



Chennai Mathematical Institute

Annual Report 2006 - 2007

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Chennai Mathematical Institute

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Preface

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The Chennai Mathematical Institute (CMI) was founded in 1989 with a charter to build up an institution of excellence in Mathematics and Computer Science. Over the years, CMI has succeeded amply in this goal. The Mathematics and Computer Science groups at CMI are among the best known in the research community in the country. The Institute has nurtured an impressive collection of Ph.D. students. Members of CMI maintain active research collaborations with leading research institutes throughout the world. A number of scholars from around the world visit CMI each year, enhancing the vibrant research atmosphere at the Institute.

Chennai Mathematical Institute began in 1989 as the School of Mathematics, a division of the SPIC Science Foundation. In August 1996, it became an independent institution called the SPIC Mathematical Institute (SMI), managed by a Trust of the same name, through a Governing Council. In order to place the Institute in a larger public domain, the name of the Institute was changed to Chennai Mathematical Institute (CMI) in January 1999.

Since its inception, CMI has had an active group of researchers in the fields of pure mathematics and theoretical computer science. In 2006-2007, the Institute expanded its areas of research into physics. The main areas of research in Mathematics pursued at the Institute are algebra, analysis, differential equations, geometry and topology. In Computer Science, the main areas of research are formal methods in the specification and verification of software systems, design and analysis of algorithms, computational complexity theory and computer security. In Physics, research is being carried out mainly in string theory, quantum field theory and mathematical physics.

Over the years, CMI has made very substantial contributions in these areas, as evidenced by the important research papers published by its members as well by the number and quality of doctoral students who are placed in various centres in India and abroad. The research activity at CMI is also enhanced and supported by

seminars and lectures, both by the faculty and the students of CMI, as well as through a healthy inflow of visitors from other research centres in India and abroad. Seminars are the life-line of any research group and CMI has had a rich tradition in this.

Since its inception, a major component of the Institute's activities has been its Ph.D. programme. CMI has also taken the initiative to bridge the gap between teaching and research by starting B.Sc. and M.Sc. programmes in Mathematics and allied subjects which are entirely conducted by faculty who are active in research. An important aim of the teaching programme at CMI is to motivate bright students to take up science at the university level. The teaching programme began in 1998 with the National Undergraduate Programme in Mathematics and Computer Science, leading to a B.Sc. (Honours) degree. In 2001, separate M.Sc. courses were introduced in Mathematics and Computer Science. In 2003, the B.Sc. (Honours) programme was expanded to include a Physics stream. The present strength of the students in the B.Sc., M.Sc. and Ph.D. programmes is 67.

In the teaching programmes at CMI, talented students are selected at the national level and are taught by experts who have contributed to these fields. CMI has the continued support of scientists from other institutions, especially the Institute of Mathematical Sciences (IMSc), Chennai, the Tata Institute of Fundamental Research (TIFR), Mumbai, the Indian Institute of Technology (IIT) Madras, Chennai, Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam and the Homi Bhabha Centre for Science Education (HBCSE), Mumbai. Substantial support for this initiative is being provided by the National Board for Higher Mathematics (NBHM), an autonomous body constituted and funded by the Department of Atomic Energy (DAE).

The year 2006-2007 witnessed an important step in the Institute's evolution as an academic institution. In December, 2006, CMI was granted the status of a University by the Ministry of Human Resources and Development (MHRD), Government of India under Section 3 of the UGC Act, 1956. With this, the Institute has the authority to grant its own B.Sc., M.Sc. and Ph.D. degrees and also the flexibility to propose new programmes.

Prior to being granted the status of a University, the Institute's Ph.D. programme was recognized by the University of Madras. CMI had also evolved a joint Ph.D.Ph.D. programme with the Birla Institute of Technology and Science, Pilani. For the B.Sc. and M.Sc. programmes, the degrees were awarded by the Madhya Pradesh Bhoj Open University (MPBOU) until 2006.

The teaching programmes at CMI have turned out to be highly successful. Six batches have already graduated in the B.Sc. programme in Mathematics and Computer Science and moved on to some of the best institutions in the world. The first B.Sc. Physics batch graduated in 2006 and these students have also joined leading academic institutions in India and abroad. Four batches of M.Sc. students have graduated and have been well placed in both academia and industry.

Members of the Faculty have strong academic ties with reputed research institutions in India and abroad. The Institute participates in a programme of the Third World Academy of Sciences (TWAS), Trieste, Italy called the "Associate Membership Scheme at Centres of Excellence in the South".

The Institute has a memorandum of understanding with the Ecole Normal Supérieure in Paris, France, one of the leading institutions in the world for teaching and research in Mathematics. This agreement provides for regular exchange visits by academic members of CMI and ENS, Paris including, in particular, exchanges of visits by undergraduate students between the two institutions. Since 2000-2001, there have been regular visits from both sides each year under this programme.

CMI is also involved in a number of collaborative research projects, both with academic and industrial partners. The Institute is currently involved in a four year project on timed and distributed computing systems under the Indo-French Networking programme, jointly funded by the French Ministry of Science, CNRS and the Indian Department of Science and Technology. The project involves scientists from CMI, IMSc and IISc, Bangalore in India and the University of Paris 7, ENS de Cachan and the University of Bordeaux 1 in France.

CMI has a sponsored research project with Honeywell Technology Solutions Laboratory, Bangalore, in the field of avionics controls, initiated in 2004-2005. CMI also has a sponsored research project with Siemens' Corporate Technology research centre, Bangalore, in the area of formal testing of reactive systems.

The Institute actively supports conferences and workshops and other activities that contribute to the growth of Mathematics and Computer Science in the country.

Faculty at CMI are also involved in training programmes both in academia and industry. Many CMI faculty play an active role in teacher-training workshops organized for college and university teachers. In addition, CMI faculty are actively involved in the Ignite programme of Tata Consultancy Services, a new initiative to

impart training in computer science to fresh recruits with B.Sc. degrees in a diverse range of subjects.

CMI has a generous three-year grant from the Board for Research in Nuclear Sciences (BRNS) and the Department of Science and Technology (DST). This funding covers an ambitious visitors' programme as well as support to enhance computational infrastructure and library facilities at the Institute.

CMI's new campus on the southern outskirts of the city, at the SIPCOT Information Technology Park, Siruseri became operational in October, 2005, with the commissioning of the academic and administrative building. The second phase, consisting of the library and students' hostel, was commissioned in early 2007. A formal function was held in February, 2007 to inaugurate the new facilities, as well as to commemorate CMI's recently acquired University status.

This year also saw the formal formation of the CMI Alumni Association. We hope that this will lead to increased participation by alumni in building up the activities and infrastructure of the Institute.

C S SESHADRI

Director





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New York University, New York, U.S.A.



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Professor of Eminence
Tata Institute of Fundamental Research, Mumbai
Chairman, National Board for Higher Mathematics
5. **Prof. S.R.S. Varadhan, F.R.S.**
Courant Institute of Mathematical Sciences
New York University, New York, U.S.A.
6. **Prof. M. Vidyasagar**
Executive Vice-President
Tata Consultancy Services, Hyderabad



Research Activities

Mathematics

Research in the past year has been essentially in the areas of algebraic geometry, representation theory, operator algebras and harmonic analysis.

In the field of operator algebras, research has been done primarily on the study of endomorphism semigroups (called E_0 -semigroups) on $B(H)$, the algebra of all bounded operators on a separable Hilbert space. E_0 -semigroups are divided into three major categories, called type I, II and III. Type I has been classified completely by William Arveson. Type II and III are still not fully comprehended. In 1987, Robert Powers discovered the first example of a type III E_0 -semigroup. After several years, in 2000 Boris Tsirelson produced an uncountable family of non-isomorphic type III product systems. (Product systems form a complete invariant for E_0 -semigroups). Tsirelson's construction involves complicated techniques from probability theory. A purely operator algebraic version of Tsirelson's construction was given, leading to a better understanding of the problems. The E_0 -semigroups associated with these product systems were studied in depth. It was shown that they are given by a pair of two C_0 -semigroups which are perturbations of each other.

Termining these E_0 -semigroups as Generalized CCR flows, several results have been proven clarifying its relation to the so called sum systems, and a necessary and sufficient criterion for them to be of type III, which is very powerful than the earlier criterion given by Srinivasan and B.V.R.Bhat. Further, there was work on generalized CCR flows associated with perturbations of unilateral shift on $L^2(0, \infty)$ leading to a new family of Generalized CCR flows, which can not be distinguished from type I examples, by the invariants introduced by Tsirelson. This association of type III factors to these type III E_0 -semigroups as invariants showed in fact, that there exists uncountably many non-isomorphic examples in this family.

