ORGANIZERS	L.R. Ram-Mohan (Worcester Polytechnic Institute) K.L. Narasimhan (TIFR)
VENUE	Tata Institute of Fundamental Research, Mumbai

Purpose

The Program is is designed to introduce the physical and mathematical concepts and the computational methodology that underlie the FEM, present examples in 1D and 2D with lectures, coursework, and experience in computer program development. It will initiate the participants into problems in 1-3D of interest to them.

The school consisted of lectures in the morning by Professor L.R. Ram-Mohan and hands on sessions in two batches in the afternoon. The latter was conducted by Mr. A. Girgis.

Structure

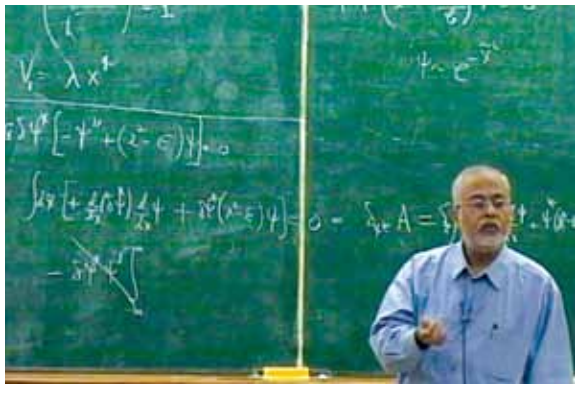
Professor Ram-Mohan decided that he would just use chalk and board for the lectures so that it would be paced right. The lectures were very detailed. Professor Ram-Mohan shared many tricks to keep track of the bookkeeping which is very important in the FEM technique. This helped people follow the lectures and resulted in a large audience participation both during and after the lectures. There were a total of fourteen lectures each of ninety minutes duration. To Professor Ram-Mohan's credit, he had the attention of the participants to the very end. Since the lectures are very detailed, they were videotaped. We are currently in the process of converting the tapes to DVD format so that they can be hosted on the website as we feel that it will be difficult to get a similar lecture series from another individual with the same clarity and detail. It is planned to make the lectures available on the website of ICTS. We are also exploring the possibility of posting the lectures on NPTEL to be able to reach a wider audience. In addition to the lectures, the participants gave short presentations re: their work and had a one on one discussion with Professor Ram-Mohan on various aspects of their work.

There were two hands on sessions each day of two hours each to enable each participant to work individually at the computer. This enabled Mr. Girgis to give individual attention to each of the participants. The hands on sessions were also very useful and came in for great praise from all the participants.

At the end of the course, the participants filled in a feedback form evaluating the course. Both the Hands On Sessions and the lectures came in for great praise. In hindsight, it was very far sighted of Professor Ram-Mohan to integrate the hands on sessions with the lectures. The participants felt that that this was one of the best schools that they had attended. Professor Ram-Mohan also interacted with many members in the institute from DCMPMS, EHEP and DAA. During his stay, Professor Ram-Mohan has set up a collaboration with DCMPMS colleagues. As part of the collaboration, he has made available his programes for electronic structure calculation to be used in the interpretation of experiments at TIFR. Overall, the course met with a very good response and exceeded our expectations.

Participants

Arvind Ajoy (IIT Madras, Chennai) | S Anoop (NIT Trichy) | HM Antia (TIFR) | Ashish Arora (TIFR) | Amrita Bhattacharya (IACS, Calcutta) | Abhijit Biswas (Jadavpur University, Kolkata) | Alok Chaubal (TIFR) | Roby Cherian (SNBNCBS, Kolkata) | Rajiv Chouhan (SNBNCBS, Calcutta) | Shekhar Deodhar (Wilson College, Mumbai) | Kusum Dhochak (TIFR) | Kavita Gangal (TIFR) | Sandip Ghosh (TIFR) | Kapil Gupta (SNBNCBS, Kolkata) | Amit Harode (CRL, Pune) |KPSS Hembram (JNCASR, Bangalore) K Kaushik (CRL, Pune) | Vaibhav Kaware (Pune University) | Edward Kennedy (SRM University, Chennai) | Shyam Kishor (Janta Vedic PG College, Baraut) | Anil Kumar (JNCASR, Bangalore) | Dinesh Kumar (JNCASR, Bangalore) | Adhish Majumdar (IIT,



Bombay) | Balasaheb Nagare (Mumbai University) | Siddharth Nambiar (TIFR) | KL Narasimhan (TIFR) | Prakash Parida (JNCASR, Bangalore) | Kaushal Patel (Veer Narmad South Gujarat University, Surat) | Praveen Pathak (HBCSE TIFR) | Anuradha Patra (IIT Madras, Chennai) | Anil Prabhakar (IIT Madras, Chennai) | S.S.Prabhu (TIFR) | G.Rajaram (NIT Trichy) | Kota Satyanarayana (Osmania University, Hyderabad) | Amandev Singh (TIFR) Vijay Singh (HBCSE TIFR) | Kashid Vikas (Pune University)

PROGRAM	AFFINE ALGEBRAIC GEOMETRY http://icts.tifr.res.in/sites/affinegeometry
DATE	22 - 28 December 2008
ORGANIZERS	R.V. Gurjar (TIFR, India) | S.M. Bhatwadekar (TIFR, India) M. Miyanishi (Kwansei Gakuin University, Japan)
VENUE	Fireflies Intercultural Centre, Bangalore, India

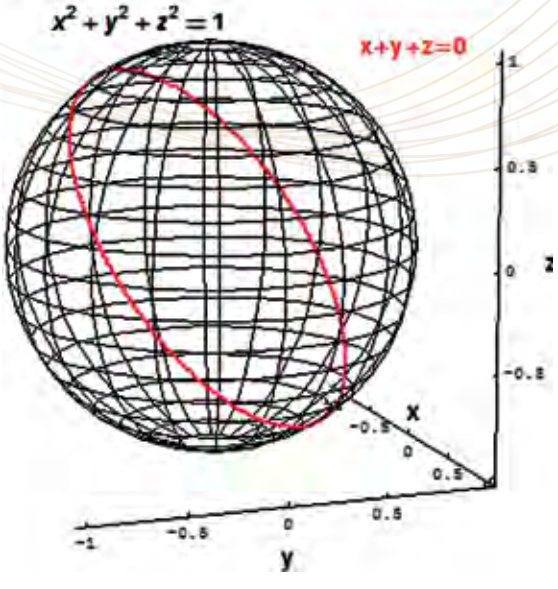
Purpose

The underlying theme of the meeting was to dicuss the recent developments in the area, 'Group actions in affine varieties, Jacobian problem, topology of affine surfaces,etc.'

Structure

There were 24 talks in all, 4 talks of one hour duration every day on six days. There were many informal discussions between the participants after the lecture hours and during the meals. The students found many lectures inspiring and came to know of interesting unsolved problems. It was very nice for them to meet some of the leaders in the area of Affine Algebraic Geometry.

The peaceful atmosphere of the Fireflies Centre was very conducive for such informal discussions. All the participants were very happy with the quality of lectures, friendly atmosphere and excellent service provided by the management of the Fireflies Centre. One of the stimulating developments during the meeting was the announcement by Prof. Leonid Makar- Limanov from USA of a solution of an outstanding open problem, viz Jacobian Conjecture. He gave a special talk on his proof on the last day of the meeting which created a great deal of excitement.



All in all, the organizers feel that the meeting was a big success and are enthusiastically looking forward to having more such meetings in India.There were a total of 32 participants, out of which 20 were foreign and 12 from within India. Among the Indian participants there were six research scholars (Five from TIFR and one from ISI, Kolkata).

Speakers	Topics
T. Asanuma, Japan	Topological aspect of the Jacobian conjecture.
A.K. Dutta, Kolkata	On commutative algebras which are locally A1 in codimension-one
S. Iitaka, Japan	Kodaira dimension and mixed plurigenera.
Z. Jelonek, Poland	On cancellation problem.
M-C. Kang, Taiwan	Groups with essential dimension one.
T. Kishimoto, Japan	An application of log minimal model program for affine algebraic three folds.
H. Ko jima, Japan	Algebraic surfaces of logarithmic Kodaira dimension one.
M. Koras	Singular points of Z -acyclic surfaces.
S. Kuroda	The Shestakov-Umirbaev inequality and polynomial automorphisms.
A. Maharana, Mumbai	Q-homology planes as cyclic covers of A2
L. Makar-Limanov, USA	On derivations related to a Jacobian pair.
K. Masuda, Japan	Lifting of the additive group scheme actions.
M. Miyanishi, Japan	Additive group scheme actions on integral schemes defined over discrete valuation rings.
P.C. Nogues	Danielewski surfaces and topology of polynomials.
B.P. Purnaprajna, USA	Canonical and Bi-canonical maps of surfaces of general type.
F. Sakai, Japan	Weierstrass points and S4 Geometry on Picard curves.
S.S. Sane, Mumbai	Projective Modules over smooth affine varieties over Archimedian real closed fields.
A. Sathaye, USA	Boxed Polynomials and the Jacobian Problem.
R. Tanimoto, Japan	On the Dixmier operator.
Vinay Wagh, Guwahati	Relations between multiplicity and the divisor class group for rational singularities.
D. Wright, USA	Stable Tameness of Two-Dimensional Polynomial Automorphisms Over a Regular Ring
H. Yoshihara, Japan	Galois points for elliptic curves.
Jie-Tai Yu, Hongkong	The Unique Embedding and Tietze Transformation.
D.Q. Zhang, Singapore	Rationality of rationally connected varieties.
S.M. Bhatwadekar, Mumbai	
M.K. Das, Kolkata	
Prosenjit Das, Kolkata	
R.V. Gurjar, Mumbai	
Sudarshan Gurjar, Mumbai	
M.K. Keshari, Mumbai	
Shameek Paul, Mumbai	
Ronnie Sebastian, Mumbai	

Participants

Shreeram S. Abhyankar, USA | Teruo Asanuma, Japan
Philippe Bonnet, Turkey | Pierrette Cassou-Nogues, France
M. K. Das, India | Das, India | A.K. Dutta, India
Gurjar Iitaka, Japan | Zbigniew Jelonek, Poland
Ming-chang Kang, Taiwan | M. K. Keshari, India
Takashi Kishimoto, Japan | Hideo Kojima, Japan
Mariusz Koras, Poland | Shigeru Kuroda, Japan
L.Makar-Limanov, USA | Alok K. Maharana, India | Kayo Masuda, Japan | M. Miyanishi,

Japan | Shameek Paul, India | B.P. Purnaprajna, USA | Sarang Sane, India | Fumio Sakai, Japan | Avinash Sathaye, USA | Ronnie Sebastian | Jie-Tai Yu, Hongkong | Ryuji Tanimoto, Japan | Vinay Wagh, India | David Wright, USA | L. Hisao Yoshihara, Japan
De-Qi Zhang, Republic of Singapore

PROGRAM	INDIAN CONDENSED MATTER WORKSHOP http://icts.tifr.res.in/sites/icmw
DATE	9 - 22 December 2008
ORGANIZERS	H.R. Krishnamurthy (IISC) | K. Damle (TIFR) | T.V. Ramakrishnan (BHU) V. Tripathi (TIFR)
VENUE	Fountain Hotel, Mahabaleshwar, Maharashtra

Purpose

This program was aimed at bringing together researchers working in the different sub-areas of condensed matter physics, statistical physics, both from India and abroad. A wide range of topics related to current research in strongly correlated electron systems such as high-Tc superconductors, manganites, disordered conductors, frustrated magnets and meso/nano scale devices were covered during the workshop.

Structure

There has been a long felt need in India for a regular international school and workshop in the area of condensed matter physics that would bring together the Indian condensed matter community and a significant number of active and authoritative international participants with a view to discuss current research and explore the possibility of collaborations. It was with this intention that the present series of meetings was initiated. The first one was held in Goa in November 2007. The success of the Goa meeting encouraged the organizers to think of having this meeting on a regular basis. With this in mind a proposal was made to the ICTS for support to organise the second meeting.

The two-week program consisted of pedagogical lectures by several experts for introducing the research topics to an audience of students, postdocs and non-experts, as well as more technical seminars covering recent work.

Pedagogical Lectures

Ehud Altman | Yuval Gefen | Mohit Randeria | A.M. Tremblay | Chandra M. Varma

Seminars on their Present Ongoing Work

S. Banerjee | G. Baskaran | Ravin Bhatt | Shailesh Chandrasekharan | Indra Dasgupta | Sushanta Dattagupta | Arindam Ghosh | Amit Ghosal | Tribikram Gupta | K. Kugel | P. Kulkarni | H.R. Krishnamurthy | Brijesh Kumar | Mukul Laad | Avinash Mahajan | K. Maiti | R. Moessner | Rajesh Narayanan | A. Pasupathy | T.V. Ramakrishnan | Sumathi Rao | P. Raychaudhuri | M. Rozenberg | T. Saha-Dasgupta | E.V. Sampathkumar |

S. Saxena | Diptiman Sen | K. Sengupta | R. Sen Sarma | R. Shankar | Y. Sudhakar | K.G. Suresh | A. Taraphder | S. Vidhyadhiraja | Smitha Vishweshwara

Highlights

1. Ehud Altman presented a great set of lectures on the physics of cold atom systems.
2. There was a lively discussion with contrasting viewpoints on the physics of high-temperature superconductors. The speakers were A.M. Tremblay, Chandra Varma and Mohit Randeria.

PROGRAM	GRAPHICAL MODELS, STATISTICAL INFERENCE AND ALGORITHMS http://icts.tifr.res.in/sites/gmsiaa
DATE	5 - 9 January 2009
ORGANIZERS	Vivek Borkar (TIFR, Mumbai) | Onkar Dabeer (TIFR, Mumbai) Devavrat Shah (MIT, USA)
VENUE	TIFR, Mumbai

Purpose

Graphical models refer to random variables and processes indexed by graphs where the graph structure determines their conditional dependencies. The genesis of the workshop is in an extensive discussion between Borkar and Shah during the former's visit to MIT last year, when they concurred on the need to expose the Indian research community to the latest trends and techniques in this fascinating area so as to generate interest among them to contribute in a substantial manner to both the fundamental and applied aspects of a field which is still rich in open issues. With this idea, a list of some researchers at the forefront of the field was drawn in order to give long tutorial survey talks, supplemented by several more focused research talks by researchers in this and allied areas.

