



## Summary of Activities

August 2010

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The Mathematical Sciences Foundation (MSF) has been engaged for over several years in pioneering work through several innovative programmes related to the teaching, understanding, learning and application of mathematics at the school, college and post-graduate levels. We believe in hands-on education in which research by students and faculty is an integral part. **The Foundation is creating a role model for higher education in India.** The vehicle that drives this role model is the discipline of mathematics and its myriad connections in a broad and liberal fashion to all areas of human endeavour.

MSF is a registered non-profit educational society (under the Societies Registration Act of 1860). **The ICICI Bank** is an institutional member of MSF. Our activities have been supported by ICICI Bank, NASSCOM, Tata Interactive Systems, National Board for Higher Mathematics, National Board for Bamboo Application, University of Houston, NIIT and various other bodies and individuals.

**MSF faculty has studied and worked at leading institutions of the world**, such as Oxford, Imperial College, Berkeley, Purdue, TIFR, IITs, Indian Statistical Institute, University of Delhi, University of Houston, Warwick, etc.

**We are creating an environment that will attract the best minds from all over the world** – whether as students who come to study, or as faculty, or as researchers for post-doctoral fellowships and further.



# MATHEMATICAL SCIENCES FOUNDATION

## Our Mission

- Nurture **out-of-the-box thinking** leading to innovations and inventions relevant for industry and the world.
- Nurture **young minds**, especially from the **less privileged segments of society**, so as to enable them to find their goals in life with the use of mathematical skills.
- Create a **consulting mechanism** that shall foster and engender a deep interaction between the corporate/industrial world and the ideas of the institute for practical gains and uses.
- Help create the right environment in the country for the needs of the nation and civil society to be served through **regular programmes of training and mentoring** for other institutions and groups of individuals.
- Act as a **magnet for leading scientists and mathematicians** from different parts of the world who shall stay linked with us to create the right environment for our activities.
- Market our **products and services** to academic and corporate institutions the world over.
- Run **innovative certificate/diploma/degree courses**.
- Design and teach “hands-on” **undergraduate programmes** with recognition from leading universities of India and other countries.
- Design and teach **part-time programmes** of various levels (e.g. basic software training, Business Statistics, Mathematical Finance, and Image Processing).
- Design and teach **post-graduate programmes**.
- Develop **material for schools**.
- Run academic programmes for **school students**.
- Run academic/training programmes for **school teachers**.
- Create **collaborative programmes with universities** from across the world.
- Provide **special services** to students and faculty of other institutions.
- Conduct **online programmes** and also **broadcast on TV and radio**.



# MATHEMATICAL SCIENCES FOUNDATION

## Office Bearers

**Chairman:** **Mr. Naresh Chandra**

Former Cabinet Secretary and Former Ambassador to the USA

**Director:** **Dr. Dinesh Singh**

Director, University of Delhi, South Campus  
Chairman, Institute of Informatics and Communication, University of Delhi  
Professor, Department of Mathematics, University of Delhi  
Adjunct Professor, Department of Mathematics, University of Houston

**Deputy Director & Secretary:**

**Dr. Sanjeev Agrawal**

Associate Professor, Department of Mathematics, St. Stephen's College

**Deputy Director & Treasurer:**

**Dr. Geetha Venkataraman**

Professor, School of Undergraduate Studies and School of Liberal Studies,  
Ambedkar University, Delhi  
Associate Professor, Department of Mathematics, St. Stephen's College  
(on leave)

## Executive Council

**Mr. Naresh Chandra**

**Dr. Dinesh Singh**

**Dr. Sanjeev Agrawal**

**Dr. Geetha Venkataraman**

**Dr. Radha Mohan**

Associate Professor, Department of Mathematics, St. Stephen's College

**Mr. Jaitirth Rao**

Former Chairman, Mphasis BFL  
Former Chairman, NASSCOM

**Mr. Ravi Bahl**

Managing Director, ChrysCapital  
Former Head, Citibank (Indonesia)

**ICICI Bank Ltd.** – represented by:

**Ms. Madhabi Puri Buch**

Managing Director and CEO, ICICI Securities  
Director, ICICI Venture

**Mr. John Alexander**

Vice President, J.M. Baxi & Co.