These developments lead to many new interesting research problems. Partial results have been obtained for example in computing the automorphism group of

the product systems, computing the cocycles etc. A stochastic calculus has been developed with these ideas with respect to the product systems associated with these Generalized CCR flows, which is expected to have lot of applications, as demonstrated in the type I case.

Some earlier work on Inductive Algebras was continued further. Some new work was initiated on an approach to proving "tangential convergence" results for bounded harmonic functions on "harmonic spaces". Questions in nilpotent Lie groups were also studied.

In the field of algebraic geometry, the Brauer group of the moduli spaces of vector bundles on curves was computed. This result has interesting implications on issues related to rationality of these moduli spaces.

Parabolic analogues of Nakajima's construction of representations of Heisenberg algebras associated to the cohomology of an algebraic surface and their geometric realizations were studied. The study of principal bundle analogues of parabolic bundles and their realisations as more concrete objects in terms of principal homogeneous spaces for non-reductive group schemes is being carried out. This will give a complete picture of the principal analogues of parabolic bundles along the lines of the work of Weil and Seshadri.

Research work has been carried out in the area of representation theory, primarily towards understanding the Kronecker coefficients. Given two irreducible representations of the symmetric group on n letters, W_α, W_β , parameterized by Young tableau of shape α, β , the Kronecker coefficient $k_{\alpha\beta}^\gamma$ is the multiplicity of the irreducible representation W_γ , of S_n parameterized by shape γ , in the tensor product $W_\alpha \otimes W_\beta$.

An explicit formula was given in the case when α, β, γ are shapes with at most two rows. This was already known in the literature, but the new proof given here is geometric and conceptual. There has been more progress towards understanding the same problem in the case when α and β are rectangular shapes. The ring of invariants for the action of $SL(n) \times SL(n)$ on an m -tuple of $n \times n$ matrices was determined. It was also shown how determining the $SL(m)$ module structure of the ring of invariants, will solve this special case of the Kronecker coefficients problem. The study of this ring of invariants also yields an entirely different proof of the Artin-Procesi theorem.

Computer Science

The research activity in Computer Science at CMI has been primarily in computational complexity theory, specification and verification of distributed systems, analysis of security protocols and DNA computing.

In computational complexity theory, planar restrictions of determinants and permanents have been studied. While planarity alone does not reduce the complexity of either problem, in conjunction with bipartiteness/bimodality the two problems become equivalent. The permanent or the determinant modulo 2 is complete for $\oplus L$, and it has been shown that parity of paths in a layered grid graph (which is bimodal planar) is also complete for this class. It has also been shown that planarity helps to reduce the complexity of bipartite unique perfect matching. The deterministic isolation technique for reachability in planar graphs has been extended to obtain better complexity upper bounds for planar bipartite matching.

In the area of distributed systems, a study has been initiated of networks of communicating finite-state machines equipped with local clocks. A solution has been proposed to the problem of checking whether the timed communication scenarios exhibited by such a network are consistent with a given specification. The proposed solution can be automated using the verification tool UPPAAL. Additionally, a textual notation has been developed for describing infinite families of timed scenarios.

Formal notions of testing have also been investigated for distributed communicating systems. Using a natural notion of observability in terms of input-output relations, two notions of test equivalence have been proposed, corresponding to different strategies for interactively generating test cases. Expressiveness and decidability issues have been investigated for these notions of test equivalence.

In the area of security protocol verification, decidability questions have been addressed for various security properties. An extension to the basic Dolev-Yao security model has been proposed, with different presentations of the base model and its extensions, based on the sequent calculus, in particular. Work has also been initiated in the study of electronic voting protocols.

In the area of DNA computing, the aqueous computing model has been extended with a new combination of basic procedures to extend the applicability of the model from decision problems to counting problems. In addition, new DNA codes have been devised to avoid unwanted hybridizations due to unnecessary mismatching

during the annealing of Watson-Crick pairs, yielding a method for solving the vertex cover problem.

Physics

The research activity in Physics at CMI has been primarily in the areas of string theory, quantum field theory, and mathematical physics.

In the field of string theory, the α'^4 corrections to the non-Abelian DBI action on the D8-brane, in the holographic dual of large N_c QCD proposed by Sakai and Sugimoto, were evaluated. These give rise to higher derivative terms, in particular, four-derivative contact terms for the pion field with a uniquely determined coupling. The pion-pion scattering amplitude near threshold was calculated. It respects unitarity and is in qualitative agreement with the experimental values.

In quantum field theory, the SU(2) Yang-Mills theory in Savvidy background was studied at finite temperature and density. The unstable modes were identified, and the partition function evaluated retaining the cubic and quartic terms in these modes. For the stable modes, the partition function was evaluated in the Gaussian approximation. The resulting energy density was found to be real. The behaviour at high temperature is found to coincide with that of a relativistic gas.

In mathematical physics, some intriguing connections between the classical topology of knots and links and the entanglement of quantum states were explored. An invariant to describe tripartite entanglement in the absence of bipartite entanglement, between Ising spins in a three-dimensional spin-glass, was obtained. An approach based on functional integrals to derive a new set of measures to quantify entanglement in simple quantum mechanical systems was developed. This is a precursor to further generalising the formalism to quantum field theories and black holes.





Campus and Infrastructure

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During 2005-2006, CMI moved into its own campus at Siruseri in the outskirts of Chennai. The campus is set on a 5.35 acre plot in the SIPCOT IT Park. The campus has been designed by the award winning Chennai-based architect K.S. Ranganath.

The first phase of the campus, the academic block, was completed in September 2005. This block includes office space for faculty, postdoctoral fellows and research scholars, as well as the administrative staff. There are seven lecture halls, including a large seminar hall that can accommodate 100 persons.

The second phase of the campus, consisting of the library and student hostel, was completed in December 2006. The large and spacious library has been designed keeping in mind the growth plans of the Institute. The hostel can accommodate over 100 students, with a provision to double the capacity in the future.

The funds for the campus have come from private sources, with major contributions from Matrix Laboratories, Hyderabad, the Shriram Group Companies, Chennai, the Chennai Willingdon Corporate Foundation, Chennai, Take Solutions, Chennai, the Infosys Foundation, Bangalore and Tata Consultancy Services.

The Institute has a high-speed dedicated Internet connection and a campus wide network equipped with high performance file servers. The entire campus is covered by a wireless network. Much of the equipment has been obtained through a grant from BRNS and DST.



The National Undergraduate Programme

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In 1998, CMI initiated an National Undergraduate Programme in the Mathematical Sciences in collaboration with Madhya Pradesh Bhoj Open University with a 3 year course in Mathematics and Computer Science, leading to a B.Sc. Honours degree. In 2001, this programme was extended to the postgraduate level with separate 2 year courses leading to M.Sc. degrees in Mathematics and Computer Science. The scope of the undergraduate programme was expanded in 2003 to incorporate a 3 year course leading to a B.Sc. Honours degree in Physics. From 2007, all B.Sc. and M.Sc. degrees will be awarded directly by CMI, now that it is recognized as a University.

The undergraduate and postgraduate teaching programmes at CMI are both run in cooperation with the Institute of Mathematical Sciences (IMSc), Chennai. These programmes tap the teaching talent available at the elite research institutes of the country, which are normally outside the university system. Students are thus exposed to lectures by active researchers who bring a very different perspective to the teaching.

B.Sc. (Hons.) Mathematics

In 2006, the ninth batch of students was admitted to the undergraduate programme. 23 students were offered admission and 6 have joined the programme. Of these, two are from the INMO stream and one is from the INOI stream. The second year B.Sc. class has 9 students, while the third year B.Sc. class has 10 students.

Out of the 10 students of the 2003 batch who took their degrees at the convocation in August, 2006, several have been placed in very prestigious institutions. Two students in the batch, Abhijit Laskar and Utsav Chaudhury have joined the European Master's programme ALGANT (Algebra, Geometry and Number Theory). Tanmoy Chakraborty has joined the Ph.D. programme in Computer Science at the University of Pennsylvania, USA with full scholarship. Indraneel Mukherjee has joined Ph.D. in Computer Science at Princeton University, USA with full scholarship. Swarnendu Datta has joined the Ph.D. programme in Mathematics at the University of Chicago,

USA with full scholarship. Chiranjib Mukherjee has joined the Ph.D. programme in Mathematics at Max Planck Institute in Mathematical Sciences, Leipzig, Germany. R. Praveen has joined the Post Graduate Diploma Programme in Management (PGDPM) at the Indian Institute Of Management, Lucknow. Kumar Madhukar and V. Jayant have joined the M.Sc. programme in Computer Science at CMI.

