Physical and Mathematical Sciences

One of the six Divisions at IISc

Chair: Rahul Pandit

Three Departments

- Physics
- Mathematics
- Instrumentation and Applied Physics (IAP)

Two Centres

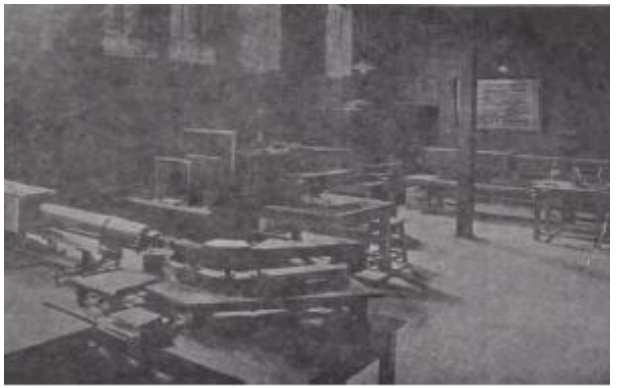
- Cryogenic Technology (CCT)
- High Energy Physics (CHEP)

Physical and Mathematical Sciences

Grants from major national and international agencies:

- **Department of Science and Technology**
- **Council for Scientific and Industrial Research**
- **Department of Biotechnology**
- **Defence Research and Development Organization**
- **Indian Space Research Organization**
- **University Grants Commission**
- **CEFIPRA, Max Planck, IUSSTF, UKIERI, AISRF and CNRS.**

Physics

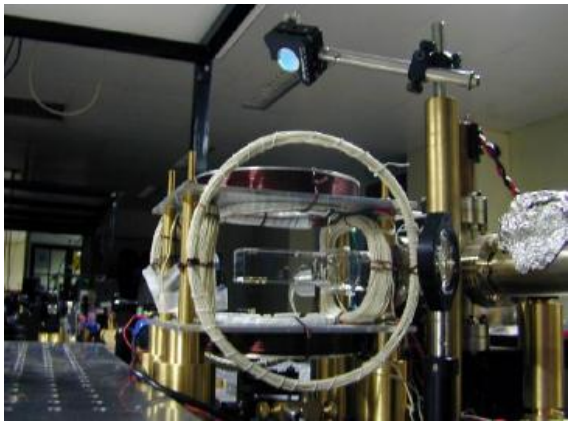


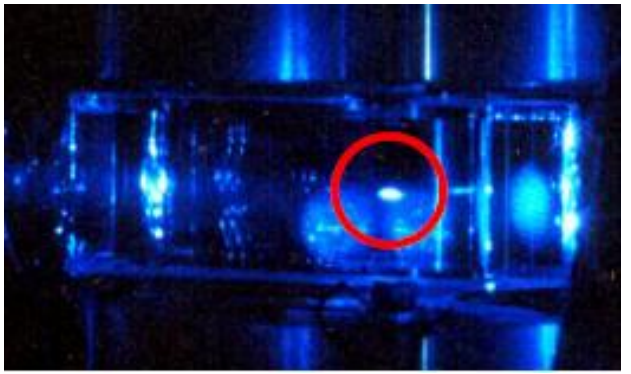
- **Founded in 1933 by Professor CV Raman.**
- **State of the art research programs in cutting edge areas**
- **Teaching Programmes**
  - **Post-M.Sc.**
  - **Integrated Ph.D. Programmes**
  - **Undergraduate Programme.**
- **Interactions with industry.**
- **UGC Centre for Advanced Study for more than two decades.**

Major Research Areas

- Condensed Matter Physics,
- Soft Matter, Complex Systems
- Biology Inspired Physics,
- Quantum Computing,
- Atomic and Optical Physics,
- Plasma Physics,
- Astronomy and Astrophysics.





Faculty at Physics

Condensed Matter (Experiment)

A.K. Sood
V. Venkataraman
Reghu Menon
K. Rajan
K.S.R. Rao
Jaydeep Basu
P.S. Anil Kumar
Arindam Ghosh
K.P. Ramesh
Suja Elizabeth

Prasad Vishnu Bhotla
Aveek Bid
R. C. Mallik
Anindya Das
Prerna Sharma
Victor Muthu
K. Ramesh
R. Ganesan
Ambarish Ghosh
Srimanta Middey

Condensed Matter (Theory)

H.R. Krishnamurthy
Chandan Dasgupta
Rahul Pandit
Sriram Ramaswamy
Vijay Shenoy
Prabal Maiti
Subroto Mukerjee
Manish Jain
Tanmoy Das
Sumilan Banerjee

Atomic and Optical Physics

Vasant Natarajan

Quantum Computing

Vibhor Singh

Plasma Physics

Animesh Kuley

Astronomy and Astrophysics

Chanda Jog
Arnab Rai Choudhuri
Banibrata Mukhopadhyay
Tarun Deep Saini
Prateek Sharma
Nirupam Roy
Rajeev Kumar Jain

Target to have 15 new members in the next 5 years

Faculty at Physics

Condensed Matter (Experiment)

A.K. Sood
V. Venkataraman
Reghu Menon
K. Rajan
K.S.R. Rao
Jaydeep Basu
P.S. Anil Kumar
Arindam Ghosh
K.P. Ramesh
Suja Elizabeth

Prasad Vishnu Bhotla

Srimanta Middey

Condensed Matter (Theory)