# MATHEMATICAL SCIENCES FOUNDATION

## Registration with Government Bodies

- MSF is registered, since 2002, with the Registrar of Societies, Delhi, as a charitable association under the Societies Registration Act of 1860. Our registration number is S42981 of 2002. Our registered address is

45 (Ground Floor)  
World Trade Centre  
Babar Road, Connaught Place  
New Delhi 110001

- MSF has a **12A exemption** – as an educational society – from paying income tax.
- Donations to MSF have been exempt from income tax under **80G**. (Most recently, vide Order No. DIT(E) 2007-08/ M-1012/1148, granting us exemption for 2007-2010. We are currently in the process of applying for exemption for the current financial year.)
- MSF is registered under **FCRA** and so can receive donations/payments in foreign currency. The FCRA registration no. is 231660733.
- MSF is also registered to pay **service tax** (Payer code: AAATM 8952 FST 001)
- Our **TAN** is DELM 07727 G and **PAN** is AAATM 8952 F.
- MSF is registered with the **Central Plan Scheme and Monitoring System (CPSMS)**, allowing us to receive grants from ministries of the Government of India. Our unique agency code is MSF.

## A Brief History

The roots of MSF go back to the **mid 1990s** and lie in the educational and research activities undertaken by a group of Mathematicians from several institutions, such as **University of Delhi, St. Stephen's College, Indian Institute of Technology** and the **Indian Statistical Institute**. Later, they were joined by some Economics and Physics faculty from St. Stephen's College.

The early projects were mostly carried out with funding from the **Department of Science and Technology (DST)**, Govt. of India. Notable amongst these was the project titled *Mathematics in the Modern World (MMW)*, which ran from 1995 to 2001, and aimed at showing the applicability of Mathematics in solving real life problems.

The MMW project made **extensive use of computers**, especially in the form of interactive programs that allow the viewer the opportunity to work his own way through the arguments. It made it possible for the layperson with a modest background in mathematics to understand and appreciate the role played by Mathematics in our everyday lives as well as in disciplines such as Economics, Physics and Computer Science. It enabled faculty and students to engage in interesting applications-oriented research work, which is extremely relevant in industry and in the corporate sector.

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This work was presented at the annual meetings of the **Indian Science Congress** held at Calcutta (1995), Delhi (1996), Hyderabad (1998), Chennai (1999) and at IARI, Delhi (2001) as well as at a science fair held in IIT-Delhi in 2000.

In 1998, these varied activities were consolidated into the **Centre for Mathematical Sciences** (CMS), housed at St. Stephen's College. In 2000, significant funding was obtained from the ICICI Bank, and the CMS became the **ICICI Centre for Mathematical Sciences**, or ICMS.

Many innovative programmes were created under the rubric of ICMS. They soon grew to a point where ICMS was no longer sufficient for housing and supporting them. Thus, the MSF was founded in July 2002, with the support of many leading citizens of India (who became its founding members) and with ICICI Bank as an **institutional member**.

The founder chairman of the Foundation was **Dr Anil Wilson** (Principal of St. Stephen's College, and later Vice-Chancellor of Himachal University).