B.Sc. (Hons.) Physics

This programme was started in 2003 with the assistance of the Physics Faculty of the IMSc, Chennai, and the active participation of physicists across the country.

In 2006, letters of admission were offered to 17 students, of whom 4 students have joined the programme.

During the course of the academic year, Physics students perform some basic experiments in class at CMI. In addition, students have an intensive laboratory programme at the Homi Bhabha Centre for Science Education (HBCSE), Mumbai, during the summer vacation after the first year. A similar arrangement has been worked out with the Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam for students at the end of the second year. Regular laboratory classes are conducted with the help of IIT Madras for students in the third year. The new library complex at CMI contains a full-fledged Physics laboratory which is being set up under the supervision of Dr. M. Veerabhadra Rao, formerly at IIT Madras.

Out of the 5 students of the 2003 batch who took their degrees at the convocation in August, 2006, several have been placed in very prestigious institutions. K. Aditya has joined the M.Sc. Programme in Fusion-related Physics and Engineering at Stuttgart University, Germany. B. Prasanna Venkatesh and Arindam Mukherjee have joined the M.Sc. (by research) in Physics programme at McMaster University, Hamilton, Canada. Satyanarayan Mukhopadhyay has joined the Integrated M.Sc.-Ph.D. programme at Harish Chandra Research Institute, Allahabad. Arya Kumar Srustidhar Chand has joined the Erasmus Mundus Master Program in Quantitative Economics at University of Paris 1, France.

M.Sc. Mathematics

All four students who joined the programme in 2004 have completed the programme successfully. Arnab Saha has joined the Ph.D. programme in Mathematics at the University of New Mexico, USA, while Vijaykumar Singh has joined as Research Associate at the Society for Electronic Transactions and Security (SETS), Chennai.

In 2006, one student joined this programme.

M.Sc. Computer Science

Anirban Mukherjee and Somenath Ghosh who joined the programme in 2004 have completed their course. They have joined Symantec, Pune as Associate Software Engineers.

In 2006, four students joined the programme, of whom one left the programme after one semester due to health problems.

Convocation

The 4th convocation of CMI was held on 1st August 2006. Degrees were awarded to 21 successful candidates. Of these, 15 were at the Undergraduate level and 6 were at the Postgraduate level. Dr. Kamlakar Singh, Vice-Chancellor, Madhya Pradesh Bhoj (Open) University, Bhopal gave away the degree certificates. Prof. S. Ramanan, Adjunct Professor, Chennai Mathematical Institute delivered the convocation address. Dr. P. Rama Rao, Chairman, Board for Research in Nuclear Sciences, was the Chief Guest.

The CMI Medal of Excellence in Mathematics, instituted by Prof. K.R. Nagarajan, was awarded to Indraneel Mukherjee. This year saw the first B.Sc. batch in Physics graduate from CMI. The first CMI Medal of Excellence in Physics, instituted by CMI, was awarded to B. Prasanna Venkatesh for his outstanding performance at the undergraduate level. Tanmoy Chakraborty received the Dr. S. Parthasarathy Commemorative Prize for exceptional research work at the undergraduate level.

Informatics Olympiad

CMI faculty coordinate the training and selection of students to represent India at the International Olympiad in Informatics through the Indian Association for Research in Computer Science (IARCS). CMI hosts the official IARCS website. From September 2004, a monthly online programming competition has been conducted by the CMI faculty via the IARCS website.

Alumni Association

The CMI Alumni Association was officially formed in 2006-2007. Prof. Seshadri will serve as the Interim President until the first full meeting of the Association takes place, in conjunction with the next Convocation of CMI in August, 2007.



Activities of the Undergraduate Students

Achievements of CMI students

SANKHYA 2006

(Sri Venkateswara Engineering College, August 2006)

Event	Participants	Place
Applex	Ravitej U Arnold Noronha Anirbit Mukherjee	1st
	Ved V Datar, Anup Walvekar Hrushikesh Tilak	2nd
Game, Set Math	Ravitej U Arnold Noronha Anirbit Mukherjee	2nd
Olympiad	Agnid Banerjee	1st
	Preyas Popat	2nd
Informals Vineeth (Logic, Puzzles and Sudoku)	S Varma	2nd

SHAASTRA

(IIT Madras, October 2006)

Event	Participants	Place
Online Programming Contest	Shreevatsa R Preyas Popat	1

Event	Participants	Place
Online programming contest	Arnold Noronha Hrushikesh Tilak Kshitij Bansal	7
Programming contest	Shreevatsa R Preyas Papat Kshitij Bansal	I
Programming contest	Arnold Noronha Hrushikesh Tilak	II

Summer camps/courses/visits to other centres

- Rajarshi Ray attended the GM RD workshop on Next Generation Design and Verification Methodologies for Distributed Embedded Control System held during January 2007, at the Indian Institute of Science, Bangalore.

Interaction with graduate students from Ecole Normale Superieure

Chennai Mathematical Institute has an agreement with the Ecole Normale Superieure in Paris, France, one of the leading institutions in the world for teaching and research in Mathematics. This agreement provides for regular exchange visits by academic members of CMI and ENS, Paris. This includes, in particular, exchanges of visits by undergraduate students between the two institutions.

The annual visitors from the ENS arrived in two groups: two for the period January-March and two for the period March-April. Charles Vial and Olivier Dudas visited CMI during January-March, 2007 while Thomas Vidick and Cyril Demarche visited during March-April, 2007. They taught, examined and evaluated the course Calculus II (second semester of the B.Sc. programme).

Every year, the top three students passing out from the B.Sc. Mathematics programme spend 8 weeks at the ENS, where they work on research projects with the ENS faculty. In May-June, 2006, Indraneel Mukherjee, Tanmoy Chakraborty and Utsav Choudhary visited the ENS. Utsav Choudhary took the place of Swarnendu Datta, who was unable to travel to Paris due to family commitments.



CMI Inaugural Function

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A formal function was held in February, 2007 to inaugurate the new infrastructural facilities, as well as to commemorate CMI's recently acquired status as a University. The function was presided over by Shri R. Thyagarajan, Chairman, Shriram Group Companies, Chennai. At this function, Shri V. Narayanan, Director, Chennai Willingdon Corporate Foundation inaugurated the library and Dr. Anil Kakodkar, Chairman, Atomic Energy Commission, inaugurated the student facilities. Shri Sudeep Banerjee, Advisor, MHRD, Government of India, delivered a felicitation.

On this occasion, two special lectures were organized.

- **Mr. N. Ram**, Chief Editor, The Hindu, Chennai spoke about "**The Literary Achievement of R.K. Narayan**".
- **Prof. M.S. Narasimhan**, TIFR Centre, Bangalore spoke about "**Evolution of Geometry**".





Academic Members

■ Director	C.S. Seshadri
■ Professor	Shiva Shankar
■ Adjunct Professors	S. Dale Cutkosky V. Kumar Murty V. Lakshmibai R. Parimala R. Parthasarathy G. Rajasekaran S. Ramanan M. Ram Murty Rani Siromoney R. Sridharan
■ Fr. Racine Visiting Professor	K.R. Nagarajan (until April 2006)
■ Visiting Professor	Tulsi Dass
■ Associate Professors	V. Balaji Madhavan Mukund V.V. Sreedhar
■ Readers	C.S. Aravinda Clare D'Cruz K. Narayan Kumar S. Senthamarai Kannan K.V. Subrahmanyam M. Sundari

Upendra Kulkarni

■ Fellows

Bharat Adsul
Samir Datta
R. Srinivasan
Suresh Nayak
S.P. Suresh
M.K. Vemuri

■ Scientific Officer

P. Vanchinathan

■ Post-doctoral Fellow

Arijit Dey
R. Parthasarathi
K.S. Sudeep (until August 2006)

■ NBHM Post-doctoral Fellow

V. Uma (until May 2006)

■ Research Scholars

Suman Bandyopadhyay
Puneet Bhateja
Jagat Chaitanya
Prakash Chandrasekaran
Sachin Anna Jaganade
Nagarajan Krishnamurthy
Gayathri Nair
N. Naresh
Pranab Sardar
Shyamashree Upadhyay

■ NBHM Research Scholars

Santosha Kumar Pattanayak
Pabitra Barik

■ CSIR Research Scholars

A. Baskar
S. Jijo

■ Administrative Staff

S. Sripathy
V. Vijayalakshmi
Rajeshwari Nair
G. Samson



Faculty Profiles

C.S. Seshadri

C.S. Seshadri received his B.A. Hons. (Mathematics) degree from Madras University (1953) and his Ph.D. from Bombay University (1958).