Feedback Report

The notion goes back to some early work of Judea Pearl in artifcial intelligence, which was followed up by a large body of work by statisticians such as Dawid, Lauritzen, etc. The major excitement in recent years has, however, been spurred by the discovery of the so called turbo codes, which turned out to be related to Gallager's early work on low density parity check codes. The 'learning algorithms' for graphical models led to fast decoding schemes for such codes. There were also interesting connections with combinatorial optimization problems, which drew the interest of theoretical computer scientists. The theory, however, was lagging despite the spectacular empirical succcess of such codes, and this caused a fiurry of activity in developing the theoretical underpinnings of the subject. As graphical models are random fields, this also drew probabilists, statistical physicists and theoretical computer scientists into the fray, and the subject rapidly developed into avibrant research area in its own right. Unfortunately, barring some scattrred work on specific appplications, the subject did not take root in India. The audience was

drawn from the IITs, IISc, TIFR, etc., comprising of many young researchers in their prime as well as students.

Tutorial Talks

The tutorial talks were as follows:

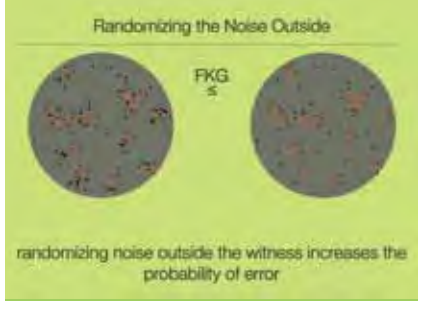
(a) Devavrat Shah, Belief propagation for combinatorial optimization: matching and independent sets. Shah used two canonical combinatorial optimization problems, maximal matching and finding independent sets in a graph, in order to introduce the celebrated belief propagation algorithm for learning in graphical models. He analyzed it in depth, introducing the key notions of computation tree and anti-monotonicity as well as the linear programming relaxation, bringing out the main features of the computational issues.

(b) Rudiger Urbanke (EPFL, Lausanne) and Andrea Montanari (Stanford Uni.) Urbanke and Montanari focused on the coding theoretic implications of graphical models, highlighting its connections with LDPC and turbo codes and touching both the theoretical and empirical issues. Specifically, they spoke about asymptotic analysis, phase transitions and connections with compressed sensing.

(c) Martin Wainwright (UC, Berkeley), Variational relaxations of graphical models: Marginal polytopes and entropy approximations. Wainwright considered graphical models in their full generality, highlighting both the sum-product and max-product formulations and their applications to problems of marginal computation, maximum likelihood etc. He introduced variational formulations of the learning problem based on linear and convex programming. He discussed extensively the algorithmic and approximation issues, which included his own landmark contributions to the 'tree-reweighted belief propagation' algorithm.

(d) Prasad Tetali (Georgia Tech.), Dynamical and spatial mixing in spin systems Tetali gave an overview of rapidly mixing markov chains covering both probabilistic and analytic techniques, and the notions of spatial and temporal mixing. He highlighted their algorithmic implications for combinatorial problems, and described further developments in the context of graph coloring problems.

(e) David Gamarnik, MIT), Spatial correlation decay and deterministic counting. Gamarnik introduced the statistical mechanical approach to graphical models based on notions of cavity expansions and correlation decay, and introduced the computational algorithms that emerge from it.



Seminar talks

The seminar talks were as follows:

1. V. Anantharam (UC, Berkeley), Anonymity via networks of mixes
2. Anant Sahai (UC, Berkeley), Power-complexity of iterative decoding
3. Sourangshu Bhattacharya (Yahoo India, Bangalore), Graphical models for sub-pointset matching
4. A.J. Ganesh (Uni. of Bristol), Epidemics on networks
5. Vinay Jethava (IISc), Approximate inference over time using message passing

6. Mokshay Madiman (Yale Uni.), Entropy inequalities for partition determined functions
7. Venkatesh Saligrama (Boston Uni.), Optimal bounds and algorithms for support recovery and approximation in compressed sensing
8. Sunita Sarawagi (I.I.T., Mumbai), Efficient inference with cardinality based clique potentials

Participation

Amit Agarwal (Yahoo India) | Venkat Anantharam (UC Berkeley, USA) | Kishor Barman (TIFR) | Sourangshu Bhattacharyya (Student, IISc) | Vivek Borkar (TIFR) | S. Chandrasekaran (TIFR) | Soumen Chakrabarti (IIT(B)) | Onkar Dabeer (TIFR) | Bikash Kumar Dey (IIT(B)) | Devadatt Dubhashi (Chalmers Univ., Sweden) | Chinmoy Dutta (TIFR) | David Gamarnik (MIT, USA) | Mohit Garg (TIFR) | Rahul Gupta, Student, IIT(B) | Penny Haxell (Univ. Waterloo, Canada) | Vinay Jethava (Student, IISc) | Sandeep Juneja (TIFR) | Pavan Kumar (Yahoo India) | Krishna Leela (Yahoo India) | Mokshay Madiman (Yale Univ., USA) | Naresh Manwani, Student (IISc) | Prachi Mehendale (TIFR) | Neelesh Mehta (IISc) | Sanjoy Mitter (MIT, USA) | Andrea Montanari (Stanford Univ., USA) Chandra Murthy (IISc) | K.P. Naveen, Student, IISc | Mehul Parsana (Yahoo India) | Jaikumar Radhakrishnan (TIFR) | B. Ravindran (IIT(M)) | Venktesh Saligrama (Boston Univ., USA) | K. Samudravijaya (TIFR) | Sunita Sarawagi (IIT(B)) Devavrat Shah (MIT, USA) | Tapan Shah (TIFR) | Rajesh Sundaresan (IISc) | Hema Swetha (Yahoo India) | Prasad Tetali (Georgia Tech., USA) | Andrew Thangaraj (IIT(M)) | Rudiger Urbanke (EPFL, Switzerland) | Martin Wainwright (UC Berkeley, USA) | Damon Wischik (University College, London, UK) | Ganesh (Univ. of Bristol, UK)

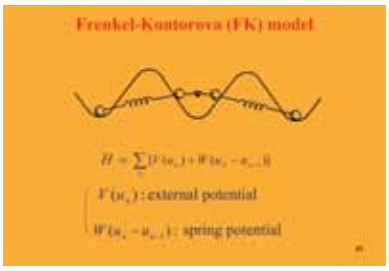
PROGRAM	HEAT TRANSPORT IN LOW DIMENSIONAL SYSTEM http://www.icts.res.in/program_details.php?id=17
DATE	15 - 21 March 2009
ORGANIZERS	Abhishek Dhar (RRI, Bangalore) | Onuttom Narayan (University of California)
VENUE	Bangalore

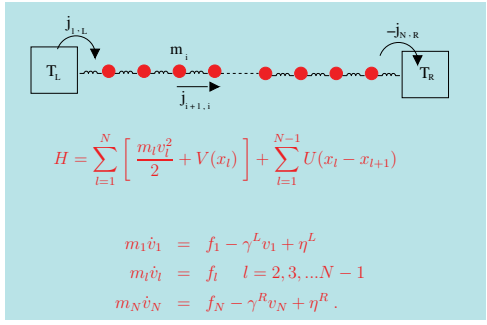
Purpose

Understanding anomalous transport and developing a general theory for transport in low-dimensional systems is an important problem in theoretical physics with much practical implications. This program aimed at getting together leading researchers in the field and trying to form a consensus on the various known results and discuss strategies and approaches in solving some of the outstanding problems.

Structure

The program was held in “Our Native Village” a resort about 40 Km away from Bangalore. All participants were housed at the venue. Apart from the pedagogic lectures and the regular seminars the program had a fair amount of free time left for open discussions. The program concluded with a discussion on interesting open problems that had emerged from the discussions





during the seven days. The first two days of the program (15-16 March) were devoted to pedagogical lectures on various topics related to heat conduction (each lecture was of 1:30 hr duration).

Lectures

1. Langevin equations and Green's function formalism: 2 lectures: Abhishek Dhar: The lectures gave a complete derivation of this formalism of heat transport and then showed various applications of this approach.

2. Kinetic theory: 2 lectures: Jani Lukkarinen:
The lectures gave a phenomenological description of the kinetic theory of phonon transport and also described recent developments in obtaining a rigorous derivation of the Phonon Boltzmann equation.

3. Exactly solved models of heat transport: 2 lectures: Stefano Olla and Cedric Bernardin:
The lectures described recent results on an exactly solved stochastic model of heat transport. This model is one of the few exactly solved non-trivial models of transport in an interacting system and makes some interesting predictions.

4. Mode-coupling theory: 1 lecture: Sarika Bhattacharya: This lecture gave an elementary introduction to mode coupling theory which is one of the formalisms used in understanding anomalous transport in low-dimensional systems.

5. Hydrodynamics theory: 1 lecture: Sriram Ramaswamy: This lecture described the basic approach of coarse-grained theories and their aplications to transport problems.
A phenomenological derivation of noisy hydrodynamic equations and the basis of renormalization group calculations were given.

The remaining part of the program had regular seminars and half a day was devoted to a poster session (each seminar was of 1:15 hr duration).

Invited Talks

March 17
Cedric Bernardin: Thermal conductivity for a noisy disordered harmonic chain.
Giulio Casati: Classical and quantum transport: from Fourier law to thermoelectric efficiency.
Abhishek Chaudhuri: Fourier's law and phonon localization in disordered harmonic crystals.
Keiji Saito: On heat fluctuations in heat transports and some aspects of average currents in higher dimension.

March 18
Deepak Dhar: Jordan Block structure of addition operators in stochastic Abelian sandpile models.
Peter Grassberger: Practical Applications of Mutual Information.

Bambi Hu: Asymmetric heat conduction in nonlinear systems.
Baowen Li: Heat conduction in nanostructures.

March 19
Jani Lukkarinen: Kinetic theory predictions for the anomalous and non-anomalous transport in FPU-type chains.
Diptiman Sen: Scattering of electrons from an interacting region.
Abhishek Dhar: Green-Kubo formula for heat conduction in open systems.

March 20
Carlos Mejia Monasterio: A stochastic model of anomalous heat transport
Onuttom Narayan: Energy transport out of equilibrium in one dimension.
Stefano Olla: Thermal conductivity in hamiltonian models perturbed by energy conserving noise.
Tomaz Prosen: Third quantization: a general method to solve master equations for open quantum systems.

March 21
Pradeep Kumar Mohanty: Restricted, driven and diffusive systems.
Sanjib Sabhapandit: Statistical properties of the final state in one-dimensional ballistic aggregation.

Speakers

Sarika Bhattacharya (Solid State and Structural Chemistry Unit, Indian Institute of Science, Bangalore.) | Cedric Bernardin (CNRS ENS Lyon, UMPA, Lyon, France) | Giulio Casati (Center for Nonlinear and Complex Systems, Vallegio, Italy) | Abhishek Chaudhuri (Raman Research Institute, Bangalore) | Abhishek Dhar (Raman Research Institute, Bangalore) Deepak Dhar (Tata Institute of Fundamental Research, Mumbai) | Peter Grassberger (University of Calgary, Calgary, Canada) | Bambi Hu (Hong Kong Baptist University and Department of Physics, University of Houston, US) | Baowen Li (Department of Physics, National University of Singapore, Singapore) | Jani Lukkarinen (Department of Mathematics and Statistics, University of Helsinki, Finland) | Pradeep Kumar Mohanty (Saha Institute of Nuclear Physics, Kolkata) | Carlos Mejia Monasterio (Institute for Complex Systems, CNR- National Research Council, Sesto Fiorentino, Italy) | Onuttom Narayan (Dept of Physics, University of California, Santa Cruz, US) | Stefano Olla (UMR CNRS, Universite Paris Dauphine, Paris, France) | Tomaz Prosen (Physics Department, University of Ljubljana, Ljubljana, Slovenia) | Sriram Ramaswamy (Department of Physics, Indian Institute of Science, Bangalore) | Sanjib Sabhapandit (Raman Research Institute, Bangalore)
Keiji Saito (Department of Physics, University of Tokyo, Japan) | Diptiman Sen (Department of Physics, Indian Institute of Science, Bangalore)

Participants

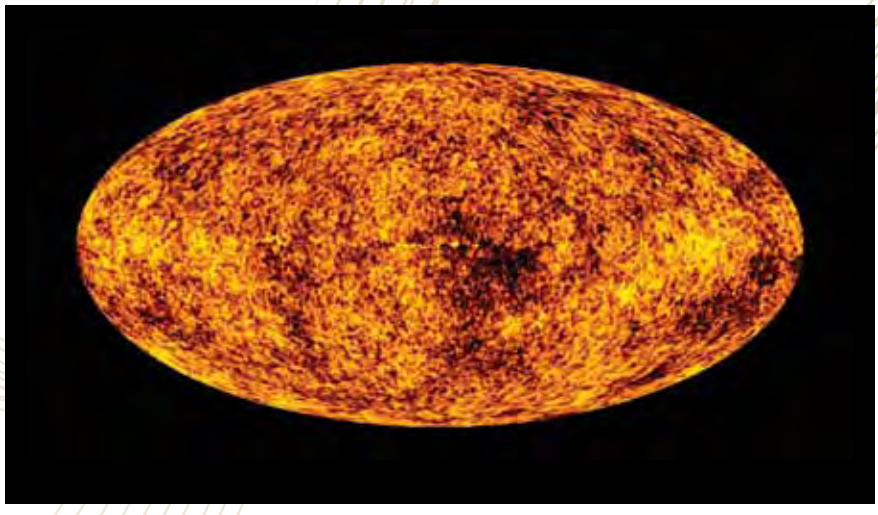
Arvind Ajoy (Indian Institute of Technology, Chennai) | Ren Jie (National University of Singapore, Singapore) | Chen Jie (National University of Singapore, Singapore)
Zhang Kaiwen (National University of Singapore, Singapore) | Vijay Kumar (Indian Institute of Science, Bangalore) | Anupam Kundu (Raman Research Institute, Bangalore)
Sourabh Lahiri (Institute of Physics, Bhubaneshwar) | Zhang Lifa (National University of Singapore, Singapore) | Tridib Sadhu (Tata Institute of Fundamental Research, Mumbai)
Arnab Saha (SNBNCBS, Kolkata) | Mamata Sahoo (Institute of Physics, Bhubaneshwar)

G. Santhosh (Institute of Mathematical Sciences, Chennai) | Amartya Sarkar (SNBNCBS, Kolkata) | Liu Sha (National University of Singapore, Singapore) | Abhiram Soori (Indian Institute of Science, Bangalore) | Ni XiaoXi (National University of Singapore, Singapore)

PROGRAM	COSMOLOGY WITH THE CMB AND LSS http://icts.tifr.res.in/sites/cmb/index
DATE	21 July - 31 August 2008
ORGANIZERS	Asantha Cooray (UCIrvine) | Subhabrata Majumdar (TIFR) Tarun Souradeep (IUCAA) | Bhuvnesh Jai (UPenn) | Simon Prunet (IAP) Sandip Trivedi (TIFR) | Subir Sarkar (Oxford)
VENUE	IUCAA, Pune, India

Purpose

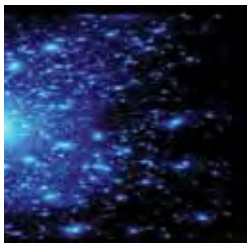
The six-week program consisted of schools and workshops covering frontline research areas in Cosmology using the Cosmic Microwave Background anisotropy,polarization and related observations of the large scale structure in the Universe. The program exposed Indian young researchers to the forefront of research in this remarkably successful area of contemporary science.