### Faculty

<b>Dr Dinesh Singh</b> <ul style="list-style-type: none"><li>• MA (Delhi)</li><li>• PhD (Imperial College)</li></ul>	Director, Mathematical Sciences Foundation; Director, University of Delhi South Campus; Chairman, Institute of Informatics and Communication, University of Delhi; Professor, Department of Mathematics, University of Delhi; Adjunct Professor, Department of Mathematics, University of Houston
<b>Dr. Sanjeev Agrawal</b> <ul style="list-style-type: none"><li>• MA (Oxford)</li><li>• PhD (Delhi)</li></ul>	Adjunct Faculty, Mathematical Sciences Foundation Associate Professor, Department of Mathematics, St. Stephen's College, University of Delhi
<b>Dr. Amber Habib</b> <ul style="list-style-type: none"><li>• MS (IIT Kanpur)</li><li>• PhD (Berkeley)</li></ul>	Professor, Mathematical Sciences Foundation
<b>Dr. Lal Mohan Saha</b> MSc (Patna), PhD (Calcutta)	Professor, Mathematical Sciences Foundation
<b>Dr. Geetha Venkataraman</b> <ul style="list-style-type: none"><li>• MA (Oxon)</li><li>• DPhil (Oxon)</li></ul>	Adjunct Faculty, Mathematical Sciences Foundation  Professor, School of Undergraduate Studies and School of Liberal Studies, Ambedkar University, Delhi  Associate Professor, Department of Mathematics, St. Stephen's College, Delhi (on leave)



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<b>Dr. Radha Mohan</b> <ul style="list-style-type: none"><li>• PhD (Purdue)</li></ul>	Associate Professor, Department of Mathematics, St. Stephen's College, Delhi
<b>Dr. Shobha Bagai</b> <ul style="list-style-type: none"><li>• PhD (IIT Delhi)</li></ul>	Adjunct Faculty, Mathematical Sciences Foundation Associate Professor, Shyama Prasad Mukherjee College, Delhi
<b>Ms. Charu Sharma</b> <ul style="list-style-type: none"><li>• BSc Mathematics (St. Stephen's College)</li><li>• MS Applied Mathematics (Houston)</li></ul>	Senior Lecturer, Mathematical Sciences Foundation
<b>Mr. Niteesh Sahni</b> <ul style="list-style-type: none"><li>• MS Maths (Delhi)</li><li>• MPhil (Delhi)</li></ul>	Senior Lecturer, Mathematical Sciences Foundation
<b>Mr. Ziaur Rehman</b> <ul style="list-style-type: none"><li>• BSc(G) (Delhi)</li><li>• BEd (Aligarh)</li></ul>	Senior Lecturer, Mathematical Sciences Foundation
<b>Mr. Tanmoy Neog</b> <ul style="list-style-type: none"><li>• BA(H) Maths (St. Stephen's College)</li><li>• MSc Financial Maths (Warwick)</li></ul>	Senior Lecturer, Mathematical Sciences Foundation
<b>Mr. Syed F Sattar</b> <ul style="list-style-type: none"><li>• BSc(G) (Meerut)</li><li>• MSc Statistics (Meerut)</li></ul>	Lecturer, Mathematical Sciences Foundation
<b>Ms. Meghna Nag Chowdhuri</b> <ul style="list-style-type: none"><li>• BA(H) Maths (Hans Raj College)</li><li>• MSc Applicable Maths (LSE)</li></ul>	Lecturer, Mathematical Sciences Foundation
<b>Mr Anjani Kumar</b> <ul style="list-style-type: none"><li>• BA (Allahabad)</li><li>• MSc (IT) (Sikkim Manipal University)</li></ul>	Computer Programmer, Mathematical Sciences Foundation



# MATHEMATICAL SCIENCES FOUNDATION

## Recent Activities

### Undergraduate Level Programmes

The Foundation offers part-time courses in applications of mathematics: **Mathematical Finance**, **Corporate Finance**, and **Mathematical Simulation with Information Technology**. Our **Excel in Business Finance** course is currently taught to about 2000 students at various business school campuses.

**Nurture Programme for college students:** The Foundation conducts special programmes throughout the academic year as well as in vacation periods to nurture mathematical talent at college level. Special reading seminars in diverse areas like Graph Theory, Game Theory, Group Actions, Topological Groups, Econometrics, Optimization, Encryption, Image Recognition, Spectral Theory for Compact Operators, Applications in Linear Algebra, Stellar Systems have been held. **Students of this programme have done original research.**

**Work & Learn Programme:** A summer programme in which undergraduate and graduate students serve an internship with MSF. The internship combines study and work, with students learning computer and mathematical skills and employing them on diverse projects ranging from image processing to education technology.