He was at the School of Mathematics, Tata Institute of Fundamental Research, Bombay from 1953 to 1984 starting as a Research Scholar and rising to a Senior Professor. He was then a Senior Professor at the Institute of Mathematical Sciences, Madras (1984-89).

He has been a Visiting Professor at the University of Paris, France; Harvard University, Cambridge, U.S.A.; Institute for Advanced Study, Princeton, U.S.A.; University of California at Los Angeles, Los Angeles, U.S.A.; Brandeis University, U.S.A.; University of Bonn, Bonn, Germany; Kyoto University, Kyoto, Japan.

He has given invited talks at many international conferences including the International Congress of Mathematicians, Nice, France, 1970.

He has received the Shanti Swarup Bhatnagar Award and the Srinivasa Ramanujan Medal of Indian National Science Academy (INSA). He was awarded the D.Sc. Degree (Honoris Causa) of Banaras Hindu University, Varanasi. He has also been awarded the Shanti Swarup Bhatnagar Medal (1995) of INSA. He received the Trieste Science Prize in 2006. He has been appointed National Research Professor by the Government of India (2006).

He is a Fellow of the Indian Academy of Sciences, Indian National Science Academy and a Fellow of the Royal Society.

His research interests are Algebraic Geometry and Algebraic Groups.

Shiva Shankar

Shiva Shankar received his B.Tech. (Electrical Engineering) from the Indian Institute of Technology, Delhi (1978) and his Ph.D. from the State University of New York (SUNY), Stony Brook, U.S.A. (1983).

He has been Assistant Professor at the Department of Applied Mathematics, SUNY, Stony Brook (1983-84), Visiting Fellow at the School of Mathematics, Tata Institute of Fundamental Research, Bangalore (1984-88), and Associate Professor at the Department of Electrical Engineering, Indian Institute of Technology, Bombay (1988-2000).

He has held Visiting Positions at the Institute of Mathematical Sciences, Chennai, and at the Mathematics Institute, University of Groningen, the Netherlands.

His research interests are Partial Differential Equations, Mechanics and Control Theory.

Rani Siromoney

Rani Siromoney received her B.A. (Hons.) (Mathematics) degree from Madras University (1950), Master's degree from Columbia University (1960) and Ph.D. from Madras University (1970).

She has been associated with the Madras Christian College since 1951, starting as a Lecturer and is now Professor Emeritus in the Department of Computer Science.

She has been a Visiting Professor at the Boston University (1974) and Visiting Scientist at the IAS - Fujitsu Laboratories Numazu, Japan (1991).

She has given invited talks in Theoretical Computer Science at many national and international conferences and lectures at several universities and Research Institutes.

She has been awarded the Smith Mundt/Fulbright Scholarship for study in Columbia University (1958-59), "Outstanding Woman Professional" by the Federation of Industries and Chamber of Commerce (India) Ladies Organization, New Delhi (1984-85) and "Lifetime Achievement Award" by the Tamil Nadu State Council of Science and Technology (2002).

Her research interests are Formal languages and Automata, Picture languages, Cryptography, Machine learning and DNA Computation.

R. Sridharan

R. Sridharan received his B.A. (Mathematics) degree from Vivekananda College, Chennai (1952), his M.A. (Mathematics) from Vivekananda College, Chennai (1955) and his Ph.D. (Mathematics) from Columbia University, New York (1960).

He has been Professor at the University of Bombay, Mumbai (1964-67) and Senior Professor at the Tata Institute of Fundamental Research, Mumbai (1967-2000).

He is a Fellow of the Indian Academy of Sciences and Indian National Science Academy.

He received the Shanti Swarup Bhatnagar Prize of the Indian National Science Academy (1980).

He has been an INSA Honorary Scientist since January 2001.

His research interest is Algebra.

K.R. Nagarajan

K.R. Nagarajan received his B.Sc. (Mathematics) Hons. degree from Annamalai University (1953), his M.S. (Mathematics) from University of Chicago (1958) and his Ph.D. (Mathematics) from University of Chicago (1962).

He has been Lecturer at the Kerala University, Kerala (1965-67), Reader at the Madurai Kamaraj University, Madurai (1967-76), Professor and Head of the School of Mathematics, Madurai Kamaraj University (1976-78-93) and Visiting Professor, Central University, Pondicherry (1995-96).

His research interest is Commutative Algebra - Invariants.

V. Balaji

V. Balaji received his B.A. Hons. (Mathematics) from University of Delhi (1982), his M.A. (Mathematics) degree from University of Delhi (1984), his Ph.D. from University of Madras (1991).

He has been an NBHM Post-doctoral Fellow at the Chennai Mathematical Institute (1989-92).

His research interest is Algebraic Geometry.

Madhavan Mukund

Madhavan Mukund received his B.Tech. (Computer Science and Engineering) degree from the Indian Institute of Technology, Bombay (1986) and his Ph.D. from Aarhus University, Aarhus, Denmark (1992). He has been a Visiting Professor at the University of Paris 7 (2001 and 2005).

He is a member of the Executive Council and the Secretary of the Indian Association for Research in Computing Science (IARCS). He is the National Coordinator of the Indian Computing Olympiad.

His research interests include formal methods for specification and verification of concurrent, distributed and timed systems and programming languages.

V.V. Sreedhar

V.V. Sreedhar received his B.Sc. degree from Andhra University, Visakhapatnam, MSc degree in Physics from the Indian Institute of Technology, Madras and received his Ph.D. degree in physics from Saha Institute of Nuclear Physics, Jadavpur University, Calcutta.

He has been an Assistant Professor in the Department of Physics at the Indian Institute of Technology, Kanpur, a Post-doc at the School of Theoretical Physics, Dublin Institute of Advanced Studies, Dublin, Ireland and a Post-doc at the Institute for Theoretical Physics, Uppsala University, Uppsala, Sweden.

His visiting positions include stints at the S.N. Bose National Centre for Basic Sciences, Kolkata, Raman Research Institute, Bangalore, Universities of Rochester, New York and Cincinnati, Ohio, U.S.A. and the High Energy Research Organization (KEK), Tsukuba, Japan.

His research interests are Quantum Entanglement, Classical and Quantum Field Theory and Fluid Dynamics.

C.S. Aravinda

C.S. Aravinda received his B.Sc. degree from Bangalore University (1983), his M.Sc. (Mathematics) degree from Bangalore University (1985) and his Ph.D. from the University of Bombay (1995).

He has been a Visiting Mathematician at ICTP, Trieste, Italy (1991-92) and a Research Associate at the Indian Statistical Institute, Bangalore (1995-97).

He has been a visiting Associate Professor at the State University of New York at Binghamton (2000-2002).

His research interests are Ergodic Theory, Riemannian Geometry and Topology.

Clare D' Cruz

Clare D' Cruz received her M.Sc. (Mathematics) from the Indian Institute of Technology, Bombay (1991) and her Ph.D. (Mathematics) from the Indian Institute of Technology, Bombay (1996).

She has been a Post-Doctoral Fellow at the Tata Institute of Fundamental Research, Mumbai (1996-98) and a Visiting Scholar at the Northeastern University, Boston, U.S.A. (1997-98).

Her research interest is Commutative algebra.

K. Narayan Kumar

K. Narayan Kumar received his M.Sc. (Tech.) in Computer Science from Birla Institute of Technology and Science, Pilani (1990). He received his Ph.D. degree from the University of Bombay (1997). He has been a visiting scholar at the State University of New York at Stony Brook (1997-98). He has been a Visiting Professor at the University of Paris 7 (2002).

His research interests include Logic, Automata theory and Concurrency.

S. Senthamarai Kannan

S. Senthamarai Kannan received his B.Sc. degree from HKRH College, Uthama Palayam (1985-88), M.Sc. degree from the Madurai Kamaraj University (1988-90) and Ph.D. from the Chennai Mathematical Institute, (1992-98). He has been a Post-doctoral Fellow at the International Centre for Theoretical Physics (1999-2000).

His research interests are Representation Theory and Algebraic Geometry.

K.V. Subrahmanyam

K.V. Subrahmanyam received his B.Tech. (Computer Science and Engineering) degree from the Indian Institute of Technology, Bombay (1986) and M.S. from Vanderbilt University, U.S.A. in 1987. He received his Ph.D. degree from the University of Bombay in December, 1995.

His research interests include Circuit Complexity and Algebraic methods in Complexity theory.