Structure

A six week long, international program of schools and workshops on this frontline research area in Cosmology was held at IUCAA from 21 July – 30 August 2008. The vision and scope of ICTS programs allowed one of the largest international cosmology programs organized in India. The scientific organization committee comprised largely of established young international cosmologists – Asantha Cooray (UC Irvine), Bhuvnesh Jain (UPenn), Simon Prunet (IAP), Subir Sarkar (Oxford), Sandip Trivedi (TIFR) and the program coordinators. Besides renowned senior researchers, such as, Marc Davis (Berkeley), Joe Silk (Oxford), Lyman Page (Princeton), Francois Bouchet (IAP), Subir Sarkar (Oxford), Ruth Durrer (Univ. Geneva), Marc Kamionkowski (Caltech) and Lev Kofman (CITA), quite a few lecturers were young achievers in their field of research. The median age of lecturers was about forty.

The programs featured a unique blend of experts teaching young researchers in the schools, as well as, engaging in scientific deliberations in the workshops. The program was divided into three sessions – Cosmic Microwave Background Anisotropy & Polarization, Probes of Large Scale structures and Link to the Early Universe. Each two week long session had nine days



of pedagogical lectures followed by a workshop. The unique format of the meeting attracted lecturers from several research institutions worldwide. Other than young PhD students from Indian institutes and universities, the program had a very sizable fraction of international students from across the globe USA, UK, France, Germany, Japan, Iran, Italy and even as far as Argentina & Brazil. The program exposed Indian young researchers to the forefront of research in this remarkably successful area of contemporary science. In all, there were about 160 participants of which around 70 came from outside India. Many of the participants stayed for all six weeks, with most people staying for atleast 2-3 weeks. All the lectures courses, workshop talks and public talks were video recorded. This excellent resource has been made available for free download from the conference website.

The six week program was subdivided into three programs, with each thematic session being run for two weeks, beginning with pedagogical lectures and culminating in a focused workshop. The first two weeks were devoted to "CMB anisotropy and polarization measurements", the next two weeks on "Probes of large scale structures" and the final two weeks on "Links to early Universe". The main topics during the first session dealt with theory & observational status of primary & secondary effects, cosmological model parameters, new statistical techniques used in CMB physics. The focus of the next two weeks was on re-ionization sources, 21 cm surveys, deep galaxy surveys, Ly-alpha probes, Baryon Acoustic Oscillations, cluster surveys and SN and their use in cosmological parameter constraints. Finally, the last two weeks had lectures on Inflation and alternatives, string cosmology, higher dimensions and higher derivative gravity, cosmic topology etc.

The program also reached out to the public through a series of four public talks to be delivered by eminent cosmologists, Francois Bouchet (IAP, Paris), Marc Kamionkowski (Caltech., USA), Joseph Silk (Oxford, UK) and Lyman Page (Princeton, USA). The talks on exciting topic from the frontiers of theoretical and observational cosmology were all well attended.

The long duration of the program also gave time for the participants to enjoy the cultural and social ambiance and develop strong bonds between the Indian and International students. The success of the ambitious program owes to the support from ICTS and the excellent organizational help of the IUCAA staff.

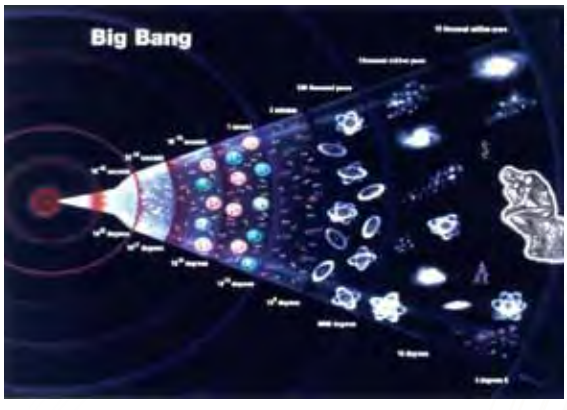
The program was well received by the international cosmology community. The feedback from many leading cosmologists have been very positive. The feedback clearly shows that the lecturers were happy at the student participations and, in general, thought the program to be very beneficial to Indian student/research community interested in Cosmology and Early Universe science. They also emphasised the need to have similar meeting in the future on a regular basis.

Participants

Amir Reza Aghamousa (IUCAA) | Moumita Aich (IUCAA) | Amna Ali (Centre for Theoretical Physics) | Adam Amara (ETH Zurich) | Mihir Ajunwadkar (Centre for Modeling

and Simulation, University of Pune) | Jasjeet Bagla (Harish-Chandra Research Institute) | Soumen Basak (Institut d'Astrophysique de Paris) | Mar Bastero-Gil (University of Granada (Spain)) | Nicholas Battaglia (CITA (Canadian Institute for Theoretical Astrophysics)) | Afsaneh Bazrafshan (Shiraz University) | Dennis Bessada (National Institute for Space Research - INPE / Astrophysics Division) | Kaushik Bhattacharya (Indian Institute of Technology, Kanpur) | Rahul Biswas (University of Illinois, Urbana Champaign) Martin Bojowald (Pennsylvania State University) | Christopher Bonnett (Institute d'Astrophysique de Paris) | Francois Bouchet (Institut d'Astrophysique de Paris) | Juan Carlos (Bueno Sanchez Lancaster University) | Sayan Chakraborti (TIFR) | Susmita Chakravorty (IUCAA) | Tzu-Ching Chang (CITA/ASIAA) | Bhramar Chatterjee (SINP) | Saugata Chatterjee (IUCAA) | Anya Chaudhuri (TIFR) | Soumini Chaudhury (Saha Institute of Nuclear Physics) | Ronidkumar Chingangbam (Centre for Theoretical Physics, Jamia Millia Islamia) | Joanne Cohn (Space Sciences Laboratory and Theoretical Astrophysics Center) Asantha Cooray (University of California, Irvine) | Jean Coupon (Institut d'Astrophysique de Paris) | Suratna Das (Physical Research Laboratory) | Sudipta Das (Harish - Chandra Research Institute) | Kanan Datta (IIT Kharagpur) | Marc Davis (University of California at Berkeley) Sanghamitra Deb (Drexel University) | Ningombam Devi (Centre for Theoretical Physics) Mark Devlin (University of Pennsylvania) | Ruth Durrer (Geneva University) | Prasun Dutta (Indian Institute of Technology, Kharagpur) | Andreu Font (Ribera Instituto de Ciencias del Espacio (IEEC-CSIC)) | Nader Ghahramany (Shiraz University) | Mohammad Ghanaatian (Shiraz University) | Abhik Ghosh (IIT Kharagpur) | Tuhin Ghosh (IUCAA) | Tapomoy Guha (Sarkar Indian Institute of Technology Kharagpur) | Gaveshna Gupta (Center for Theoretical Physics, Jamia Milia Islamia) | Jean (Christophe Hamilton APC – Paris) Diego Herranz (Instituto de Fisica de Cantabria) | Shaun Hotchkiss University of Oxford) Fomin Igor (Ulyanovsk State University) | Kaiki Inoue (Kinki University) | Preshanth Jagannathan (Swedish Institute of Space Physics) | Rajeev Jain (Harish-Chandra Research Institute) | Deepak Jain (Deen Dayal Upadhyaya College) | Pankaj Jain (IIT Kanpur) | Bhuvnesh Jain (University of Pennsylvania) | Mojtaba Jangjoo (Shiraz University) | Harvinder Jassal (Harish-Chandra Research Institute) | Sanjay Jhingan (Centre for Theoretical Physics, Jamia Millia Islamia) | Nidhi Joshi (Centre for Theoretical Physics, Jamia Millia Islamia) | Marc Kamionkowski (Caltech) | Sayan Kar (IIT Kharagpur) | Khamphee Karwan (Faculty of Science, Kasetsart University, Bangkok, Thailand) | Nishikanta Khandai (Harish-Chandra Research Institute) | Satej Khedekar (TIFR) | Daniela Kirilova (Institute of Astronomy) | Francisco Kitaura (Max Planck Institute for Astrophysics) | Lev Kofman (Canadian Institute of Theoretical Astrophysics) | Jean Claude (Kubwimana University of Cape Town) | Girish Kulkarni (Harish-Chandra Research Institute) | Gauri Kulkarni (Pune) Aleksandra Kurek (Astronomical Observatory of the Jagiellonian University) | Sachiko Kuroyanagi (Nagoya University) | Carlos Lopez (Arenillas Institue of Space Sciences (ICE)) | Suman Majumdar (Indian Institute of Technology Kharagpur) | Subhabrata Majumdar (TIFR) | Siddharth Malu (IUCAA) | Anupam Mazumdar (Copenhagen University) | Pieter Meerburg (University of Amsterdam) | Sanjit Mitra (Jet Propulsion Laboratory) | Subhendra Mohanty (Physical Research Laboratory) | Surhud More (Max Planck Institute for Astronomy) | Anupreeta More (Max Planck Institute for Astronomy) | Seyed Mohammad (Sadegh Movahed School of Astronomy; Institute for Studies in Theoretical Physics and Mathematics (IPM)) | Dipak Munshi (Institute of Astronomy, University of Cambridge) | Seshadri Nadathur (University of Oxford) | Sharvari Nadkarni Ghosh (Cornell University) | Akhilesh Nautiyal (Physical Research Laboratory) | Rajaram Nityananda (NCRA) | Saumia (P.S. Institute of Physics, Bhubaneswar) | Nikhil Padmanabhan (Lawrence Berkeley National Lab) | T Padmanabhan (IUCAA) | Lyman Page (Princeton University) | Sanjay Pandey (L B S P G College) | Dibyendu Panigrahi

(Kandi Raj College) | Aseem Paranjape (TIFR, Mumbai) | Mandar Patil | Hiranya Peiris (Institute of Astronomy, University of Cambridge) | Ue Li Pen (Canadian Institute for Theoretical Astrophysics) | Christoph Pfrommer (Canadian Institute for Theoretical Astrophysics) Dmitri Pogosian (University of Alberta) | Jayanti Prasad (NCRA, Pune) | Simon Prunet (Institut d'Astrophysique de Paris) | Clem Pryke (The Kavli Institute for Cosmological Physics) | Hadi Rahmani (IUCAA) | Abhishek Rawat (IUCAA) Nirupam Roy (NCRA) | Varun Sahni (IUCAA) | Pramoda Samal (IIT Kanpur) | Satyabrata Sahu (TIFR) | Prasant Samantray (IUCAA) | Saumyadip Samui (IUCAA) | Jose Sanz (IFCA) | Prakash Sarkar (IIT Kharagpur) | Devdeep Sarkar (University of California, Irvine) | Sudipta Sarkar (IUCAA) | Subir Sarkar (University of Oxford) | Seema Satin (Dept. of Physics, University of Pune) | Bjoern Schaefer (Institut d'Astrophysique Spatiale) | Claudia Scccola (Facultad de Ciencias Astronmicas y Geofsicas, Universidad Nacional de La Plata) | Douglas Scott (University of British Columbia, Vancouver) | Anjan Ananda Sen (Centre for Theoretical Physics) | T Seshadri (Univ. of Delhi) | Arman Shafieloo (IUCAA) | Ravi Sheth (University of Pennsylvania) | Yuri Shtanov (Bogolyubov Institute for Theoretical Physics) | (Arunansu Sil Service de Physique Thorique) | Joe Silk (University of Oxford) | Parampreet Singh (Perimeter Institute for Theoretical Physics) | Sandeep Sirothia (NCRA - TIFR) | Tarun Souradeep (IUCAA) | Lakshmanan Sriramkumar (Harish-Chandra Research Institute) | Svetlana Starikova (Department of Astronomy, University of Padova) | Ravi Subrahmanyan (Raman Research Institute) | Kandaswamy Subramanian (IUCAA) | Sharanya Sur (IUCAA) | David Sutton (University of Oxford) | Govind Swarup (NCRA) | Masahiro (Takada IPMU, U. Tokyo) | Andrea Tartari (Physics Department - University of Milano-Bicocca) | Saeed Tavasoli (Ferdowsi University of Mashad) | Shruti Thakur (Department of Physics and Astrophysics, University of Delhi) | Itzadah Thongkool (Centre for Theoretical Physics, Jamia Millia Islamia) | Kshitij Thorat (Indian Institute of Science) | Rakesh Tibrewala (TIFR) Andrew Tolley (Perimeter Institute for Theoretical Physics) | Pranjal Trivedi (Sri Venkateswara College, Delhi University) | Sandip Trivedi (TIFR) | Sanil Unnikrishnan (Delhi University) | Tanmay Vachaspati (Case Western Reserve University) | Marco Viero (University of Toronto) | Yogesh Wadadekar (National Centre for Radio Astrophysics) | Ludo Waerbeke (University of British Columbia) | Ben Wandelt (University of Illinois at Urbana-Champaign) | Martin White (University of California, Berkeley) | Jaswant Yadav (Delhi University)



PROGRAM	DIFFERENTIAL GEOMETRIC METHODS IN ALGEBRAIC GEOMETRY bundle09@math.tifr.res.in
DATE	6 - 17 April 2009
ORGANIZERS	Indranil Biswas | A. J. Parameswaran | S. Subramanian Vijaylaxmi Trivedi
VENUE	TIFR, Mumbai

Speakers

A. Anton, CSIC, Madrid
U. Bhosle, TIFR

Topics

Higgs bundles and triality
On the moduli of coherent systems.