In 2009 this was expanded into **Inviting All Young Minds**, a month-long summer internship featuring 70 high school and college students from all over India. IAYM 2009 was hosted at Delhi Public School, R.K. Puram, New Delhi, during June 1-27, 2009. It was partly sponsored by the **National Council for Science and Technology Communication**.

**IAYM 2010** was conducted at The Air Force School, Subroto Park, New Delhi during June 1-29 2010 and featured 50 high school and college students from all corners of the country. IAYM 2010 was supported by the **Department of Science and Technology**, **NIIT** and **Mr Narayana Murthy** (founder, Infosys).

**Innovative Use of Bamboo:** In this one-year project funded by the **National Mission for Bamboo Application**, MSF is exploring the use of bamboo in creating low-cost educational aids and labour-saving devices. In June 2010, 8 student interns worked full time on this project, together with MSF faculty and designers and craftsmen from Rhizome, Ahmedabad. This has already led to several innovative teaching aids that demonstrate mathematical and physical principles, a device that uses footfalls to generate electricity, and a design for a bamboo-based bus shelter.

**From A Life of Mathematics:** Under this programme, the Mathematical Sciences Foundation has invited leading mathematicians of the world to Delhi to reside, lecture and interact with students and faculty. Visitors lecture on their own work, the personal experiences that have shaped their lives and their work, and on aspects of the history of mathematics related to their work. The lectures are meant to be accessible to undergraduates - over the years they have received a tremendous response from both students and faculty.

One very important feature of this programme is the informal, and very often unscheduled, interaction between the undergraduates and the senior practicing mathematician. These interactions take place in lecture rooms, offices; over breakfasts, lunches & dinners; on walks in the city – in fact, anywhere and anytime. This has provided a very ‘human face’ to academics and has motivated many students.



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Between 2001 and 2009, nine 'From a Life of Mathematics' seminars have taken place. The invited speakers include **Sir Michael Atiyah** (Fields Medal, Abel Prize, Past President of Royal Society), **M S Narasimhan** (FRS), **Henry Helson** (Professor Emeritus, Berkeley), **Marie-Francoise Roy** (Past President, French Mathematical Society), **Kenneth Ross** (Past President, Mathematical Association of America), **Lars Inge Hedberg** (Past President, Swedish Mathematical Society), **Jean-Paul Pier** (Past President, Luxembourg Mathematical Society), **I. Grattan-Guinness** (University of Middlesex), **Deborah Hughes-Hallett** (Harvard University), **Volker Peckhaus** (University of Erlangen), **Garrett J Etgen** (Former Chairman, Department of Mathematics, University of Houston), **Martin Golubitsky** (President SIAM), **William Fitzgibbon** (Dean, College of Technology, Houston), **Wenlin Li** (Past President, Chinese Society for History of Mathematics), **Vitali Milman** (Past President, Israeli Mathematical Union), **Nachum Dershowitz** (University of Tel Aviv), and **Peter Fillmore** (Past President, Canadian Mathematical Society).

### Postgraduate Level Programmes

The Foundation offers courses at the **Masters level** in **Mathematics, Physics and Computer Science**. These courses train the participants to pursue careers in pure mathematics as well as in applicable mathematics. Graduates of these courses are admitted to the graduate programmes of the **University of Houston** with full credit, financial aid, and a tuition waiver. 45 students have gone to Houston under this programme, and many have now entered successful careers in both academia and the corporate world.

**Organising Talks and Seminars and Visits by eminent scientists, mathematicians and corporate leaders:** Several talks are arranged throughout the year and eminent personalities visit the Foundation. These talks and visits have been of great help to students as well as the faculty.

### Research & Publications

The faculty and students associated with the Foundation are actively involved in research in mathematics. A research monograph, co-authored by a faculty member of the Foundation, has been published by Cambridge University Press. Several research papers have been communicated to international journals for publication.

Major areas of research are Wavelets, Harmonic Analysis, Differential Geometry, Lie Groups, Functional Analysis, Numerical Analysis, Algebra, Econometrics, Statistical Inference, Bioinformatics, etc.