M. Sundari

M. Sundari received her M.Sc. (Mathematics) from the University of Hyderabad, Hyderabad (1988), M.Phil. (Mathematics) from the University of Hyderabad, Hyderabad (1990) and Ph.D. (Mathematics) from the Indian Statistical Institute, Bangalore (1996).

She has been a Visiting Mathematician at the International Center for Theoretical Physics, Trieste, Italy (1996), Research Associate at the University of New South Wales, Sydney, Australia (1996-97), Assistant Professor in the Effat College, Jeddah, Saudi Arabia (2000-01), a Faculty member at the ICFAI Institute of Science and Technology, Hyderabad (2003-04) and Assistant Professor at the Indian Institute of Technology Roorkee, Roorkee (2004-06).

Her research interests are Representation theory of Lie groups, Uncertainty Principles in Harmonic Analysis, Wiener-Tauberian theorems.

Bharat Adsul

Bharat Adsul received his B.Tech. (Computer Science and Engineering) degree from the Indian Institute of Technology, Bombay (1997) and Ph.D. (Computer Science and Engineering) degree from the Indian Institute of Technology Bombay (2003).

His research interests include Logic, Concurrency and Combinatorics.

Samir Datta

Samir Datta received his B.Tech. (Computer Science and Engineering) degree from the Indian Institute of Technology, Kanpur (1995), M.S. degree from Rutgers University (1997) and Ph.D. degree from Rutgers University (2004).

He has been a Network Architect at Tellium Inc. (2000-03) and a Post Doctoral Fellow at WINLAB, Rutgers University (2004-05).

His research interests include Complexity Theory, Wireless and High Speed Networking.

R. Srinivasan

R. Srinivasan received his Ph.D. degree in Mathematics from the Indian Statistical Institute and the Institute of Mathematical Sciences (1998).

He has been a Visiting Fellow at the Harish-Chandra Research Institute, Allahabad (1998-2000), Post Doctoral Fellow at the Indian Statistical Institute (2000-01), Post

Doctoral Fellow at Universite d'Orleans, France (2001-02), Visiting Scientist at the Indian Statistical Institute (2002-03), Visiting Fellow at ICTP, Trieste, Italy (2003) and JSPS Post Doctoral Fellow at University of Tokyo, Japan (2003-2005).

His research interests are Operator Algebras and Operator Theory.

Suresh Nayak

Suresh Nayak received his B.Tech. (Computer Science and Engineering) degree from the Indian Institute of Technology, Bombay (1991) and his M.S. and Ph.D. (Mathematics) degree from Purdue University, U.S.A. (1997,1998).

He has been a Visiting Fellow at the Harish-Chandra Research Institute, Allahabad (1999-2001).

His research interests are Algebraic Geometry and Commutative Algebra.

S.P. Suresh

S.P. Suresh received his M.C.A. degree from R.E.C. Tiruchirapalli (1996), his M.Sc. (by Research) from Anna University (1999) and his Ph.D. degree from the Institute of Mathematical Sciences (2003).

His research interests include in Computer Science, Reasoning about Security protocols and Classical Indian Epistemology.

M.K. Vemuri

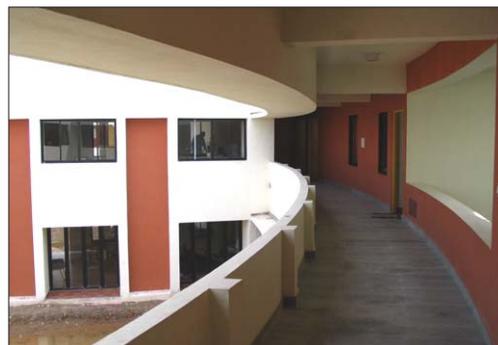
M.K. Vemuri received his M.S. (Mathematics) from Syracuse University, U.S.A. (1989) and Ph.D. from the University of Chicago, U.S.A. (1997).

He has been a Visiting Assistant Professor at Colgate University, U.S.A. (1997-99), an Instructor at Polytechnic University, U.S.A. (1999-2000) and a Teaching Research Associate at Syracuse University, U.S.A. (2000-2002).

His research interest is Analysis.

Awards

- V. Balaji has been elected as a Fellow of the Indian Academy of Sciences.
- V. Balaji has been awarded the Shanti Swarup Bhatnagar Prize in Mathematics for the year 2006.
- C.S. Seshadri has been awarded the Trieste Science Prize for the year 2006.
- C.S. Seshadri has been appointed as National Research Professor by the Government of India.





Publications

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Journal Articles

Mathematics

- (J1) Bharat Adsul and K.V. Subrahmanyam: A Geometric Approach to the Kronecker Problem I: The Two Row case, to appear in the Proceedings of the Indian Academy of Sciences (Mathematical Sciences).
- (J2) V. Balaji: Principal bundles on projective varieties and the Donaldson-Uhlenbeck compactification, *Journal Differential Geometry*, 76, (2007), (arXiv:math.AG/0505106)
- (J3) V. Balaji, A. Dey and R. Parthasarthi: Geometry of parabolic bundles on surfaces-I, (The Donaldson-Uhlenbeck compactification), (to appear in the Proceedings of the Indian Academy of Sciences) (archiv:math.AG/06001274)
- (J4) V. Balaji and J. Kollar: Holonomy groups of stable vector bundles, (to appear in the RIMS Journal, Kyoto University in the Volume dedicated to Prof Hironaka's 77th birthday.) (archiv:math.AG/06001120)
- (J5) V. Balaji, I. Biswas O. Gabber And D.S. Nagaraj: Brauer Obstruction for universal bundles, (to appear in *Comptes Rendus*, Paris).
- (J6) Clare D'Cruz and J. Puthenpurakal: The Hilbert Coefficients of the fiber cone and the ν -invariant of the associated graded ring, to appear in *Canad. J. Math.*
- (J7) S. Senthamarai Kannan: Cohomology of line bundles on Schubert Varieties in the Kac-Moody setting, to appear in the *Journal of Algebra*, April 2007.

- (J8) Shiva Shankar: A Cousin problem for systems of PDE, *Mathematische Nachrichten*, 280, No.4:446-450, 2007.
- (J9) R. Srinivasan and Masaki Izumi: Generalized CCR Flows, 45 pages, math.OA/0705.3280v1, to appear in *Communications in Mathematical Physics*.
- (J10) M. K. Vemuri: Realizations of the canonical representation, to appear in *Proceedings of the Indian Academy of Sciences - Mathematical Sciences*.

Computer Science

- (J11) R Ramanujam and S P Suresh: A (restricted) quantifier elimination for security protocols, *Theoretical Computer Science*, 367, pages 228-256, 2006.

Physics

- (J12) R. Parthasarathy and Alok Kumar: SU(2) Yang-Mills theory in Savvidy background at finite temperature and chemical potential, *Phys.Rev. D75* (2007) 085007.
- (J13) V. V. Sreedhar: On the topological origin of entanglement in Ising spin Glasses, *Modern Physics Letters A22*, No. 3 (2007), 201-208. enumerate

Conference Papers

Mathematics

- (C1) T.Parthasarathy: Bankruptcy Problem, A game theoretic analysis, National Conference on Management Science and Practice, to appear in the conference volume to be published by IIM, Ahmedabad.
- (C2) Shiva Shankar: Control theory and algebraic geometry, *Proceedings of the Ramanujam Mathematical Society*, 2006. enumerate

Computer Science

- (C3) Ganapathy Subramaniam and Rani Siromoney: A new efficient method in DNA computing to solve NP complete problems that are -complete, *Proc of the National Conference on Recent trends in discrete and fuzzy math*, Bharatha Mata College, Kerala.

- (C4) Prakash Chandrasekaran and M. Mukund: Matching Scenarios with Timing Constraints, Proc. 4th International Conference on Formal Modelling and Analysis of Timed Systems (FORMATS 2006), Springer Lecture Notes in Computer Science 4202 (2006) 98-112.
- (C5) Prakash Chandrasekaran, C.L. Conway, J.M. Joy, and S.K. Rajamani: Programming asynchronous layers with CLARITY, to appear in ESEC/FSE 2007, ACM Digital Library Proceedings.
- (C6) Puneet Bhateja, Paul Gastin and M. Mukund: A Fresh Look at Testing for Asynchronous Communication, Proc. 4th International Symposium on Automated Technology for Verification and Analysis (ATVA 2006), Springer Lecture Notes in Computer Science 4218 (2006), 369-383.
- (C7) Tanmoy Chakraborty and Samir Datta: One-Input-Face MPCVP Is Hard for L, But in LogDCFL, Proc. 26th International Conference on Foundations of Software Technology and Theoretical Computer Science (FSTTCS 2006), Springer Lecture Notes in Computer Science 4337 (2006), 57-68.