Bielawski, Leeds University	Ind-group actions on moduli spaces of bundles and sheaves over $P2$.
Bradlow, University of Illinois	Morse theory for Higgs bundles
A. Dey, Carnegie Mellon University	Asymptotic irreducibility of rank 2 parabolic moduli over algebraic surfaces
T. Gomez, CSIC, Madrid	Torelli theorem for the moduli space of framed bundles
Hurtubise, McGill University	Monopoles on a circle bundle.
Logares, University of Proto, Portugal	Torelli theorem for the moduli space of Hitchin pairs.
Martens. Toronto University	Moduli of parabolic Higgs bundles and Atiyah algebroids
Mochizuki, RIMS, Kyoto	Wild harmonic bundles and wild pure twistor D-modules.
V. Munoz, CSIC, Madrid	Torelli theorem for the moduli of pairs.
Nitsure, TIFR	Moduli for unstable bundles on curves
Oliveira, University of Proto, Portugal	Moduli Spaces of Quadratic Pairs
Pali, Jussieu University, Paris	Degenerate complex Monge-Ampore equations over compact Kohler manifold
Poddar, ISI, Kolkata	Quasitoric spaces
Garcia-Prada, CSIC, Madrid	Higgs bundles and representations of surface groups / Involutions of the moduli space of Higgs bundles and real forms.
Wilkin, Johns Hopkins University	Morse theory on the space of Higgs bundles
Yoshikawa, Tokyo University	Analytic torsion and invariants of K3 and Calabi-Yau manifolds.

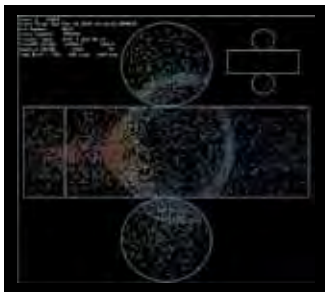
Participants

Sanjay Amrutiya (HRI, Allahabad) | Alvaro Anton (CSIC, Madrid) | V. Balaji (CMI, Chennai) Roger Bielawski (Leeds University) | S.Bradlow (University of Illinois at UC) | Tomas L.Gomez (CSIC, Madrid) | Oscar Garciaprada (CSIC, Madrid) | J.Hurtubise (McGill University at Montreal) | M.Logares (University of Proto, Portugal) | Vivek Mallik (IMSc, Chennai) | John Martens (Toronto University, Canada) | Takuro Mochizuki (RIMS, Kyoto) | Archana Morye (HRI, Allahabad) | C.Mourougane (Rennes University, France) | Vicente Munoz (CSIC, Madrid) | Andre Oliveira (University of Proto, Portugal) | Y. Pandey (CMI, Chennai) | Nefton Pali (Jussieu University, Paris) | Mainak Poddar (ISI, Calcutta) | S. Ramanan (CMI,Chennai) | Graeme Wilkin (John Hopkins University) | Ken-Ichi Yoshikawa (Tokyo University)

PROGRAM	ASPECTS OF NEUTRINOS http://www.icts.res.in/program_details.php?id=20
DATE	1 - 24 April 2009
ORGANIZERS	Gustavo Branco | Amol Dighe (TIFR, Mumbai) | S. Uma Sankar
VENUE	International Centre, Goa

Purpose

Neutrinos have provided us with the first window for physics beyond the standard model. In the coming years, high statistics experiments, both with short and long baselines, will provide precise data on neutrino oscillations. This will lead to stringent tests of models of new physics. Moreover, searches for neutrinoless double beta decay may provide the first direct evidence of lepton nonconservation. Neutrinos from a future supernova explosion in our galaxy are expected to open up an entirely new window into unexplored physics and astrophysics. Neutrinos and related



weakly interacting particles are the most likely dark matter candidates. It is expected that heavy neutrinos give rise to the matter-antimatter asymmetry in the universe. Research in the field of neutrino physics, both theoretical and experimental, promises to be an exciting and fruitful endeavour in the next decade. As part of the Program, a week-long conference "NuGoa09" was held at the International Centre in Goa during 8 - 15 April 2009. The participants in the Program also spent some time visiting various Indian institutions for collaborative work, whereas the conference provided a platform for all of them to interact with each other.

The Program focused on (i) models of neutrino masses and mixing, (ii) CP violation in the leptonic sector and leptogenesis, (iii) physics prospects at long baseline experiments, (iv) neutrino astrophysics and cosmology. During the weeks before and after the conference, there were intense discussion meetings consisting of groups of 5–6 people on some of these topics.

Structure

This program consisted of a number of small meetings organised around a central conference NuGoa09 in Goa during 8 - 15 April 2009. The themes were:
(i) models of neutrino masses and mixing,
(ii) CP violation in the leptonic sector and leptogenesis,
(iii) physics prospects at long baseline experiments,
(iv) neutrino astrophysics and cosmology.

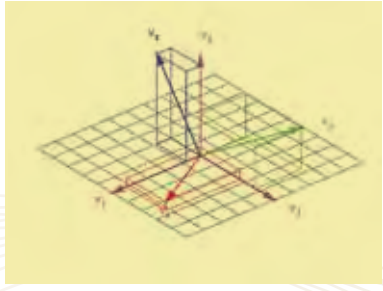
Speakers	Topics
Rathin Adhikari, Jamia Millia Islamia	Seesaw neutrino mass and extra U(1) symmetry
Charanjit Aulakh, Punjab University, Chandigarh	Minimal Susy SO(10) GUT fits of the neutrino data
Borut Bajc, Stefan Institute, Slovenia	Seesaw mechanisms
Gustavo Branco, IST, Portugal	Leptonic CP violation and leptogenesis
Sovan Chakraborty, SINP, Kolkata	Diffuse Neutrino Background from Supernova and GRB
Eung Jin Chun, KIAS, Korea	Dirac leptogenesis in extended nMSSM
Basudeb Dasgupta, NTI for Physics, Munich	Collective effects in supernova neutrino oscillations
David Emmanuel-Costa, IST, Portugal	Anomaly-Free Constraints in Neutrino Seesaw Models
Pomita Ghoshal, TIFR	Determining neutrino mass hierarchy if theta_13=0
Ricardo Gonzalez-Felipe, IST, Portugal	Leptogenesis from a broken A4 symmetry
Srubabati Goswami, PRL, Ahmedabad	Current status of neutrino masses and mixing
Walter Grimus, University of Vienna	Symmetries in the neutrino mass matrix
Steen Hannestad, Aarhus University, Denmark	Neutrinos in astrophysics and cosmology

D. Indumathi, IMSC, Chennai	India-based Neutrino Observatory (INO)
Prashant Jaikumar, IMSC, Chennai	Neutrino rates in dense quark matter and neutron stars
Takaaki Kajita, University of Tokyo	Atmosphericneutrinos - Flux, cross section and oscillations
Livia Ludhova, INFN, Milano	The latest results of the Borexino experiment
Debasish Majumdar, SINP, Kolkata	Neutrino factory and INO
Kajari Mazumdar, TIFR	Neutrinos at colliders
Poonam Mehta, RRI	Topological phase in two flavor neutrino oscillations
Manimala Mitra, HRI	Triplet Higgs Model with S_3 Symmetry and Lepton Masses
Vandana Nanal, TIFR	Neutrinoless double beta decay
Palash Pal, SINP, Kolkata	Demystifying Majorana neutrinos
Sandip Pakvasa, University of Hawaii	Hanohano - A deep ocean Anti-neutrino observatory
Parag Parobo, Goa University	Special Talk: Portugal and Goa: cultural interactions and question of Identity
Silvia Pascoli, Durham University	Sterile neutrinos as dark Matter
Ketan Patel, PRL, Ahmedabad	Fermion Masses and Mixings in mu-tau symmetric SO(10)
G.Rajasekaran, IMSC, Chennai	Unification of neutrino mixing with quark mixing
Chitta Ranjan Das, IST, Portugal	Borexino and SK spectra with sterile neutrinos and spin-flavor precession
Subhendu Rakshit, TIFR	Ice-fishing for cosmic neutrinos
Shamayita Ray, TIFR	RG evolution of neutrino mass and mixing: Type-III seesaw
Margarida Rebelo, IST, Portugal	Leptogenesis and low energy leptonic physics
D.P. Roy, HBCSE, Mumbai	Probing a SUSY model for neutrino mass at the HE neutrino
Probir Roy, SINP, Kolkata	The magic of four-zero neutrino Yukawa texture
Narendra Sahu,	Symmetries in neutrino mass matrix:
Lancester University, UK	A bottom-up approach
Abhijit Samanta, SINP, Kolkata	Sensitivity to neutrino mixing parameters with atmospheric neutrinos at INO
Ravi Shanker Singh, IIT, Bombay	A new long baseline
Bipin Singh Koranga, Delhi University	Deviation from Tri-bimaximal neutrino mixing above GUT scale
Sudhir Vempati, CHEP, Bangalore	Flavor violation in seesaw models
Walter Winter,	CP violation searches with neutrino factories and
University of Wurzburg, Germany	beta beams
Urjit Yajnik, IIT, Bombay	Spontaneously broken parity and leptogenesis

Participants

Rathin Adhikari (Jamia Milia Islamia, Delhi) | Charanjit Aulak (Panjab University, Chandigarh) | Borut Bajc (Stefan Inst., Ljubljana, Slovenia) | Debasish Borah (IIT Bombay, Mumbai) | Gustavo Branco (IST, Lisbon, Portugal) | Sovan Chakraborty (SINP, Kolkata) | Bhag Chauhan (HP Dept of Education) | Sandhya Choubey (HRI, Allahabad) | Brajesh Choudhury (Delhi University) | Debajyoti Choudhury (Delhi University) | Eung Jin Chun (KIAS, Seoul, Korea) | Chitta Ranjan Das (IST, Lisbon, Portugal) | Basudeb Dasgupta (MPI for Physics, Munich) | S. Dev (HP University, Shimla) | Amol Dighe (TIFR, Mumbai) | David Emmanuel-Costa (IST, Lisbon, Portugal) | Diptimoy Ghosh (TIFR, Mumbai) | Pomita Ghoshal (TIFR, Mumbai) | Ricardo Gonzalez-Felipe (IST, Lisbon, Portugal) | Srubabati Goswami (PRL, Ahmedabad) | Walter Grimus (University of Vienna) | Manmohan Gupta (Panjab University, Chandigarh)Steen Hannestad (Aarhus University, Denmark) | D. Indumathi (IMSC, Chennai) Prashant Jaikumar (IMSC, Chennai) | Anjan Joshi (PRL, Ahmedabad) | Takaaki Kajita (University of Tokyo, Japan) | Kamales Kar (SINP, Kolkata) | Subrata (PRL, Ahmedabad) | Bhavik Kodrani (PRL, Ahmedabad) | Bipin Singh Koran (University of Delhi) | Susmita Kund (SINP, Kolkata) | Livia Ludhova

(INFN Milano, Italy) | Tina Lund (Aarhus University, Denmark) | Debasish Majumdar (SINP, Kolkata) | Poonam Mehta (RRI, Bangalore) | Sasmita Mishra (IIT Bombay, Mumbai) | Manimala Mi (HRI, Allahabad) | Naba Mondal (TIFR, Mumbai) | M.V.N. Murthy (IMSC, Chennai) | Sandip Pakvasa (University of Hawaii, USA) | Palash Pal (SINP, Kolkata) | Silvia Pascoli (Durham University, UK) | Ketan Patel (PRL, Ahmedabad) | Sudhanwa Patra (PRL, Ahmedabad) | Joao Pulido (IST, Lisbon, Portugal) | G. Rajasekaran (IMSC, Chennai) Subhendu Rakshit (TIFR, Mumbai) | Shamayita Ray (TIFR, Mumbai) | Sushant Raut (IIT Bombay, Mumbai) | Giles Reid (U. of Canterbury, New Zealand) | Anna Riis (Aarhus University, Denmark) | Margarida Rebelo (IST, Lisbon, Portugal) | D. P. Roy (HBCSE, Mumbai) | Probir Roy (SINP, Kolkata) | Narendra Sahu (Lancaster University, UK) | Abhijit Samanta (SINP, Kolkata) | Goran Senjanovic (ICTP, Trieste, Italy) | Santosh Kumar Singh (PRL, Ahmedabad) Nita Sinha (IMSC, Chennai) | S. Uma Sankar (IIT Bombay, Mumbai) | Sudhir Vempati (CHEP Bangalore) | Walter Winter (University of Wurzburg, Germany)
Urjit Yajnik (IIT Bombay, Mumbai)



PROGRAM	WORKSHOP ON FINANCIAL MATHEMATICS - STOCHASTIC VOLATILITY AND CREDIT RISK http://www.icts.res.in/program_details.php?id=18
DATE	9 - 16 May 2009
ORGANIZERS	A. Bhattacharya (Kotak) | S. Nanda (TIFR-CAM) H. Schellhorn (CGU) | Srikanth Iyer (IISc)
VENUE	Bangalore

Purpose

The goal of the workshop was to encourage collaboration between industry and academics, across countries, to work on problems of interest motivated by the finance industry.

Structure

The workshop was on two different subtopics: stochastic volatility and credit risk. The participants and speakers were both academics and practitioners from the finance industry. At the beginning of the workshop leading experts presented open problems of interest. Some participants gave lectures to provide background material related to the open problems. The members then broke up into groups and brainstormed on these selected problems with the aim to start discussions, exchange ideas and possibly move towards solutions and start new collaborations.