Our faculty has also completed two Department of Science and Technology, Government of India, research projects entitled

- (1) Enumeration of Types of Finite Groups and Associated Topics, &
- (2) Linear Mappings Associated with Banach Spaces of Functions.



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## Sample of MSF Publications

### Articles

- Dinesh Singh (with M. Raghupathi) *Function Theory in Real Hardy Spaces* Mathematische Nachrichten (to appear).
- Dinesh Singh (with Snehlata and M. Mittal) *A Finite Multiplicity Helson-Lowdenslager-de Branges Theorem in  $L^2$* . Studia Mathematica (to appear).
- G. Litak, L. M. Saha and M. Ali. *Continuous and Pulsive Feedback Control of Chaos*, Recent Progress in Controlling Chaos, by Miguel A. F. Sanjuan and Celso Grebogi, World Scientific (eBooks), (2010) 337 – 369.
- Dinesh Singh, An article in Hindi on the Life of Evariste Galois; *Ganitagya Evariste Galois; Heratnak Zindagi aur Maut Ki Kahani*, Naya Path June 2009, 35-40.
- K. Davidson, V. I. Paulsen, M. Raghupathi and Dinesh Singh. *A Constrained Nevanlinna-Pick interpolation problem*. Indiana University Math. Journal 58(2), 2009, 709-732.
- M. K. Das, Pankaj Narang, M. Yuasa and L. M. Saha. *On particle trajectories in restricted 3-body problem including the effect of radiation: Sun-Jupiter system*. Astrophys. Space Sc. 314, (2008) 59 – 71.
- Harmonic Analysis on the Unit Circle: A Personal Perspective; The Mathematics Student 2007.
- Geetha Venkataraman. *Teaching Students to Think*, Economic and Political Weekly, August 25, 2007.
- Vern I. Paulsen and Dinesh Singh. *Extensions of Bohr's Inequality*. Bull. London Math. Soc. 38 (2006), 991-999.
- Dinesh Singh. *The Spectrum in a Banach Algebra*. Amer. Math. Monthly. 113 (2006) 756-758.
- Vern I. Paulsen and D. Singh, *Modules over subalgebras of the disk algebra*, Indiana University Mathematics Journal, 55(5), 2006, 1751-1766.
- Dinesh Singh *The Infinitude of the Primes* Amer. Math. Monthly, 111(2004), 1863.
- Vern I. Paulsen and Dinesh Singh. *On Bohr's Inequality for Uniform Algebras*. Proc. Amer. Math. Soc. 32 (2004) 493-512.
- Amber Habib. *Direct limits of Zuckerman Derived Functor Modules*. Journal of Lie Theory, 11 (2001) 339-353.
- Radha Mohan. *The Core of a Module over a Two-Dimensional Regular Local Ring*. Journal of Algebra 189 (1997), 1-22.
- Sanjeev Agrawal and Dinesh Singh. *De Branges spaces contained in some Banach spaces of analytic functions*; Illinois Journal of Mathematics, Vol. 39 (1995).



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## Books

- **Enumeration of Finite Groups**, Geetha Venkataraman, Peter Neumann and Simon Blackburn. Cambridge University Press, 2007.
- **Wavelets and Allied Topics**, Dinesh Singh, J. Prestin et. al, Narosa, 2001, New Delhi.
- **Functional Analysis and Operator Theory**, Dinesh Singh and B. S. Yadav, Lecture Notes in Mathematics (1511), Springer-Verlag.
- **Understanding Mathematics**, K B Sinha, Dinesh Singh, Rajeeva Karandikar et. al, Universities Press.
- **Course in Mathematics**, Sanjeev Agrawal, recommended course book for CBSE and ICSE.
- **The Calculus of Finance**, Amber Habib (To be published by Universities Press in 2010).

## Consultancy Reports

- Modeling the Daily Cash Requirements of \*\*\*\*\* Bank Branches, 2007.
- On Real Estate Pricing for \*\*\*\*\* Bank, 2002.