Preprints and Reports

Mathematics

- (P1) Sundari Maddala: Tangential convergence of bounded harmonic functions on generalised Siegel domain, submitted to the journal of the Australian Mathematical Society.
- (P2) Shiva Shankar, D. Napp and H. Trentelman: Regular implementation in the space of compactly supported functions.
- (P3) Shiva Shankar: Synthesis of differential kernels.
- (P4) M. K. Vemuri: A non-commutative Sobolev estimate and its application to spectral synthesis, submitted to the Tamkang Journal of Mathematics.
- (P5) M. K. Vemuri and Amritanshu Prasad: Eigenfunctions of the Laplace-Beltrami operator on Hyperboloids, submitted to the Tamkang Journal of Mathematics.

Computer Science

- (P6) Prakash Chandrasekaran, C.L. Conway, J.M. Joy, and S.K. Rajamani: Verifiable Design of Asynchronous Software, To appear in Proc. GM RD Workshop on Next Generation Design and Verification Methodologies for Distributed Embedded Control Systems, Bangalore (2007).
- (P7) Prakash Chandrasekaran, C.L. Conway, J.M. Joy, and S.K. Rajamani: Programming asynchronous layers with CLARITY, Technical Report MSR-TR-2007-80, Microsoft Research, 2007.
- (P8) Prakash Chandrasekaran and M. Mukund: Adding time to scenarios, To appear in Proc. GM RD Workshop on Next Generation Design and Verification Methodologies for Distributed Embedded Control Systems, Bangalore (2007).
- (P9) Bharat Adsul, Suresh Nayak and K.V. Subrahmanyam: A Geometric Approach to the Kronecker Problem, II: Invariants of matrices under simultaneous left-right action.

Physics

- (P10) R. Parthasarathy and K.S. Viswanathan: corrections in holographic large QCD and pion-pion scattering", hep-th/07070512. "





Conferences, Visits and External Lectures

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C.S. Seshadri

- Participated in the CIMAT-CMI-VBAC conference on Moduli Spaces and Vector Bundles, in honour of Prof. P.E. Newstead on the occasion of his 65th birthday at CIMAT, Mexico.

R. Sridharan

- Visited the Netaji Subhas Open University, Kolkata and delivered the Third Srinivasa Ramanujan Memorial Endowment Lecture in January 2007.

T. Parthasarathy

- Gave an invited talk on "Bankruptcy Problem, A game theoretic analysis" in the National Conference on Management Science and Practice at the Indian Institute of Technology during March 2007.

R. Parthasarathy

- Visited the Physics Department at the California State University at Fresno and lectured on "SU(2) YM theory at finite temperature", in April 2007.
- Visiting Professor to the Physics Department, Simon Fraser University, Burnaby, Canada, during June-July, 2007.

Rani Siromoney

- Visited St. Peters Engineering College, Chennai.
- Visited Tiruvella in July 2006.
- Fulbright Scholar at MACFAST during July-August 2006.
- Gave a series of lectures given at the Dept of Computer Science, University of Madras, to M.Sc. and M.Phil. students during November 2006 - April 2007.

Shiva Shankar

- Presented a talk on "Control theory and algebraic geometry", at the conference of the Ramanujan Mathematical Society, Central University, Hyderabad, in July 2006.

V. Balaji

- Attended the ICM held in Madrid Spain in August 2006.
- Gave an invited talk in the International Conference in Algebraic Geometry, held in honour of Vikram Mehta's 60th birthday in August 2006 at the Tata Institute of Fundamental Research, Mumbai.
- Attended the VBAC meeting at CIMAT, Guanajuato, Mexico in November-December 2006 for a Conference and Workshop held in honour of Prof Peter Newstead's 65th birthday and gave a course of lectures on "Principal Bundles on projective varieties".
- Visited the University of Toronto during March-April 2007 and gave a course of lectures on "Principal Bundles". Also gave two research seminars in the Symplectic Geometry Seminar of the University of Toronto on "Donaldson-Uhlenbeck spaces for principal bundles and Holonomy groups of stable bundles".

Madhavan Mukund

- Visited Corporate Technology, Siemens, Bangalore and gave a talk entitled "Verification of Message Sequence Charts", in April 2006.
- Visited LSV, ENS de Cachan and LaBRI, University of Bordeaux 1 for one month in May-June 2006 on the Indo-French Networking Research Programme project "Timed and distributed models for control and verification (Timed-DISCOVERI)". Gave a talk entitled "Matching Scenarios with Timing Constraints" at LSV, ENS de Cachan, in May 2006.
- Attended 5th Update Meeting on Advanced Formal Methods, and gave a talk on "Infinite games on finite graphs", at the Indian Institute of Technology, Guwahati, in July 2006.
- Gave an Invited talk on "Verification of timed MSCs" in the Preconference Workshop on Timed Systems, at the Indian Statistical Institute Kolkata, in December 2006.

- Participated in FSTTCS 2006 at the Indian Statistical Institute, Kolkata, in December 2006 and chaired a session.
- Gave an invited talk on "Adding time to scenarios" at the GM RD Workshop on Next Generation Design and Verification Methodologies for Distributed Embedded Control Systems, at Bangalore, in January 2007.
- Visited Microsoft Research India, Bangalore and gave a talk entitled "Verification of Message Sequence Charts" in February 2007.

V.V. Sreedhar

- Visited Raman Research Institute (RRI), Bangalore from January to March 2007 and gave a Colloquium on "Classical Topology and Quantum Entanglement" in March 2007.
- Gave a set of lectures on Quantum Information Theory at RRI, from March to June 2007.

K.V. Subrahmanyam

- Visited TechVista, Microsoft Research India, Bangalore, in January 2007.
- Visited Prof Milind Sohoni, IIT-Mumbai in June 2006.
- Gave a talk on "A history of computability : from intractable to feasible computing" at the Asian School of Journalism, Chennai.
- Gave a course of 6 lectures on Complexity theory, Cryptography and Randomization at SETS, Chennai.

K. Narayan Kumar

- Visited LSV, ENS de Cachan and LaBRI, University of Bordeaux 1 for one month in May-June 2006 on the Indo-French Networking Research Programme project "Timed and distributed models for control and verification (Timed-DISCOVERI)".
- Gave a talk on "The Expressive Power of Linear Time Temporal Logic" at the 5th Update Meeting on Advanced Formal Methods at IIT Guwahati, in July 2006.
- Attended Preconference Workshop on "Timed Systems", ISI Kolkata, in December 2006.
- Attended FSTTCS 2006 at Indian Statistical Institute, Kolkata, in December 2006 and chaired a session.

- Visited the Department of Computer Science and Automation, Indian Institute of Science, Bangalore in January 2006 and gave a talk titled "A Theory of Message Sequence Charts".

S. Senthamarai Kannan

- Gave a talk at the International Conference in Algebraic Geometry, held in honour of Vikram Mehta's 60th birthday in August 2006 at the Tata Institute of Fundamental Research, Mumbai.
- Attended Algebraic Groups Workshop at ISI, Bangalore during December 2006.

Clare D'Cruz

- Participated in ICM-Madrid 2006 at Spain during August 2006.
- Visited Periyar University, Salem and gave a talk on "Grobner Basis and applications to robotics" during March 2006.
- Attended ATM Workshop at Indian Institute of Technology, Chennai.

Sundari Maddala

- Participated in the Instructional Workshop on Analysis, at Periyar University, Salem, in January 2007.

M.K. Vemuri

- Visited Sagun Chanillo at Rutgers in December 2006.
- Lectured at the "Workshop on Analysis" held at Periyar University in Salem, in January 2007.

R. Srinivasan

- Visited Indian Statistical Institute, Bangalore, in March 2006.
- Gave a series of lectures on "Conformal Fields Theory" at the Institute of Mathematical Sciences during April 2006 to March 2007.
- Gave a general talk on "DHR endomorphisms related to CFT" at the Institute of Mathematical Sciences during January 2007.

Prakash Chandrasekaran

- Summer intern at Microsoft Research India, Bangalore, June-August 2006. Worked with with Sriram Rajamani and Joseph Joy.