Speakers	Topics
Ankush Agarwal	Commodities
Ayan Bhattacharya	Empirical Properties of Financial Market Time
Mrinal Kanti Ghosh	A non-linear Filtering approach to Merton's credit risk model / Back ground material
Srikanth Iyer	Credit Derivatives and Pricing / The Credit Risk + Model

Sandeep Juneja	Computational issues in pricing multi-dimension American and European options
Sanjeev Kapse	Option pricing
Rajeeva Karandikar	Merton's paradigm for assessing credit risk via option pricing theory
Asim Mahmood	Forecasting index range and volatility within a stochastic volatility framework
Henry Schellhorn	Background material / Henry Schellhorn Counterparty Risk: some new Advances in Structural Modelling based on Queueing Theory / E±cient Pricing of Path-Dependent American Options
Ratna Sinroja	Stochastic Volatility - Heston's model
Ronnie Sircar	Back ground material / Stochastic Volatility Modelling
Ramaprasath	Option pricing
Sandeep	Option pricing

Participants

K. P. Abraham, (Indian Institute of Science, Bangalore, India) | Ankush Agarwal, (Bank of America, Mumbai, India) | Arnab Basu, (IIM, Bangalore, India) | Shankarshan Basu, (IIM, Bangalore, India) | Ayan Bhattacharya, (Kotak Securities, Mumbai) | Devlina Chatterjee, (Indian Institute of Science, Bangalore, India) | Sudipta Das, (Indian Institute of Science, Bangalore, India) | Santanu Dey, (Tata Institute of Fundamental Research, Mumbai, India) | Chandan Shikha Dua, (IIT. Delhi, India) | Mrinal Ghosh, (Indian Institute of Science, Bangalore, India) | Tirupam Goel, (IIT Kanpur, India) | Srikanth Iyer, (Indian Institute of Science, Bangalore, India) | Sandeep Juneja, (Tata Insitute of Fundamental Research, Mumbai, India) | Sanjeevan Kapshe, (SEBI, Mumbai, India) | Swapnil Kumar, (IIT Delhi, India) | Asim Mahmood, (BRICS Securities,Mumbai, India) | Chiranjit Mukhopadhyay, (Indian Institute of Science, Bangalore, India) | Seema Nanda, (TIFR, Centre for Applicable Mathematics, Bangalore, India) | Ravi Prakash, (Indian Institute of Science, Bangalore, India) | L. Prasad, (Indian Institute of Science, Bangalore, India) | L. Ramprasath, (CAFS, Instittute for Financial Management & Research, Chennai, India) Abhinanda Sarkar, (General Electric, Bangalore, India) | Henry Schelhorn, (Claremont Graduate University, CA, USA) | Ratna Sinroja, (Tata Insitute of Fundamental Research, Bangalore, India) | Ronnie Sircar, (Princeton University, NJ, USA) | Subhamay, (Indian Institute of Science, Bangalore, India)

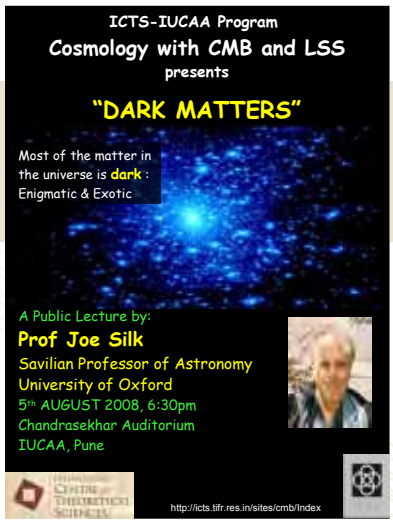
Public Lectures

2008

TITLE	OBSERVING THE BIRTH OF THE UNIVERSE
SPEAKER	Lyman Page, Department of Physics, Princeton University, USA
DATE & TIME	9 August 2008 | 4 pm
VENUE	Nehru Science Centre Auditorium, Worli, Mumbai

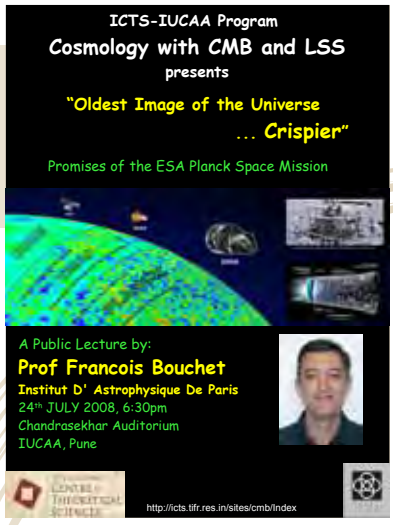
Measurements of the cosmos based on a wide variety of methods are in good agreement on the contents and history of the universe. We focus on observations that are aimed at quantifying and understanding the universe when it was less than a billionth of a billionth of a second old to test specific models of how the universe was born. We review the framework in which to think about cosmological observations with an emphasis on results from the Wilkinson Microwave Anisotropy Probe (WMAP).

TITLE	DARK MATTERS
SPEAKER	Joseph Silk, University of Oxford
DATE & TIME	5 August 2008 | 6:30 pm
VENUE	Chandrashekhar Auditorium, IUCAA, Pune



TITLE	THE BIG RIP - A NEW FATE OF THE UNIVERSE
SPEAKER	Marc Kamionkowski, California University of Technology
DATE & TIME	30 July 2008 | 6:30 pm
VENUE	Chandrashekhar Auditorium, IUCAA, Pune

TITLE OLDEST IMAGE OF THE UNIVERSE
SPEAKER Francois Bouchet, Institut D'Astrophysique De Paris
DATE & TIME 24 July 2008 | 6:30 pm
VENUE Chandrashekhar Auditorium, IUCAA, Pune



TITLE BLACK HOLES AND THE STRUCTURE OF SPACETIME
SPEAKER Juan M Maldacena, Institute for Advanced Studies, Princeton University, USA
DATE & TIME 9 July 2008, 5 pm
VENUE Homi Bhabha Auditorium, TIFR, Mumbai

Black holes are a fascinating prediction of Einstein's Theory of Gravity. They have an interesting history. According to the classical theory nothing can escape a black hole. On the other hand, quantum mechanics implies that the black hole emits some radiation. This leads to a puzzling theoretical paradox. Efforts to solve this paradox have produced a new picture for the fundamental structure of spacetime.

Subramanyan Chandrasekhar Lecture Series

LECTURE BY ASHOKE SEN
Harish-Chandra Research Institute,
Allahabad, India

DATE & TIME 10 August 2009 | 4:00 pm

VENUE TIFR, Mumbai

Extremal Black Holes in String Theory

In these lectures Prof. Sen will review recent progress on understanding the entropy of black holes in the extremal limit, both from macroscopic and the microscopic points of view

Ashoke Sen is a renowned theoretical physicist who has made path-breaking contributions to the study of String Theory, a framework for the study of quantum gravity and the fundamental laws of nature. He has made pivotal contributions to the study of duality symmetry in String Theory and field theory, the interpretation of instabilities in the landscape of String Theory and the precise accounting for black hole entropy. His honors include the Fellowships of the Royal Society of London, TWAS and all the Indian academies of science. He is a recipient of the TWAS Physics Prize, the Bhatnagar Prize and the ICTP Yukawa Prize. Subramanyan Chandrashekhar lectures are delivered by eminent academicians on important new developments in their area of speciality. The first lecture in any series is aimed at a general scientific audience, while the remaining are aimed at specialists.

Upcoming Programs

PROGRAM	ICTS CONDENSED MATTER PROGRAMME 2009 http://www.icts.res.in/program/icmp09
DATE	5 - 23 December 2009
ORGANIZERS	Kedar Damle | H R Krishnamurthy | R. Shankar | Vikram Tripathi
VENUE	Fountain Hotel, Mahabaleshwar

Purpose

This programme will be held from 5 - 23 December 2009 at Fountain Hotel, Mahabaleshwar in the Sahyadri mountain range, a scenic five hour drive from Mumbai. The centre-piece of this programme will be the 14 day Mahabaleshwar Condensed Matter School. The first half of the school will run from 5 - 12 December, and the second half will run from December 16 - 23 December. Each half of the school will feature 4 lecture courses of 5 lectures each, that wil be held in the mornings. Afternoons will be largely free for discussion, except for colloquiua on topics related to the focus areas of the school. In addition , there will be an embedded 3 day Mahabaleshwar Condensed Matter Conference from 13 - 15 December.

Mahabaleshwar Condensed Matter School 2009.
Cold atoms by Ehud Altman and Anatoli Polkovnikov
Frustrated Magnetism by Leon Balents
Granular metals and superconductors by Mikhail Feigelman (to be confirmed)
Graphene by Leonid Levitov
Thermal transport in strongly correlated systems by Subroto Mukerjee
Variational wavefunctions for strongly correlated systems by Arun Paramekanti and Vijay Shenoy
Unconventional phases and transitions by Subir Sachdev
Computational methods for strongly correlated systems by Anders Sandvik

PROGRAM	ICTS INAUGURAL EVENT - SCIENCE WITHOUT BOUNDARIES http://www.icts.res.in/program/icts-ie
DATE	27 - 31 December 2009
ORGANIZERS	Vivek Borkar | S. G. Dani | A. Dhar H. R. Krishnamurthy K. VijayRaghavan | Spenta R.Wadia
VENUE	Indian Institute of Science, Bangalore

Purpose

This event marks the unveiling of the foundation stone of the ICTS Campus at Bangalore. The academic program of the event will consist of keynote lectures by leaders in traditional areas of basic sciences as well as in interdisciplinary areas. The program is being planned in such a way as to allow a flexible framework which goes beyond a standard conference. There will also be several public lectures by eminent scientists as a part of the ICTS outreach effort.

SCHEDULE

27 DECEMBER 2009

J.N. Tata Auditorium, IISc

5:30 pm - 6:30 pm	Public Lecture by Michael Atiyah: **Truth and Beauty in Mathematics and Physics**

28 DECEMBER 2009

Satish Dhawan Auditorium

9:15 am	Welcome Note
9:30 am - 10:05 am	C.N.R. Rao: **Graphene**
10:05 am - 10:40 am	Ajay Sood: **Nonequilibrium Fluctuations in Driven Soft Matter**
11:10 am - 11:45 am	S.R.S. Varadhan: **Random Walk in a Random Environment: A Survey.**
11:45 am - 12:20 pm	J. Radhakrishnan: **Some Randomness, Some Memory and Some Error**
12:20 pm - 12:55 pm	Yamuna Krishnan: **Wires, Reporters and Information Capsules: Cellular Journalism with DNA.**

J.N. Tata Auditorium, IISc

4:00 pm - 5:00 pm	Foundation Stone Ceremony of the ICTS Campus Unveiling by Prof. C.N.R. Rao
5:30 pm - 6:30 pm	Public Lecture by David Gross: **The Role of Theory in Science**

29 DECEMBER 2009

Faculty Hall, IISc

09:30 am - 10:05 pm	Michael Green: **Some Dualities of String Theory Amplitudes**
10:05 am - 10:40 pm	Andrew Strominger: **Black Holes: The Harmonic Oscillators of the 21st Century**
11:10 am - 11:45 am	Lyman Page: **Constraining Models of the Early universe with the CMB**
11:45 am - 12:20 pm	Tarun Souradeep: **Peering beyond 'Standard' Cosmology**
12:20 pm - 12:55 pm	Chandrasekhar Khare: **Modular Forms and Galois Theory**
3:00 pm - 5:00 pm	Panel Discussion: **Physics and Consilience** Edouard Brezin (Chair), Naama Barkai, Albert Libchaber, Govindan Rangarajan, Avi Wigderson

30 DECEMBER 2009

Faculty Hall, IISc

9:30 am - 10:05 am	Ashoke Sen: **Black Holes & String Theory**
10:05 am - 10:40 am	Sandip Trivedi: **Accelerating Universes and theEmerging Landscape in String Theory**
11:10 am - 11:45 am	Raman Sundrum: **Spacetime Structure and the Large Hadron Collider**
11:45 am - 12:20 pm	Amol Dighe: **Particle Astrophysics of Neutrinos**
12:20 pm - 12:55 pm	K. Sandeep: **Concentration Phenomenon in Semilinear Elliptic Problems**
3:00 pm - 5:00 pm	Panel Discussion: **Interdisciplinary Science by Way of Some Examples** K R Sreenivasan (Chair), Sriram Ramaswamy, Subir Sachdev, Eitan Tadmor, Mukund Thattai

J.N. Tata Auditorium, IISc

5:30 pm - 6:30 pm	Public Lecture by Albert Libchaber: **The Origin of Life: From Geophysics to Biology?**

31 DECEMBER 2009

Faculty Hall, IISc

9:30 am - 10:05 am	Sriram Shastry: **Extremely Correlated Quantum Liquids; Coping with Projected Electrons**
10:05 am - 10:40 am	Ashwin Vishwanath: **Beyond Landau: Deconfinement & Topology in Quantum Solids**
11:10 am - 11:45 am	Siva Athreya: **Survival of the Contact Process on the Hierarchical Group**
11:45 am - 12:20 am	C.S. Rajan: **Spectrum and Arithmetics**
12:20 am - 12:55 am	Manjul Bhargava: **Counting Problems in Number Theory**
1:00 pm - 1:30 pm	Closing Remarks by T. V. Ramakrishnan

Panel Discussions

TITLE	PHYSICS AND CONSILIENCE
DATE & TIME	29 December | 3:00 pm
PANELISTS	Édouard Brézin (Chair) | Naama Barkai | Albert Libchaber G. Rangarajan | Avi Wigderson
VENUE	Faculty Hall, Indian Institute of Science

The number of interfaces between physics and other branches of knowledge has grown considerably over the past years. As we know since Galileo, "Nature is a book written in the language of mathematics", the interpenetration of physics with biology is now more and more evident, and many new areas such as neural networks, algorithmic complexiy, econophysics, sociophysics, have appeared recently. In the round table the four speakers will illustrate this in the areas of life sciences, mathematics, theory of computation and complexity.

The speakers will be asked to comment on a few questions such as

- is physics for biology and biologists more than additional tools such as imaging?
- when physicists deal with "living matter" do they bring a different perspective?
- what are the important achievements in the physics / biology interface?
- what are the main problems in which this cross-disciplinary science is important?
- how fertile is the interface between statistical physics, quantum physics and computation?
- what are the new areas in which mathematics and physics travel side by side?

TITLE	PANEL ON INTERDISCIPLINARY SCIENCE BY WAY OF SOME EXAMPLES
DATE & TIME	30 December | 3:00 pm
PANELISTS	K.R. Sreenivasan | Sriram Ramaswamy | Subir Sachdev Eitan Tadmor | Mukund Thattai
VENUE	Faculty Hall, Indian Institute of Science

Our panel consists of a biologist (MT), two condensed matter theorists (SS and SR), a mathematician (ET) and a fluid dynamicist (KRS). We are "theory heavy" and oriented more towards physical and mathematical sciences. Our panel will accordingly have a bias towards related areas.

The term "interdisciplinary" means that a researcher crosses boundaries between established disciplines to create her own approach that is best suited to the problem on hand. Our panel prefers to illustrate the richness of interdisciplinarity via examples within the experience of the panelists, rather than speak about it generically. The panel hopes to be provocative but does not intend to be outrageous.

KRS will introduce the panel and, after making a few broad remarks, will dwell briefly on his recent work on quantum turbulence, which combines the extraordinary properties of superfluidity ("flow without friction") and classical turbulence in hydrodynamic systems.

Ramaswamy will discuss the richness of interactions between physics and biology from the point of view of his recent work on soft matter far from equilibrium. He will discuss mainly the features of active biological matter, but will also touch on sedimentation and glassy materials—all of which have common elements whose understanding enriches these subjects.

Sachdev will focus on the recent cross-fertilization between condensed matter physics and string theory. The quantum theory of gravity near black holes has turned out to have remarkable connections to problems in many body physics, and analogs of quantum critical points, superconductors, and non-Fermi liquids have been found. This connection has led to new insights in both fields. He will discuss the promise for the future, and also some of the pitfalls.