## Conferences and Workshops

**International Research Conference:** *Mathematics in the Twentieth Century. In Commemoration of the Birth Centenary of Andre Weil.*

The Mathematical Sciences Foundation organized an international conference from Jan 2 to 5, 2006 at New Delhi. The conference was in commemoration of the birth centenary of Andre Weil, the famous French mathematician who, as a young professor in his early twenties, had come from Paris to India to teach at Aligarh University in 1930. The conference was inaugurated by Prof. Deepak Pental, Vice Chancellor, Delhi University.

The conference was co-sponsored by the Embassy of France in collaboration with the French Mathematical Society. **Distinguished mathematicians from France, Canada, China, USA, Australia, Luxembourg, Italy, Chennai, Bangalore, Mumbai and Delhi** shared their thoughts on a common platform, and made impressive presentations on the theme of Mathematics in the Twentieth century, interspersed with remembrances of Andre Weil. During the four days of the conference, Indian professors, mathematics research scholars and students also had the opportunity of meeting and interacting with the top mathematicians of the world during the breaks for lunch and tea. The conference was very well attended, and attracted the attention of the media.

**Participating in Research Level Conferences:** Our faculty members have attended as well as presented papers at numerous conferences. Recently our faculty attended and delivered talks in Bangalore, IIT Kanpur, Varanasi and King's College London.



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**Participating in Teachers Refresher Courses:** Our faculty has lectured in UGC conducted Refresher Courses for college and university teachers. We have conducted a Refresher Course in Mathematics.

**Training students in real life applications of mathematics:** Students associated with the Foundation are exposed to real-life applications of mathematics through the above mentioned courses as well as by placements as interns at various corporate houses during their vacation periods.

### Sahayog – Schools Programme

**School Student Level Workshops:** The Foundation firmly believes that to improve mathematical education in the country, special attention has to be given to school mathematics. The Foundation has conducted workshops for school students at various schools in Delhi and elsewhere. Students of schools that cater to the underprivileged sections of society were admitted free to these workshops.

**School Teacher Training Workshops:** To improve school mathematics, it is obvious that school teachers have to be provided support and training. We have been conducting workshops for teachers for the past several years. These workshops have been conducted not only in Delhi but at places all over the country and also in foreign countries. Besides conducting a workshop for school teachers in various remote parts of the coal mine areas of Bihar, we have conducted workshops for school teachers as well as for college teachers at St. Stephen's College.

**Mathematics Help Line:** The Foundation launched a **FREE mathematics help line for students appearing for their board exams** (Classes X and XII) in February 2004 which received an enormous response not only from India (Delhi, Guwahati, Kota, Cochin, Jammu, Mumbai, Varanasi, Haridwar, Panipat, Ajmer, Ghaziabad, Noida, Chandigarh, Palwal, Bahadurgarh, Jabalpur, Gurgaon, Faridabad, Bhiwari) but also from abroad (U.A.E). Students contacted us in bulk by telephone, fax and email. The Foundation's faculty, aided by student volunteers, was available to solve their problems over phone, fax and email. We received over 1300 calls/emails from not only students but anxious parents and teachers. We were even contacted by students of other classes starting from class V. Advice was also given on how to tackle their anxiety and how to cope with examinations.

In March 2005, besides the telephonic helpline, the Foundation also conducted a **free mathematics helpline on television with the support of Doordarshan and NDTV** which again received an overwhelming response.

**MSFChallenge2006:** An initiative to encourage school students to use computers for mathematical problem solving. MSFChallenge2006 was the inaugural contest for what we plan to make an international feature with attractive academic prizes. **The inaugural 2006 contest had 80 competing teams.** The event was possible because of the support received from NIIT. The winners were given books and telescopes and the first place teams were taken on **an all expenses paid trip to meet active scientists and mathematicians at ISRO and IISc, Bangalore.**

**Development of school level curriculum and lessons:** With the support of NASSCOM, the MSF is currently engaged in a fifteen year project to redefine the mathematics curriculum at



## MATHEMATICAL SCIENCES FOUNDATION

the school level and develop e-lessons and testing methodologies. Several innovative mathematics tools for school children of classes VI-X have already been created.