- Gave a talk on "Matching scenarios with timing constraints" at GM RD, Bangalore in July 2006.
- Attended 5th Update Meeting on Advanced Formal Methods at the Indian Institute of Technology, Guwahati, in July 2006.
- Attended FORMATS 2006 in September 2006, at Paris, France and presented a paper entitled "Matching Scenarios with Timing Constraints".
- Attended FSTTCS 2006 in December 2006, at Indian Statistical Institute, Kolkata.
- Attended IRISS 2007 in January 2007, at Hyderabad.
- Attended GM RD Workshop in January 2007, at Bangalore.

A Baskar

- Attended ISEA Course on Security during May-June 2006 held at the Institute of Mathematical Sciences, Chennai and gave a talk on "Electronic Voting Protocols".
- Attended 5th Update Meeting on Advanced Formal Methods at the Indian Institute of Technology, Guwahati, in July 2006.
- Attended IRISS'07 in January 2007 at IIIT Hyderabad and gave a talk entitled "Is an electronic voting protocol receipt-free?".

Puneet Bhateja

- Attended FSTTCS 2006 at Indian Statistical Institute, Kolkata.
- Attended IRISS'07 in January 2007 at IIIT Hyderabad and gave a talk.
- Presented a paper entitled " A Fresh Look at Testing for Asynchronous Communication" at the 4th International Symposium on "Automated Technology for Verification Analysis" in October 2006 at Beijing, China.

Nagarajan Krishnamurthy

- Attended FSTTCS 2006, during December 2006 at ISI Kolkata. Attended Workshops on "timed automata" and "approximation algorithms".
- Attended Workshop on Algorithms for Data Streams, in December 2006 at the Indian Institute of Technology, Kanpur.



Other Professional Activities

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Shiva Shankar

- Associate Editor, International Journal on Multidimensional Systems and Signal Processing, Springer Verlag.
- Member of an IEEE Technical Committee in the area of Control Theory.

Madhavan Mukund

- Member, Editorial Board, Formal Methods Letters.
- Member, Editorial Board, Transactions on Petri Nets and Other Models of Concurrency (ToPNoC).
- Member, Program Committee, 27th International Conference on Application and Theory of Petri Nets (ICATPN 2006), Turku, Finland, 2006.
- Member, Program Committee, 33rd International Colloquium on Automata Languages and Programming (ICALP 2006), Venice, Italy, 2006.
- Member, Program Committee, 4th IEEE International Conference on Software Engineering and Formal Methods (SEFM 2006), Pune, India, 2006.
- Member, Program Committee, 26th International Conference on Foundations of Software Technology and Theoretical Computer Science (FSTTCS 2006), Kolkata, India, 2006.
- Secretary, Indian Association for Research in Computing Science (IARCS).
- National Coordinator, Indian Computing Olympiad.
- Team Leader of the Indian team, International Olympiad in Informatics, Merida, Mexico, August 2006.
- Column editor, "News from India", Bulletin of the European Association for Theoretical Computer Science (EATCS).

K. Narayan Kumar

- Coach and Deputy Team Leader of the Indian team, International Olympiad in Informatics, Merida, Mexico, August 2006.



Undergraduate / Graduate Courses

Course	Instructor
■ Algebra I	Shiva Shankar
■ Calculus I	T. Parthasarathy
■ English	Shreekumar Varma
■ Classical Mechanics I	R. Jagannathan, IMSc.
■ Introduction to Programming I	Madhavan Mukund
■ Overview of Physics	G. Rajasekaran
■ Algebra III	Suresh Nayak
■ Design Analysis of Algorithm	K.V. Subrahmanyam
■ Analysis I	S. Kesavan
■ Calculus III	Murali K. Vemuri
■ Algebra IV	R. Sridharan
■ Ordinary Differential Equations	R. Srinivasan
■ Theory of Computation	K. Narayan Kumar
■ Mathematical Physics	K.S. Balaji
■ Property of Matter	R. Shankar, IMSc.
■ Quantum Mechanics I	R. Parthasarathy
■ Quantum Mechanics III	Tulsi Dass
■ Statistical Physics II	Gautam Menon, IMSc.
■ Condensed Matter Physics	Purusattam Ray, IMSc.

- Special Topics Quantum Mech P.P. Divakaran
- Physics Laboratory M. Veerabhadra Rao
- Commutative Algebra Clare D'Cruz
- Measure Integration S. Kesavan
- Algebraic Topology V. Balaji
- Elementry Differential Geometry C.S. Aravinda
- Representation Theory of Finite Groups S. Senthamarai Kannan
- Basic Programming Laboratory Madhavan Mukund
- Operating Systems Prakash Chandrasekaran
- Software Engineering Samir Datta
- Theory of Computation K. Narayan Kumar
- Automata, Logics, Games and Algebra K. Narayan Kumar
- Computer Security S.P. Suresh
- Computer System Verification Bharat Adsul
- Algebra II Clare D'Cruz
- Calculus II Charles Vial, Olivier Dudas,
..... Thomas Vidick Cyril Demarche,
..... ENS, France
- Discrete Mathematics Samir Datta
- Introduction to Programming II Madhavan Mukund
- Economics S.K. Shanti
- Analysis II Shiva Shankar
- Computer Organisation S.P. Suresh
- Electromagnetism I T.R. Govindarajan, IMSc.
- Topology M. Sundari
- Programming Language Concept K. Narayan Kumar
- Probability P. Vanchinathan

- Classical Mechanics II V. Balakrishnan, IIT Madras
- Statistical Physics I..... S. Sivakumar, IGCAR, Kalpakkam
- Atomic Molecular Physics R. Parthasarathy
- Quantum Mechanics II R. Simon, IMSc.
- Electromagnetism II N. Subramanian/
..... T.R. Ravindran, IGCAR, Kalpakkam
- Nuclear Particle Physics Samir Bose,
..... Notre Dame University, U.S.A.
- Gravitation Cosmology K. Subramanian, IUCAA, Pune /
..... R. Srianand, IUCAA, Pune
- Algebra S. Senthamarai Kannan
- Functional Analysis V.S. Sunder, IMSc.
- Complex Analysis R. Sridharan
- Compilers S.P. Suresh
- Logic Bharat Adsul
- Timed and Hybrid Systems Madhavan Mukund
- Lie Theoretic Methods in Analysis Alladi Sitaram, ISI, Bangalore
..... Amritanshu Prasad, IMSc.
- Riemannian Geometry Murali K. Vemuri
- Representation Theory V. Lakshmbai,
..... Northeastern University, U.S.A.
- Optimization Techniques T. Parthasarathy



Courses, Special Lectures

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- R. Parimala, Tata Institute of Fundamental Research, Mumbai, delivered the INSA Srinivasa Ramanujan Medal Lecture 2006 on "Some open questions concerning rational points on homogeneous spaces" (July 2006).
- K.S. Sudeep gave a talk on "Matched-factor d -domatic Colouring of Graphs" (July 2006).
- Prakash Chandrasekaran gave a talk on "Matching scenarios with timing constraints" (September 2006).
- Puneet Bhateja gave a talk on "A fresh look at testing for asynchronous communication" (October 2006).
- Dr. M. Sundari gave a talk on "Uncertainty Principles in Harmonic Analysis" (November 2006).
- Bharat Adsul gave a talk on "The problem of tensor product multiplicities for the symmetric group" (December 2006).
- Sudarshan Ananth gave a course of lectures on "Quantum Field Theory"(January 2007).
- H.S. Mani gave a course of lectures on "Astronomy Astrophysics" (January-February 2007).
- S. Ramanan gave a talk on "Complete Intersections and Riemann-Roch (to be concluded)" (March 2007).
- C.S. Aravinda gave a talk on "Poincare conjecture or Hamilton-Perelman theorem" (March 2007).



Visitors

- Partha Sarathi Chakraborty, Institute of Mathematical Sciences, Chennai. Gave a talk on "An Invitation to Noncommutative Geometry" (April 2006).
- Navin Goyal, McGill University, Montreal, Canada. Gave a talk on "Lower Bounds for The Cooperative Noisy Broadcast Problem" (April 2006).
- B.P. Purnaprajna, University of Kansas, U.S.A. Gave a talk on "On the geometry of surfaces of general type" (April 2006).
- Upendra Kulkarni, ISI, Bangalore. Gave a talk on "Algebraic groups in characteristic p: line bundles, Ext groups and sum formulas" (April 2006).
- David Sinnou, University of Paris VI, France. Gave a talk on "Mordel-Lang Problems" (July 2006).
- Rajgopal Kannan, Louisiana State University. Gave a talk on "Approximation Algorithms for Power-Aware Scheduling of Wireless Sensor Networks with Rate and Duty-Cycle Constraints" (July 2006).
- Valentino Tosatti, Harvard University. Gave a talk on "Constant scalar curvature Kaehler metrics and the Calabi flow" (July 2006).
- Arnaud Sangnier, LSV, ENS de Cachan, France. Gave a talk on "From pointer systems to counter systems using shape analysis" (August 2006).
- Anandam Banerjee, Northeastern University, Boston, U.S.A. Gave a talk on "Zero-cycles on hypersurfaces of low degree" (August 2006).
- Raghav Kulkarni, University of Chicago. Gave a talk on "Determinant, Permanent and their Planar Restrictions" (August 2006).