Tadmor will discuss recent developments of analytical theories and their interplay with computational algorithms for models which involve separation, decomposition and averaging of scales. He will demonstrate the synergy of different points of view from different fields through examples of his recent work on shock waves, kinetic transport, biological flows and image processing.Thattai will describe recent developments in the field of synthetic biology, which borrows ideas from engineering to construct genetic networks from standardized parts. Over the past few years, researchers around the world have built amplifiers, flip-flops, and even oscillators using a handful of genes inserted into the bacterium Ecoli. He will review - these systems, and present his recent work on using engineering principles to build cell-to-cell communication systems.

The panel will be prepared to address questions and discussions on the subject of the brief presentations and also on the modalities of fostering interdisciplinary science, especially in India.

Public Lectures

TITLE	TRUTH AND BEAUTY IN MATHEMATICS AND PHYSICS
DATE & TIME	27 December 2009 | 5:30 pm
SPEAKER	Sir Michael Atiyah (University of Edinburgh)
VENUE	J.N. Tata Auditorium, Indian Institute of Science, Bangalore

Sir Michael Atiyah is one of the most distinguished mathematicians of our times with contributions to topology, geometry, analysis and mathematical physics. His famous contributions include the Atiyah-Singer index theory. His work cuts across many boundaries

in mathematics and has deep connections with quantum field theory and string theory. He has been President of the Royal Society of London, Master of Trinity College and Director of the Newton Institute in Cambridge. Presently he is Honorary Professor at the University of Edinburgh. He is a recipient of the Fields Medal and the Abel Prize.

From the earliest times mathematics and physics have been closely intertwined and the iconic figure of Isaac Newton unites the two. He was both a mathematician and a physicist and the modern scientific era, which he inaugurated, uses mathematics as the language of physics. But, while they share a common framework, they differ in their aims and objectives. Physics attempts to explain the workings of nature, and mathematics is an intellectual edifice constructed by the human brain. At first sight one might be tempted to say that physicists seek the truth while mathematicians are guided by beauty. But this is too naïve and we have to look more deeply, both at the relation between mathematics and physics, and at the notions of truth and beauty. I will take this as my theme and look at it in a historical context. In particular I will discuss what the great figures in both fields have said and how this has affected their work. I will focus on famous instances in the past and what they may teach us about the future. At the present time the frontier between mathematics and physics is enjoying a renaissance, where extremely sophisticated mathematical ideas are being explored in the search for a "grand unified theory" of fundamental physics. It is not yet clear whether the ultimate secrets of the physical universe are about to be unveiled or whether totally new insights will be required. We live in interesting times and a philosophical look at the past may help to guide us to the future, where truth and beauty finally live in harmony.

TITLE THE ROLE OF THEORY IN SCIENCE
DATE & TIME 28 December 2009 | 5:30 pm
SPEAKER David Gross (KITP, Santa Barbara)
VENUE J.N. Tata Auditorium, Indian Institute of Science, Bangalore

Professor David Gross, Nobel Laureate, is a co-discoverer of asymptotic freedom and one of the chief architects of the fundamental theory of the strong force which describes the properties of strongly interacting particles and nuclear physics. He has also made fundamental contributions to string theory which is a framework for the study of quantum gravity and the fundamental laws of nature. He is currently Director and Frederick W. Gluck Professor at the Kavli Institute for Theoretical Physics, University of California at Santa Barbara. He has been a MacArthur Fellow and a recipient of the 2004 Nobel Prize for Physics.

On the occasion of the inauguration of the International Centre for Theoretical Sciences, TIFR, I shall share some of my observations and conclusions as to the various roles of theory in science. Physics is the field of science where theory is most established and it is the most mature and powerful of the sciences. But theory, much of it derived from physics, is growing in importance in the neighboring fields of astronomy, chemistry and biology. Theory can both deepen our understanding of separate areas of science, as well as provide the intellectual glue of interdisciplinary research.

TITLE	THE ORIGIN OF LIFE: FROM GEOPHYSICS TO BIOLOGY?
DATE & TIME	30 December 2009 | 5:30 pm
SPEAKER	Albert Libchaber (Rockefeller University)
VENUE	J.N. Tata Auditorium, Indian Institute of Science, Bangalore

Professor Albert Libchaber is a distinguished physicist and biologist. He has made fundamental experimental contributions to fluid dynamics and the onset of turbulence. His current research centers on questions concerning the origin of life. He studies mathematical patterns in biology at both the organismal and the cellular and molecular levels. He is presently Detlev W. Bronk Professor in the Laboratory of Experimental Condensed Matter Physics at the Rockefeller University. He has been a MacArthur Fellow, a recipient of the Wolf Prize in 1986 and Prix des Trois Physiciens from the Foundation of France in 1999. He is a fellow of the French Academy of Sciences and the National Academy of Sciences, USA.

Abstract: One of the deepest and most controversial questions of our time is that of the origin of life. In this public lecture a hypothesis is presented, according to which the temperature gradients existing in the earth - which led to plate tectonics and the formation of undersea thermal vents - also led to the evolution of life around these vents. Movies will be shown of experiments, in which all stages of this scenario are justified: how thermal gradients led to plate tectonics, to DNA amplification in thermal vents, to polymerisation of peptides at high pressure, and to the organization of bacteria. This mixture of physics, chemistry, and biology illustrates how life can originate without the intervention of the sun, driven only by geophysical thermal gradients. The recorded talks will be uploaded on the website: www.icts.res.in

Foundation Stone Ceremony ICTS Campus

The foundation stone of the ICTS will be unveiled by
Prof. C.N.R. Rao, FRS
in the presence of Sir Michael Atiyah, FRS and
Professor David Gross, Nobel Laureate
on 28 December 2009 at 4:00 pm
in J.N. Tata Auditorium, Indian Institute of Science, Bangalore

The ceremony will be followed by the public lecture titled:
"The Role of Theory in Science" given by Prof. David Gross,
(KITP, Santa Barbara)

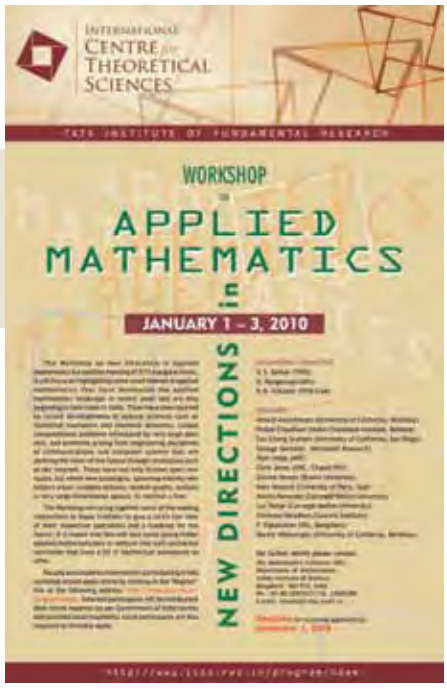
Professor C.N.R. Rao, FRS, has made fundamental and prolific contributions to solid state, materials and structural chemistry. Simultaneous with his passionate pursuit of science his efforts have created a movement for education and research in the basic sciences in India and in the developing world. He is a former Director of the Indian Institute of Science, Bangalore and founding President of the Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, where he is currently National Research Professor and Linus Pauling Research Professor. He is a past President of TWAS, IAS and INSA. He is a recipient of the Padma Vibhushan, the Dan David Prize and the Royal Medal of the Royal Society.

Organizing Commitee

Vivek Borkar, TIFR
S.G. Dani, TIFR
Avinash Dhar, TIFR
H.R. Krishnamurthy, IISc
K. VijayRaghavan, NCBS-TIFR
Spenta R. Wadia, TIFR & ICTS-TIFR

Satellite Meetings of the Event

EVENT	NEW DIRECTIONS IN APPLIED MATHEMATICS
ORGANIZERS	V. Borkar | G. Rangarajan | P.N. Srikanth
DATE	1 - 3 January 2010
VENUE	Indian Institute of Science (IISc), Bangalore



This is a sateliite meeting of ICTS Inaugural Event.

The Workshop on New Directions in Applied Mathematics will focus on highlighting some novel themes in applied mathematics that have dominated the applied mathematics landscape in recent years and are only beginning to take roots in the Indian mathematical community. Unlike the classical strands of applied mathematics that were dominated by continuum

mechanics, numerical o.d.e. and p.d.e., etc., the newer developments have been spurred by recent developments in natural sciences, notably statistical mechanics and chemical dynamics, unique computational problems introduced by very large data sets, as well as problems arising from engineering disciplines of communications and computer science that are defining the tenor of the future through revolutions such as the internet. These have not only thrown open new issues, but whole new paradigms, spawning entirely new subject areas. To mention a few, complex systems, random graphs, analysis in very large dimensional spaces, and so on. The Workshop will bring together some of the leading researchers in these frontiers to give a bird's eye view of their respective specialties and a roadmap for the future. It is hoped that this will spur some young Indian applied mathematicians to venture into such uncharted territories that have a lot of intellectual adventures to offer.

List of Speakers

Venkat Anantharam (University of California, Berkely) | Probal Chaudhuri (Indian Statistical Institute, Kolkata) | George Gonthier (Microsoft Research) | Piotr Indyk (MIT) | Chris Jones (The University of North Carolina at Chapel Hill) | Govind Menon (Brown University) Marc Mezard (University of Paris, Sud) | Vasudea Murthy (TIFR, Bangalore) | Kavita Ramanan (Carnegie Mellon University) | Eitan Tadmor (University of Maryland) | Srinivas Varadhan (Courant Institute of Mathematica Sciences, USA) | P. Vijaykumar (IISc, Bangalore) | Martin Wainwright (University of California, Berkeley)

EVENT	BREAKING BARRIERS: FROM PHYSICS TO BIOLOGY
ORGANIZERS	Stephane Fauve | Elisha Moses G. V. Shivashankar | Jun Zhang
DATE	9 - 11 January 2010
VENUE	NCBS, Bangalore

A three-day meeting on "Breaking Barriers: from Physics to Biology" has been organized in Bangalore, India. This meeting is a joint program of the International Centre for Theoretical Sciences (ICTS-TIFR) and National Centre for Biological Sciences (NCBS-TIFR). This joint program of ICTS and NCBS is a satellite meeting of ICTS Inaugural Meeting. The meeting will also bring together close associates and members of Albert Libchaber 's laboratory. Albert Libchaber is currently on the international scientific advisory board at NCBS, Bangalore. We hope to rekindle old relations, revisit and build on the many past scientific interactions. A few formal lectures along with semi-formal presentations and many informal discussions have been planned.

EVENT	EVOLUTION OF COMPLEX SYSTEMS
ORGANIZERS	Chandan Dasgupta | Raghavendra Gadagkar Somdatta Sinha
DATE	13 - 15 January 2010
VENUE	Indian Institute of Science, Bangalore

This is a satellite meeting of the ICTS Inaugural Event.

The evolution of an organized structure requires linking multiple structural and functional entities in a non-random fashion. Innovation and robustness are hallmarks of the evolution of any organization. Researchers in different fields of natural sciences, engineering, social, and behavioral sciences have been studying the evolution and structural determinants of chemical, biological, social, and economic organized structures using their discipline specific tools and vocabulary, often remaining unaware of the convergence of underlying processes and ideas. This symposium, in which several senior researchers from the Santa Fe Institute, USA and other international and national experts on complexity will participate, aims to bring a multidisciplinary perspective into a diverse set of processes spanning different fields of enquiry to identify and describe the common mechanisms that lead to the evolution of functional and structural organization and their robustness, with a specific role of change in perpetuating the existing or innovating new behavior.

PROGRAM	SCHOOL AND CONFERENCE ON MULTISCALE MODELING AND SIMULATIONS OF HARD AND SOFT MATERIALS http://www.icts.res.in/program/mmsm2009
DATE	7 - 20 December 2009
ORGANIZERS	P B Sunil Kumar | Srikanth Sastry Umesh V Waghmare
VENUE	Centre for Computational Materials Science (CCMS), JNCASR

Phenomena in many systems of interest in materials science, soft condensed matter physics and biology require analysis of processes that span a wide range of time and length scales, from atomic level details of bonding and corresponding dynamics to the emergence of morphologies of interest on mesoscopic scales, occurring on times scales of seconds, hours and beyond. Computational modeling of such phenomena has always been a challenge. Separate models for different scales, for example from models that focus on an atomic level description to those that treat the system at a gross macroscopic level, have been around for some time now. However, models that systematically coarse grain the description or models that incorporate the treatment of different scales into one description are just beginning to emerge. Development of a multi-scale modeling strategy and methods would expand the range of applications of firstprinciples methodology to phenomena which involve much longer time and length-scales. Progress in such modeling is aimed at linking of atomic level models and calculations to larger scale computations such as the

simulation of devices or a biological cell. It is thus timely and appropriate to bring together people working on the development of multi-scale simulation methods in soft and hard materials, and use the exchange of ideas and tricks of the trade to facilitate development of more robust approaches to multi-scale simulations across these disciplines. The proposed event will have a school that is scheduled for ten days, to be followed by a four day conference. We envisage the content of the school as divided into roughly four parts, with pedagogical level lectures and tutorial sessions, on (a) General strategies and formalism for coarse graining, (b) Hybrid Quantum-Classical modeling, (c) Coarse grained modeling of soft and bio-molecular systems and (d) Multiscale modeling of solids and surface phenomena (including phenomena such as catalysis). The lectures will be typically of 90 minutes duration, with two such lectures planned per day during the morning session. There will be hands-on sessions and discussions in the afternoons. The school will be followed by a four day conference at which active researchers in multi-scale modeling from around the world will present state of the art approaches and results in this area.

Target audience: The target audience for the school will be Ph.D. students, typically beyond 2 years of Ph D study, with graduate level training in computation, engaged in computational research. Similar criteria apply to other, more senior, researchers. The conference is aimed at all researchers engaged in computational modeling in material science and biology, including physicists, chemists, biologists and engineers.

PROGRAM	WORKSHOP IN HIGH ENERGY PARTICLE PHYSICS (WHEPP XI) http://www.icts.res.in/program/WHEPP
DATE	2 - 12 January 2010
ORGANIZERS	Anjan Joshipura | Subhendra Mohanty | Saurabh Rindani
VENUE	Physical Research Laboratory, Ahmedabad

Purpose

The WHEPP series of workshops , which is held every two years , was started in 1989 at TIFR , Mumbai with the purpose of bringing together phenomenologists from all over India and abroad to meet and set up working groups that would identify and work on important and relevant problems in High Energy Physics Phenomenology.