**Interaction with the Corporate World:** To further mathematics education, it is very important to inform its students about its fundamental importance to society. The Foundation is interacting closely with the corporate world for this reason. This interaction happens at various levels. The corporate houses take active interest in the designing and teaching of the courses that the Foundation offers at various levels. Our students are placed as interns at corporate houses to gain hands-on experience on the usefulness of their course work.

### Institute for Innovations & Inventions

The **Institute for Innovations and Inventions with Mathematics and IT (IIIMIT)** is being proposed as an international research and research pedagogy institute aimed at giving an impetus to mathematics and IT based innovations and inventions; to enrich and innovate mathematics education; as a fuller version of the Mathematical Sciences Foundation; and as a public-private partnership between agencies of the Central Government, the Delhi Government, the Mathematical Sciences Foundation and other enterprises.

#### Salient Features

- The proposed institute will take up **cutting edge projects** related to real-world problems and act as an interface between academia, industry and society at large.
- The Institute will focus on those **inventions and inventions** which can be realized by applications of Mathematics and Information Technology.
- A significant thrust area for the institute shall be the effort to create a **training and research platform for college teachers and undergraduate students** in innovations and inventions related to mathematics and IT through their curriculum. IIIMIT shall also help upgrade curriculum in colleges and shall offer special refresher courses/training programmes for college teachers.
- **Information Technology** shall also be used to extend the reach of the Institute beyond its own campus and centres to all parts of India, as well as internationally.
- The Institute shall draw in-on a visiting basis-**eminent faculty from all over the world** into its programmes for research and interaction.
- Innovation shall not be confined to the research goals of the Institute, but extend to its **structure and management**.
- The Institute shall not be confined to research scientists, but shall involve and train – in innovation – people drawn from **various sectors of academia and industry**, including college teachers and undergraduate students.

**Thus, the ambition of the Institute is to engender innovation and implant it into the fabric of Indian life and work.**

#### Proposed Activities of IIIMIT

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There are several lacunae that have crept into the manner in which education in India has developed; our colleges and universities do not seem to be very well related to the needs of society. This is particularly true of mathematics.

**The IIIMIT is visualized as an institution that will fill these lacunae**, not only in relation to IT but all other disciplines where mathematics is a vital contributor to progress. It will blur the artificial divide between pure and applied mathematics, and rupture the unfortunate isolation in India of mathematics from its sister disciplines as well as from society.

Its emphasis on an integrated research programme that brings together academia, industry and society makes IIIMIT unique in India. In this respect it must be emphasized that IIIMIT is quite different from the existing institutions in India.

IIIMIT will function as a **global inter-University centre**, attracting the leading scientists and institutions of the world to interact with the Institute for knowledge generation and assimilation.

Some international agencies and institutions that are expected to partner in the activities of the IIIMIT are

- **University of Houston**
- **Rice University**
- **King's College London**
- **MITACS (Canada)**
- **Mathematical Biosciences Institute, Ohio**

The MSF is currently in the process of examining ways and means of signing specific MOUs with:

- **College of Technology, University of Houston**
- **Advanced Micro Devices (AMD)** - for technology exchanges to drive innovations in mathematical sciences through IT.
- **Institute of Genomics & Integrative Biology** (a premier CSIR institute) – towards
  - Genome wide association studies to identify genetic associations with different diseases.
  - Developing efficient clustering algorithms for population stratification
  - Determining pre disease state in human beings by measuring their heart rate and the way they breathe

Discussions with the other institutions named above are also in advanced stages.