- Ramarathnam Venkatesan, Microsoft Research, Redmond and Bangalore. Gave a talk on "Three applications of Spectral gaps/Expander graphs in cryptography" (September 2006).
- V.V. Sreedhar, IIT, Kanpur. Gave a talk on "The Maximal Invariance Group of Fluid Mechanics" (November 2006).
- Zachary Treisnman, TIFR, Mumbai. Gave a talk on "Arcs in Algebraic Geometry" (November 2006).
- Rajaram Nityananda, NCRA-TIFR, Pune. Gave a talk on "Elementary optics from an advanced standpoint" (November 2006).
- Paul Gastin, LSV, ENS de Cachan, France. Gave a talk on "Distributed synthesis for synchronous systems" (December 2006).
- Upendra Kulkarni, ISI, Bangalore. Gave a talk on "Tilting modules for algebraic groups" (December 2006).
- M.P. Murthy, University of Chicago, U.S.A. Gave a talk on "Grothendieck groups of Samuel Algebras" (December 2006).
- M. Ram Murty, Queen's University, Canada. Gave a talk on "Generalised Euler constants" (December 2006).
- S.D. Adhikari, Harish-Chandra Research Institute, Allahabad. Gave a talk on "Zero-sum problems in combinatorial number theory" (January 2007).
- Jaikumar Radhakrishnan, TIFR, Mumbai. Gave a talk on "List decoding for Reed-Solomon Codes" (January 2007).
- Andrea Maffei, Universita di Roma "La Sapienza", Italy. Gave a talk on "Equations defining symmetric varieties and affine grassmannians" (January 2007).
- Pagnon Ngoc Gioan Jean, ICTP, Trieste, Italy. Gave a talk on "Generic Fiber of the Springer fiber of type A" (January 2007).
- Sambuddha Roy, IBM India Research Lab, Delhi. Gave a talk on "Ramsey Numbers and Decision Trees for Entity Identification" (January 2007).
- Pagnon Ngoc Gioan Jean, ICTP, Trieste, Italy. Gave a talk on "The dual approach to the Springer fiber = orbital variety" (January 2007).

- Sudarshan Ananth. Gave a talk on "Lie Algebras in Particle Physics" (January 2007).
- M.S Raghunathan, Tata Institute of Fundamental Research, Mumbai. Gave talks on "Geometry's dictat to Arithmetic (The work of Faltings)" and "Arithmetic's dictat to Geometry" (February 2007).
- Adam Koranyi, CUNY, U.S.A.. Gave a talk on "An elementary construction of the symmetric spaces of rank one" (February 2007).
- Govind Krishnaswami, Utrecht University, The Netherlands. Gave a talk on "Approximation methods for large-N matrix models" (February 2007).
- Charles Vial, ENS, France. Gave a talk on "Rational and numerical equivalence for varieties of abelian type over finite fields" (February 2007).
- Olivier Dudas, ENS, France. Gave a talk on "Some properties of the Deligne-Lusztig varieties" (February 2007).
- Mokshay Madiman, Yale University, U.S.A. Gave a talk on "An "Informative" Tour through parts of Probability-nadu" (February 2007).
- Manfred Kufleitner, LaBRI, Univ Bordeaux I, France. Gave a talk on "Trace languages and the variety DA" (March 2007).
- N. Mukunda, IISc., Bangalore. Gave a talk on "Space and Time in Life and Science" (March 2007).
- M.V. Panduranga Rao, IISc, Bangalore. Gave a talk on "Quantum Finite Automata: The Next Frontier in Automata Theory?" (March 2007).





N.K. Rajendiran & Co.,
Chartered Accountants

FORM NO. 10-B
(See Rule 17 - B)

AUDITOR'S REPORT

Audit report u/s 12A(b) of the Income Tax Act 1961, in case of charitable or religious Trust or institutions

We have examined the Balance sheet of **CHENNAI MATHEMATICAL INSTITUTE**, Plot No. H1, SIPCOT IT Park, Siruseri 603 103 as at 31st March 2007 and also the Income & Expenditure Account for the year ended on that date which are in agreement with the books of accounts maintained by the said Institution.

We have obtained all the information and explanations, which to the best of our knowledge and belief, were necessary for the purpose of our audit. In our opinion, proper books of account, have been kept by the Head Office and the Branches of the above named institution visited by us so far as appears from our examination of the books, and proper returns adequate for the purposes of Audit have been received from Branches not visited by us.

In our opinion, and to the best of our information and according to the information given to us the said accounts give a true and fair view.

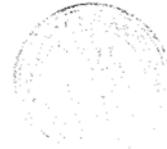
- i) in case of Balance Sheet, of State of affairs of the above named Institution as at 31st March 2007, and
- ii) in case of Income & Expenditure Account, of the Excess of Expenditure over Income for the year end on that date.

Prescribed particulars are annexed hereto.

FOR N.K.RAJENDIRAN & CO.
Chartered Accountants.

Place: Chennai
Date: 13.09.2007

N.K. Rajendiran
(N.K.RAJENDIRAN)
PROPRIETOR



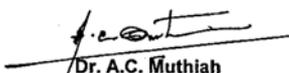
**CHENNAI MATHEMATICAL INSTITUTE
PLOT NO. H1, SIPCOT IT PARK, SIRUSERI, 603 103.**

BALANCE SHEET AS AT 31ST MARCH 2007

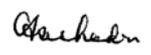
<u>SOURCES OF FUNDS</u>	SCH	31.03.2007 Rs.	31.03.2006 Rs.
Capital Fund	A	13499597	13499597
Endowment Fund	B	40750000	23250000
Project Fund	C	45231702	12148910
Revenue Surplus	D	7725733	14317313
TOTAL		<u>107207032</u>	<u>63215820</u>

APPLICATION OF FUNDS

Fixed Assets	E	70007914	45317756
Investments	F	19802584	15584654
<u>Current Assets, Advances & Deposits</u>			
Current Assets	G	1068605	750486
Advances and Deposits	H	298699	1875136
Project Expenses - BRNS/DST		18475500	3532747
Total		<u>19842804</u>	<u>6158369</u>
Less: Current Liabilities	I	<u>2446271</u>	<u>3844959</u>
Net Current Assets		17396534	2313410
TOTAL		<u>107207032</u>	<u>63215820</u>
Notes forming part of Accounts	J		
Significant Accounting Policies	K		

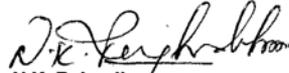

Dr. A.C. Muthiah
Founder Trustee


Shri K. Madhava Sarma
Trustee/Secretary


Prof. C.S. Seshadri
Trustee/Director



As per our report of even date annexed
For M/s. N.K. Rajendiran & Co.,
Chartered Accountants


N.K. Rajendiran
Proprietor



Place : Chennai
Date : 13/9/2007

CHENNAI MATHEMATICAL INSTITUTE
PLOT NO. H1, SIPCOT IT PARK, SIRUSERI, 603 103.

INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH 2007

<u>INCOME</u>	SCH	31.03.2007 Rs.	31.03.2006 Rs.
Voluntary Contributions	L	20569200	18770750
Fee Receipts	M	405210	538960
Interest on Investments	N	1551857	798573
Other Receipts	O	49105	14750
TOTAL		<u>22575372</u>	<u>20123033</u>
<u>EXPENDITURE</u>			
Research & Establishment	P	15811402	11919477
Operational Expenses	Q	6513927	7902049
Administrative & General Expenses	R	1327482	591066
Depreciation		5514141	2738703
TOTAL		<u>29166953</u>	<u>23151296</u>
Excess of Expenditure Over Income transferred to Balance Sheet		6591580	3028263


Dr. A.C. Muthiah
 Founder Trustee

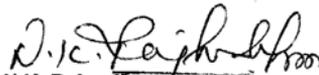

Shri K. Mahava Sarma
 Trustee/Secretary


Prof. C.S. Seshadri
 Trustee/Director



As per our report of even date annexed
For M/s. N.K. Rajendiran & Co.,
 Chartered Accountants

Place : Chennai
 Date : 13/9/2007.


N.K. Rajendiran
 Proprietor