Our aim is to bring together active workers in High Energy Physics to initiate discussions and form collaborations in different Working Groups in the following fields

PROGRAM	SCHOOL ON GLASS FORMERS AND GLASSES http://www.icts.res.in/program/glass2010
DATE	4 - 20 January 2010
ORGANIZERS	Takeshi Egami | Michael Falk | Srikanth Sastry
VENUE	Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore

This two week long school will survey the state-of-the-art in theory and experiment aimed at building a fundamental understanding of glassy behavior. The goal is to prepare students and junior researchers to undertake cutting edge research on glass formers and glasses. Lectures will cover topics ranging from the onset of slow relaxation at temperatures above the glass transition to the origin of mechanical response and material failure in amorphous solids. Tutorial sessions will provide opportunities for informal interaction and instruction. Ph.D. students of physics, chemistry, materials science and other engineering disciplines are encouraged to apply.

PROGRAM	INTERNATIONAL PROGRAM ON QUANTUM INFORMATION http://www.icts.res.in/activities_current.phpid=115&heading=up
DATE	4 - 30 January 2010
ORGANISERS	Pankaj Agrawal | Samuel L. Braunstein | Arun K. Pati | Barry C. Sanders Lev Vaidman
VENUE	Institute of Physics, Bhubaneshwar, Orissa, India

Quantum information science is one of the frontier area of science and technology. It is also an interdisciplinary area of research where scientists from physics, mathematics, and computer science can contribute alike. One of the main goal is how well one can process information using laws of quantum theory. Quantum information theory aims to process information that is not amenable with classical devices. At the same time this also provides new insights into the nature of quantum world. Quantum information processing includes quantum computation, quantum communication, quantum cryptography and various information processing tasks. Not only this provides fundamental arena to investigate quantum phenomena but also gives new technological benefits like quantum teleportation, remote state preparation and and secure communications.

In the proposed programme, we hope to bring experts from all over the world and focus on various issues related to quantum information science and general quantum theory. These issues will be characterization and quantification of entanglement, quantum channels and quantum operations, role of entanglement in quantum algorithms and quantum computation, developing new quantum algorithms, understanding of capacities of quantum channels, and new communication tasks in the multiparty case.

The aim of the programme will be to have a fruitful interaction between leadings experts of the field which may lead to a better understanding of the subject. In addition, during the one

month programme there will be mini workshops, seminars and discussion meetings among all the participants.

PROGRAM	INTERNATIONAL SCHOOL AND CONFERENCE ON COLD ATOMS AND IONS http://www.icts.res.in/program/iccia10
DATE	6 - 21 January 2010
ORGANIZERS	B.P. Das | B.N. Jagatap | M. Mukherjee | B. Deb | A. Narayanan P. Panigrahi | H. Ramachandran | S. Rangwala | B. Roy | K. Sengupta C.S. Unnikrishnan
VENUE	Kolkata, India

Taking into consideration the enormous potential of the growing field of research in cold atoms and ions, the International School and Conference on Cold Ions and Atoms is being organized to provide extensive exposure to the students in a challenging and cutting edge research frontier of today, engaging a wide scientific community across the world, thereby promoting extensive collaborations between different groups.As the field of cold atoms and ions is vast and growing at a phenomenal pace , it is necessary to have regular schools and conferences on various aspects of it for the benefit of the doctoral students and professional scientists. Considering the potential interdisciplinary applications of this field to explore avenues which till yesterday were thought to be out of reach, it would indeed be desirable to have interactions among the practitioners of this field. In the recent past, a number of schools on this field have been held in various countries of the world. In this school and conference conference we intend to address the following topics related to cold atoms and ions in a focused manner:

(A) Cold atoms in optical lattices
(B) Cold Molecules
(C) Quantum Information and Computation
(D) Metrology
(E) Precision Measurements and Tests of Physics beyond the Standard Model

PROGRAM	4TH ASIAN WINTER SCHOOL ON STRINGS, PARTICLES AND COSMOLOGY http://www.icts.res.in/program/asian4
DATE	11 - 20 January 2010
ORGANIZERS	Amol Dighe | Rajesh Gopakumar Hyung Do Kim | Nakwoo Kim Hideo Kodama | Yasuhiro Okada Sreerup Raychaudhuri | Tarun Souradeep Tadashi Takayanagi | Gautam Mandal.
VENUE	Fountain Hotel, Mahabaleswar.

This School is being organized as a program of the International Centre for Theoretical Sciences of TIFR. It forms part of an ongoing series of Asian Winter schools organized jointly by China, India, Japan and Korea. The previous Schools were held in Korea,

Japan and China. The current school combines with the 4th edition of the Asian Schools on Particles, Strings and Cosmology held annually in Japan. The current school is also a joint APCTP-ICTS activity and replaces the 14th APCTP Winter School on String Theory.

The School will cover various areas in String Theory, High Energy Physics and Cosmology. The intended audience consists of senior graduate students as well as practicing researchers whose primary interest is in String Theory. The lectures will cover a selection of basic areas as well as advanced topics at the forefront of current research.

PROGRAM	NON-EQUILIBRIUM STATISTICAL PHYSICS http://www.icts.res.in/program/nesp
DATE	30 January - 8 February 2010
ORGANIZERS	Satyajit Banerjee | Bikas K. Chakrabarti | Debashish Chowdhury Amit Dutta | Arun Grover
VENUE	Indian Institute of Technology, Kanpur

Strictly speaking, no macroscopic system is in thermodynamic equilibrium although, over an approriate window of time, they may appear to be in equilibrium. However, the foundation of non-equilibrium statistical mechanics (NESM) is not as well established as that developed by Maxwell, Boltzmann and Gibbs for systems in equilibrium. Moreover, the smaller is the system, the stronger are the fluctuations. Furthermore, at sufficiently low temperatures, quantum fluctuations give rise to additional interesting properties also in systems far from equilibrium. The main aim of the ICTS program on "Non-equilibrium Statistical Physics" is to critically examine the foundations of NESM and to assess the recent progress in understanding physical phenomena in wide varieties of systems far from equilibrium.

This program will be organized in two parts. During the first 6 days (30 January - 4 February, 2010), in the Instructional Workshop, lectures on frontier areas of research will be delivered at a pedagogical level. During the last 4 days of the program (i.e., 5 - 8 February, 2010) a research level activity will be held in the format of a Conference with the title Fluctuations in Living and Non-living Systems far from Equilibrium. There will be plenary lectures and invited talks where latest results will be presented by the speakers.

PROGRAM	GEOMETRY, TOPOLOGY AND DYNAMICS IN NEGATIVE CURVATURE http://www.icts.res.in/program/gtdnc
DATE	2 - 7 August 2010
ORGANIZERS	C S Aravinda | F T Farrell | J F Lafont | S K Roushon | Joseph Samuel
VENUE	Raman Research Institute, Bangalore.

This is an ICM Satellite Conference.

Geodesic flow on the unit tangent bundle of a closed surface of constant negative curvature is one of the earliest examples of an ergodic dynamical system.The dynamics of geodesic flow has a

significant bearing on the geometry and topology in negative curvature and has lead to some of the most celebrated rigidity theorems. This conference intends to bring together mathematicians working in various aspects of negative curvature and to expose/introduce interested research students in India to these exciting as well as recent developments

PROGRAM	ALGEBRAIC AND COMBINATORIAL APPROACHES TO REPRESENTATION THEORY http://www.icts.res.in/program/repthy
DATE	12 - 16 August 2010
ORGANIZERS	Punita Batra | K. N. Raghavan | S. Viswanath | Upendra Kulkarni Vyjayanthi Chari | Kailash Misra
VENUE	Indian Institute of Science, Bangalore

This is a satellite conference of the International Congress of Mathematicians (ICM) 2010. The algebraic and combinatorial analysis of the representation theory of Kac-Moody Lie algebras, Vertex algebras, Quantum groups and Hecke algebras has been an important area of current research due to its applications in many areas of mathematics and physics. This conference will bring together leading international experts working on various aspects of this theme area of research. There will be some expository survey talks as well as invited talks on current research developments.

PROGRAM	GEOMETRIC TOPOLOGY AND RIEMANNIAN GEOMETRY http://www.icts.res.in/program/GTRG
DATE	12 - 15 August 2010
ORGANIZERS	Basudeb Datta | Siddhartha Gadgil | Harish Seshadri
VENUE	Indian Institute of Science, Bangalore

This is an ICM Satellite Conference.

The aim of the conference is to expose research students and working mathematicians in India to the state of the art in these fields, to facilitate their taking up research problems in these areas. The conference will consist of one hour lectures by leading mathematicians in the two areas as well as a few shorter lectures. More informal interactions will also be facilitated.

PROGRAM	APPLICATION OF CONTROL THEORY AND OPTIMISATION TECHNIQUES IN BIOCHEMICAL PATHWAYS http://www.icts.res.in/program/Biochem
DATE	16 - 18 August 2010
ORGANIZERS	Somdatta Sinha | M. Vidyasagar
VENUE	Tata Consultancy Services, Madhapur, Hyderabad

Control theory is concerned with designing strategies that ensure the robust performance of a system by automatically adapting to changes in the environment. Biochemical pathways in the cell

are responsible for processing environmental signals, inducing appropriate cellular responses, and regulating internal events such as gene expression. Through elaborate mechanisms, they allow cells and entire organisms to perform their basic functions. The key role played by feedback in life are manifested in the homeostatic control and regulation of biochemical pathways, which break down nutrients and provide the cell with energy and materials, and their appropriate timing in functions. Recent years have witnessed remarkable advances in elucidating the components of cellular pathways and networks of genes. They provide a snapshot of the complete genetic activity of a cell , yet the overall connectivity and functional characteristics are still poorly understood - a fundamental lacuna in understanding their control architecture. Several mathematical tools based on control-theoretic thinking have already begun making a contribution in the understanding of the robustness and evolvability in designs of real biochemical pathways. Some examples are the theory of monotone input-output systems, feedback control theory, etc. Optimization techniques (Flux Balance Analysis) are being applied to pathways as it is assumed that biological organisms generally optimize there metabolic pathways for growth. Such applications are useful in designing pathways for addressing host-parasite interactions and pathway engineering. This satellite symposium will explore the close analogies between biochemical regulatory networks and engineered automatic control systems. Feedback, which is a central theme in such analogies, and the role of stochasticity, common in intracellular setting, will be explored in connection to fault-tolerant systems in pathways. At the symposium, internationally known researchers will discuss relevant mathematical foundations and model systems from biology that would enhance interdisciplinary discussions. The emphasis will be on mathematical theory along with their application. This conference precedes the International Congress of Mathematics to be held at Hyderabad (ICM2010).

PROGRAM	ASIAN SCHOOL ON LATTICE FIELD THEORY
ORGANIZERS	Sinya Aoki | Saumen Datta | Rajiv Gavai | Sourendu Gupta Shoji Hashimoto | Kazayuki Kanaya | Nilmani Mathur | Atushi Nakamura
VENUE	TIFR, Mumbai

Lattice field theory is a very well developed tool for the analysis of non-perturbative analysis of quantum field theories. It has been used to shed light on many aspects of phenomena whose roots lie in quantum field theory; for example, hadron properties in QCD, the phase diagram of QCD, nuclear properties from QCD, the triviality of scalar theories and bounds on the Higgs mass in the standard model, computation of matrix elements required for the extraction of standard model parameters, etc. An annual conference on this subject draws as many as 500 people. There is widespread and growing interest in Asia. In this program, we plan to bring together the Asian effort in this field through a school where technical aspects of this subject are taught. The target audience is students from India, Japan and other Asian countries. Interested students from other regions will also be accommodated, if possible.

We propose to hold this program in TIFR Mumbai some time after March 2010 for 3 weeks. The organizers will be in TIFR during significant parts of the school. We expect around 40 students to attend the school. In addition we envisage that several lecturers will come for shorter periods.

PROGRAM	BUNDLES WITH PROJECTIVE VARIETIES
DATE	3 - 14 May 2010
ORGANIZERS	I. Biswas | A.J. Parameswaran | S. Subramanian | V. Trivedi
VENUE	TIFR, Mumbai

Bundles on complex projective varieties is a rich topic lying on the interface of Analytic and Algebraic Geometry. This topic is also relevant in String theory. For example, holomorphic vector bundles on Calabi-Yau manifolds appear there.

In the proposed program, we plan to have only lecture series; each speaker will be expected to give about 3 lectures on a specific topic in the above mentioned area.

Subramanyan Chandrasekhar Lectures (Second Series)

TOPIC	BLACK HOLES: THE HARMONIC OSCILLATORS OF THE 21ST CENTURY
LECTURE BY	ANDREW STROMINGER Harvard University
DATE	4 - 6 January 2010
VENUE	TIFR, Mumbai

In the 20th century, many problems across all of physics were solved by perturbative methods which reduced them to harmonic oscillators.

Black holes are poised to play a similar role for the problems of 21st century physics. They are at once both the simplest and most complex objects in the physical world. They are maximally complex in that the number of possible microstates, or entropy, of a black hole is believed to saturate a universal bound.

They are maximally simple in that, according to Einstein's theory, they are featureless holes in space characterized only be their mass, charge and angular momentum. This dual relation between simplicity and complexity, as expressed in black holes, has recently been successfully applied to problems in a disparate variety of physical systems. In the first lecture I will give an introduction to the subject intended for a general audience. Subsequent lectures will describe recent developments

Andrew Strominger is a renowned theoretical physicist with seminal and path-breaking contributions to quantum gravity and string theory. He is a co-discoverer of the Calabi-Yau compactification of string theory which provides an unified framework for quantum gravity and the theory of elementary particles. With Cumrun Vafa, he provided the first constituent model for supersymmetric black holes in terms of D-branes and established the equality of the entropy formulas of Boltzmann and Hawking-Bekenstein. Both these contributions are historic signposts in the quest to discover the fundamental laws of nature. He is presently a Professor at Harvard University and a Senior Fellow of the Harvard Society of Fellows.

I want to thank you and your colleagues for arranging such an excellent meeting in Darjeeling. Everybody enjoyed it very much, and the level of science was great... It really was first-class scientifically and most enjoyable, both socially and culturally.

- Richard McCray (Colarado University), Supernovae & GRBs.

THE WORKSHOP WAS REALLY GREAT AND SUCCESSFUL. I PERSONALLY ENJOYED DISCUSSIONS WITH PEOPLE DURING THE WORKSHOP. INDEED IT WAS AN OPPORTUNITY FOR ME TO VISIT TIFR AND TALK TO PEOPLE THERE AS WELL AS THE OTHER PARTICIPANTS. I COULD ALSO COLLABORATE WITH PEOPLE THERE AND PUBLISHED A PAPER ALONG THE SUBJECT WHICH WAS COVERED BY THE WORKSHOP. I HOPE ICTS WOULD CONTINUE THIS, RATHER SUCCESSFUL, ACTIVITY.