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## Board of Advisors of IIIMIT

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**Roland Glowinski**  
Member, French Academy of Sciences  
Legion d' Honneur

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**Marty Golubitsky**  
Director, Math. Biosciences Institute, Ohio,  
Member, American Academy of Arts and Sciences

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**M. S. Narasimhan**  
Fellow of the Royal Society  
King Faisal Prize; TIFR Bangalore

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**Barbara Keyfitz**  
President, Int. Council on Ind. and Applied Math.  
Former Director, Fields Institute

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**K. B. Sinha**  
Bhatnagar Prize; Bhatnagar Fellow, Raman Gold Medal; Distinguished Associate I.I.Sc. Bangalore

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**Rajendra Bhatia**  
Bhatnagar Prize; J. C. Bose Fellow,  
Fellow TWAS, I.C.T. Delhi

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## Charitable Work and Outreach Programmes

A significant portion of the teaching and training effort of the Foundation is carried out with no fees being charged. We also grant scholarships, fee waivers or interest-free loans to students from economically deprived backgrounds. Further, we make special efforts to reach out to students from backgrounds, locations or communities where education is at a premium. Some examples:

- MSF bore over half the costs of the **Inviting All Young Minds** 2009 programme. These included student stipends and travel allowance, board and lodging for outstation students, books, special prizes, etc., and amounted to **Rs 6.7 lakhs**.
- Deserving students of our **graduate programme** (with University of Houston) are granted combinations of tuition waivers, scholarships and interest-free loans – these take care of not only their expenses while studying in Delhi but also their travel and initial stay in the US. This can extend to about Rs **3 lakhs** for a single student.
- **Free workshops** for under privileged students of **Islamia Middle School** (a minority institution situated in the walled city). These workshops lasted for 6 months in the 2009-10 session. After the workshops a contest on Mathematics and general awareness was organized in the school to create interest and excitement in the students towards the education. Prizes worth Rs. 15,000 were distributed by MSF.
- In the 2009-10 session, MSF organized and financed a **6-month paid internship** for 18 undergraduate students to work on projects related to applications of mathematics to real-world problems.
- MSF has organized **free online graduate courses** taught by Prof Jeff Morgan (Chair, Dept. of Mathematics, University of Houston). Past courses have been on Numerical Differential Equations and Numerical Linear Algebra. Starting September 2010, Prof Morgan will teach a course on Applicable Analysis.
- MSF faculty have conducted **free mathematics workshops for street children** in Delhi and Mumbai, and have also travelled to remote areas in Rajasthan and Madhya Pradesh for student/teacher training.
- MSF regularly organizes competitions and distributes books and other prizes – some recent examples were at Lady Shri Ram College and Banaras Hindu University.



## Student Feedback

### Our efforts have received glowing tributes from students:

- “I enjoyed in every sense! Hands on activities and projects brought a new dimension to the level of understanding the beauty of mathematics.” **(IAYM 2010)**
- “One month was overwhelming. Here, every individual is given equal opportunity and is made to think out of the box.” **(IAYM 2010)**
- “The most memorable month of my life.” **(IAYM 2009)**
- “I was there just for a year and I have learned so much in that time. I think it's a great institute doing a great job and I would really like to do something for this institute.” **(Graduate Programme 2004)**
- Students are encouraged to think rationally and to ask questions which ultimately lead to an overall growth of the individual. 1 year at MSF as a student was the best opportunity I have ever got in my entire academic life.” **(Graduate Programme 2005)**
- “The quality of teaching and reference material were amazing. Within limited time, a lot of syllabus was covered without hampering its quality.” **(Mathematical Finance 2007)**
- “The sense of direction and knowledge which this programme instills in the students who opt for it could surely not be obtained elsewhere.” **(Simulations & IT 2004)**
- “This workshop is one of the best things I have ever faced till now. Truly I think it has been very much able to curb my fear of the topic sets and functions.” **(School Workshop 2003)**
- “The workshop was of great benefit to the more than 120 students and teachers that participated. For the first time they were able to gain insight into a very subtle part of mathematics that was rightly termed by you as the 'gateway to the calculus'.” **(School Workshop 2003)**
- “The fact that I must stress on is that I could understand much more than I thought I could – my capacity was reassessed! I will never be the same again, and I mean it.” **(MSFChallenge2006)**
- “This contest made us more aware of the surprising applications of mathematics. It has increased our knowledge vastly.” **(MSFChallenge2006)**