- Mohsen Alishahiha (IPM, Iran), Monsoon Workshop.

The conference has been very useful and well organized. The people present were very competent, the experts of the field. At the same time quite some students and/or young people were present, who made everything more spicy. The talks were very interesting, long enough to enter into details. I must say I was very impressed by the organization, so that I really hope to take part in similar activities in future.

- Borut Bajc (IJS Ljubljana, Slovenia), Aspects of Neutrinos.

THE MONSOON WORKSHOP WAS ONE OF THE BEST WORKSHOPS THAT I HAVE ATTENDED. THE FORMAT CERTAINLY ENCOURAGED PLENTY OF INTERACTION AND GAVE ME LOTS OF IDEAS FOR NEW RESEARCH PROJECTS. IT WOULD BE HARD TO IMPROVE ON THIS WORKSHOP.

- Harvey Reall (Cambridge University), Monsoon Workshop.

I would like to send a very positive feedback regarding the cosmology school organised at IUCAA in August 2008. I think the organisers have done an excellent job in putting together a very attractive program and managing the practical details very well. I have only good things to say about it: the lecture room was very good quality, the schedule well balanced between study and free time in order to give the participants many opportunities to meet and discuss about science. The guest house and food were of very high standard (I like Indian food), and I think the idea to have everyone hosted at the lecture place is excellent, it avoids the pain of commuting (which could be difficult sometimes) from hotel places in the city. As a lecturer I particularly appreciated the opportunity to meet Indian students and talk to them directly. Given that traveling abroad is expensive I think it is very important for them to have this possibility on a regular basis. For me, it is also an excellent way of finding new talented students, otherwise it is impossible to gauge the quality of a student from abroad (e.g. students applying for grad school). I would visit and lecture again in the future if there was another opportunity.

- Ludovic Van Waerbeke (University of British Columbia), Cosmology CMB

I think the program was very useful! And I would certainly consider returning for something similar. The quality of the students was really quite high. This meant that they seemed to get a lot out of the lectures and the ability to interact with the lecturers in a relaxed atmosphere. Less capable students would probably have just sat there - but these particular people were very keen to ask questions and learn stuff. I think the way it was organised was probably close to ideal for the target audience. It was also fun for the speakers of course!

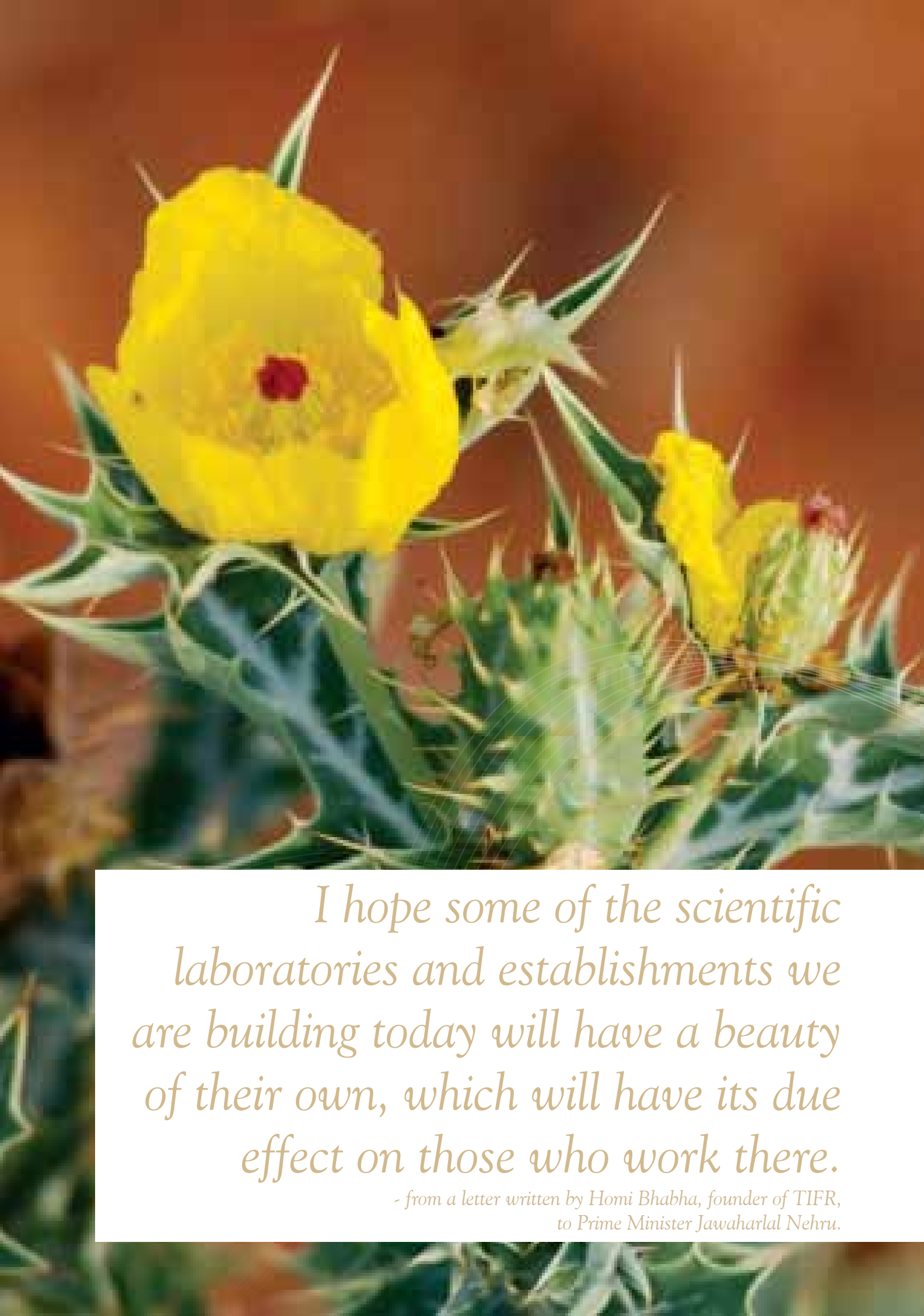
- Douglas Scott (University of British Columbia), Cosmology CMB

The most heartening aspect of the meeting for me was the outstanding talks by some of the young students which were impressive, and the large number of talks and participation by women physicists. This is more commonplace in India but somewhat of a surprise coming from the west! I hope we will have another.

- Sandip Palevasa (University of Hawaii, USA), Aspects of Neutrinos.

The talks were of really high quality I thought, and the teaching very good. I thought that the students were very interactive and were not afraid at all to ask questions. I think in India you can be really proud of your university education, the students compare favourably to Europe or America, and their level of English is impeccable. The only point of criticism would be that (as you had suggested tin the beginning!) one could have done something hands-on with the students, like the crash course on cosmological simulations. Or perhaps a question session where students can ask the well-known "stupid questions" which are answered by an expert in cosmology (thinking of Simon White here). Another point I'd like to mention is that the scope was perhaps a bit too broad. The organisation was flawless.

- Bjoern Schaefer (Institut für Theoretische Astrophysik, Heidelberg), Cosmology CMB



I hope some of the scientific laboratories and establishments we are building today will have a beauty of their own, which will have its due effect on those who work there.

- from a letter written by Homi Bhabha, founder of TIFR, to Prime Minister Jawaharlal Nehru.

TIFR

A National Resource

The Tata Institute of Fundamental Research was founded by Homi Bhabha in 1945 with support from the Sir Dorabji Tata Trust and the Government of Bombay. Even before its formal inauguration in Bombay in Dewcember 1945, TIFR began working out of a laboratory inside the Indian Institute of Science, Bangalore on 1 June 1945.

Today, in the seventh decade of its existence, TIFR is a national resource and a symbol of the country's potential. As an internationally renowned research institution, its research encompasses all branches of the natural sciences and mathematics. In addition to basic research, the institute remains conscious of the importance of science education, public outreach, and the training of young researchers. Scientists nurtured at TIFR lead a host of laboratories and institutions of basic research, applied science and technology in India and around the world.

Bhabha had conceived TIFR not merely as a place for doing excellent science but as an instrument for growing science and scientific culture in India. TIFR catalyzed the formation of several national initiatives in science and technology, including:

The Atomic Energy Establishment at Trombay, later renamed the Bhabha Atomic Research Centre, and the atomic energy programme of India | The National Centre for Software Technology (NCST) in Mumbai and Bangalore, now absorbed by the Centre for Development of Advanced Computing (CDAC) | (TIFR designed India's first computer, TIFRAC) | The Society for Applied Microwave Engineering and Electronic Research (SAMEER) in Mumbai and Chennai | The Inter-University Centre for Astronomy and Astrophysics (IUCAA, Pune) The Centre for the Development of Telematics (CDoT) | The University of Mumbai -Department of Atomic Energy (UM-DAE) Centre for Excellence in Basic Sciences, Mumbai.

A Distributed Institution of Excellence

"No organizational chart of the future developments of the Institute was submitted either when it was founded or later. The philosophy has always been to support ability whenever it has been found in the fields of work directly covered by the Institute or in related areas." – Introduction, Tata Institute of Fundamental Research 1945 – 1970 (Silver Jubilee Commemoration Volume).

Today we all know of the great importance of fundamental research and... how entirely new avenues can be opened up by fundamental research, namely the study of nature for itself unhampered by any preconceived practical ends... The progress of science has also been of great philosophical importance in widening our mental horizon and showing the limitations of commonsense ideas based upon the world immediately perceived by our senses.

- Homi Bhabha, from the lecture at the inauguration of TIFR, 19 December 1945.

Research at TIFR is grouped into three major schools: the School of Natural Sciences, the School of Mathematics and the School of Technology and Computer Sciences. The School of Natural Sciences has seven departments: Biological Sciences, Chemical Sciences, Astronomy and Astrophysics, Condensed Matter Physics and Materials Science, Nuclear and Atomic Physics, High Energy Physics and Theoretical Physics.

TIFR's Centres located across the country include: the Homi Bhabha Centre for Science Education (HBCSE) at Mankhurd, Mumbai, which aims to promote equity and excellence in science and mathematics education from primary school to undergraduate college level, and encourage the growth of scientific literacy in the country; the National Centre for Radio Astrophysics (NCRA) in Pune, which is a leading centre for research in a wide range of areas in astronomy and astrophysics; the National Centre of Biological Sciences (NCBS) in Bangalore which is involved in basic research in the frontier areas of biology, ranging from the study of single molecules to systems biology.

The TIFR Centre for Applicable Mathematics (TIFR-CAM) is also located in Bangalore. In addition, TIFR has the following field stations and facilities at various parts of the country: the Balloon Facility at Hyderabad; the Giant Metre-Wave Radio Telescope (GMRT) at Khodad near Pune; the Cosmic Ray Laboratory at Udhagamandalam, Tamil Nadu; a large equatorially mounted cylindrical radio telescope at Udhagamandalam; the Gravitation Laboratory at Gauribidnur in Karnataka; the High Energy Gamma Ray Laboratories at Pachmarhi (Madhya Pradesh) and Hanle (Ladakh); the Pelletron facility at Colaba and the National Facility for High Field NMR at Colaba.

From the beginning, research programs at TIFR have involved graduate students centrally. By the end of 1960s, a Graduate School was set up, and TIFR students received a Ph.D degree from Bombay University until 2002, when the institute was declared a deemed university. Students graduating from TIFR are well trained to take up a challenging career in science. The institute cherishes this contribution to the nation.

New Initiatives

It is a tribute to the vision of its founder that in the birth centenary year of Homi Bhabha, the institute is poised for even greater growth. Three of its most significant new initiatives will take shape during the Bhabha Centenary: the institute's new campus at Hyderabad, the partnership in a life sciences consortium in Bangalore, and the International Centre for Theoretical Sciences in Bangalore. The model of TIFR as a distributed institution of excellence is borne out by these initiatives.

The IUCAA conference on cosmology was well organized, interactive, and a pleasure to be a part of. The lecturers were from all over the world and were experts in their fields. The students were interested and engaged. Questions from the lectures would often end up in discussions over meals. An especially nice aspect of the conference was the public lecture program. They were well attended, a testament to the high regard the town has for science.

- Lyman Page (Princeton University), Cosmology CMB

It's really a wonderful workshop. The speakers are all active researchers on various subjects. The meeting was organized in such a nice way that the participants got enough time to have stimulating discussion. I did learn quite a lot from the workshop. One project I am working on was initiated during the meeting. Thanks again for the invitation, very nice organization and hospitality.

- Bin Chen (ITP, Beijing China), Monsoon Workshop.

The program consisted of summer school lectures coupled with three mini-workshops on different aspects of cosmology. I attended it for ten days and thought both aspects worked very well. The lectures for students were appropriately pedagogical, well attended and quite lively. Both during the lectures and especially because of the coupling with the mini-workshops, there was enough material related to ongoing research to give the students a good flavor. At least half the students seemed to grasp the material very well and engage with the speakers, which seems to me to be an excellent outcome. I would definitely attend or help organize such a program again. As with any such summer school, one must try to do better in terms of student interaction. If time permits (e.g. for a future school with a narrower scope of topics), small assignments or readings of outstanding recent papers followed by discussion led by students could work well.

- Bhuvnesh Jain (University of Pennsylvania), Cosmology CMB

The Monsoon workshop on string theory has been a truly inspiring scientific activity for me. In addition to interactions with other international visitors, he large and high level local scientic community has been a particular asset for the programme. During my stay I have further developed several of the ideas I have been pursuing and I began one new project with another participant.

- Volker Schomerus (DESY Hamburg) | Monsoon Workshop

Images

Super Kamiokande; Source: Google | Cosmology pictures; Source: NASA | Picture from Lecture notes of talk by Abhishek Dhar | Picture from Lecture notes of talk by Bambi Hu | Pictures from Lecture notes from talk by Andrea Montanari and Rudi Urbanke | Image by Jakob Scholbach; Source: Wikipedia | Picture from Lecture notes of talk by R. Venugopalan | Pictures from Mathematica 3 D state space picture of ECG data using "Embedding" Talk by P. G. Vaidya | Review on "Complexity in strongly correlated electron systems" by Elbio Dagotto in "Science"; VOL. 309, No. 5732; Page: 257-262 | "Coherent Optical control of semiconductor quantum dots for Quantum Information Processing" by Y. Wu, X. Li, D. Steel, D. Gammon, L. J . Sham in Physics E: Low dimensional Systems and Nanostructure. VOL: 25; 2004; page: 242-248

Activity Report design

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