H.R. Krishnamurthy

Sumilan Banerjee

Ph.D. students: 209

Postdoctoral Fellows: 30

Project Assistants: 59

Supporting staff: 5

Atomic and Optical Physics

Vasant Natarajan

Quantum Computing

Vibhor Singh

Plasma Physics

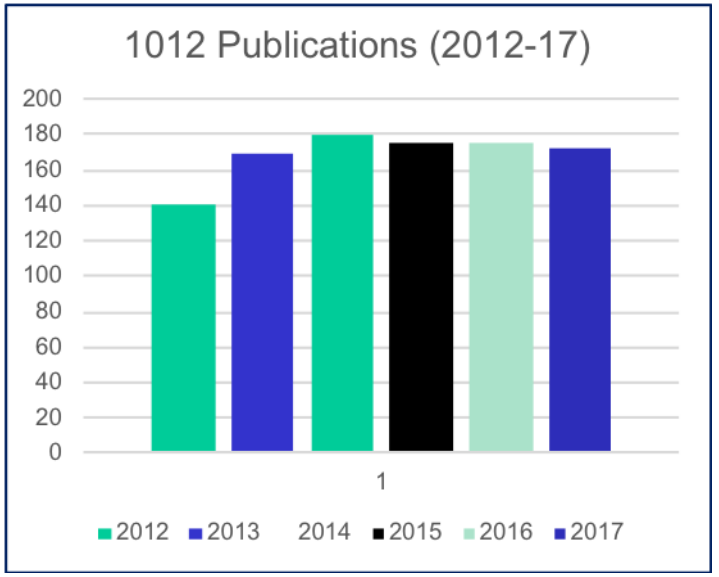
Animesh Kuley

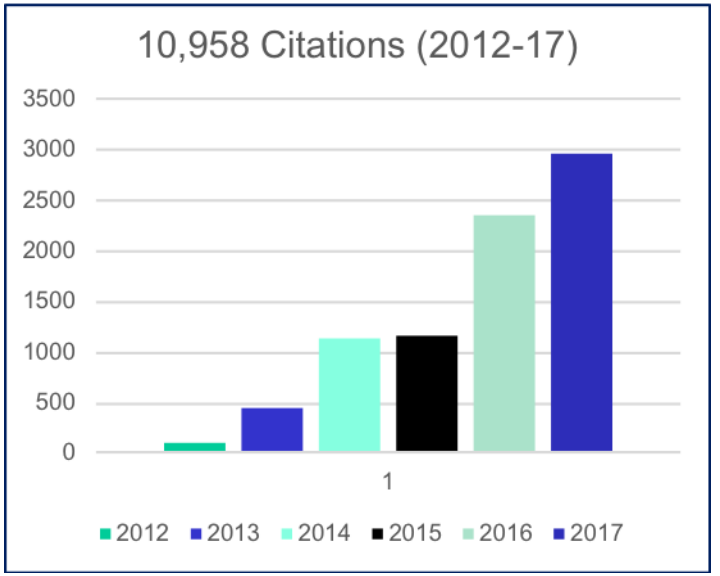
Astronomy and Astrophysics

Chanda Jog
Arnab Rai Choudhuri
Banibrata Mukhopadhyay
Tarun Deep Saini
Prateek Sharma
Nirupam Roy
Rajeev Kumar Jain

Target to have 15 new members in next 5 years

Publications





High Impact Journal	Number (2012-17)
PNAS	7
Nature Nano	4
Nature Comm Nature Phys	8 3
PRL Nano Letter ACS Nano	32 5 4

Total Publications: 4558

Citations : 83369

H-Index: 106

Mathematics

- **Founded in 1956.**
- **Research: all areas of pure and applied mathematics, e.g., Algebra, Topology, Nonlinear Systems, Fluid Dynamics, Functional Theory, etc.**
- **Teaching Programmes: Post-M.Sc. and Integrated Ph.D. Programmes.**
- **UGC Special Assistance Programme.**

Faculty at Mathematics	
Probability:	**Algebra/AlgGeom:**
Manjunath Krishnapur Arvind Ayyer Srikanth K. Iyer Mrinal K Ghosh Sanchayan Sen	Dilip P. Patil Pooja Singla Abhishek Banerjee R. Venkatesh Apoorva Khare
Analysis:	**Geometry/Topology:**
S. Thangavleu, E.K. Narayanan Gautam Bharali Kaushal Verma Tirthankar Bhattacharya Gadadhar Misra	Basudeb Datta Siddhartha Gadgil Harish Seshadri Subhojoy Gupta Vamsi Pritham Pingali Ved Datar
	PDE:
	A.K. Nandakumaran Thirupathi Gudi
Dynamical Systems/MathBio:	**Analytic Number Theory:**
G. Rangarajan	Soumya Das

Ramanna Fellow, two NASI Platinum Jubilee Professors, along with several distinguished Associates of the NMI

Faculty at Mathematics

Probability:	Algebra/AlgGeom:
Manjunath Krishnapur Arvind Ayyer Srikanth K. Iyer Mrinal K Ghosh Sanchayan Sen	Dilip P. Patil Pooja Singla Abhishek Banerjee R. Venkatesh Apoorva Khare
Analysis:	**Geometry/Topology:**
S. Thangavleu, E.K. Narayanan Gautam Bharali Kaushal Verma Tirthankar Bhattacharya Gadadhar Misra	Basudeb Datta Siddhartha Gadgil Harish Seshadri Subhojoy Gupta Vamsi Pritham Pingali Ved Datar
	PDE:
	A.K. Nandakumaran Thirupathi Gudi
Dynamical Systems/MathBio:	**Analytic Number Theory:**

Strengthen some of the areas like PDE, Dynamical systems, Hermitian and Algebraic Geometry.

Aim to recruit at least two mathematicians each year to increase the size of the faculty from the twenty five at present to about thirty in five years.

Faculty at Mathematics

Probability:	Algebra/AlgGeom:
Manjunath Krishnapur Arvind Ayyer	Dilip P. Patil Pooja Singla
	PDE:
	A.K. Nandakumaran Thirupathi Gudi
Dynamical Systems/MathBio:	Analytic Number Theory:

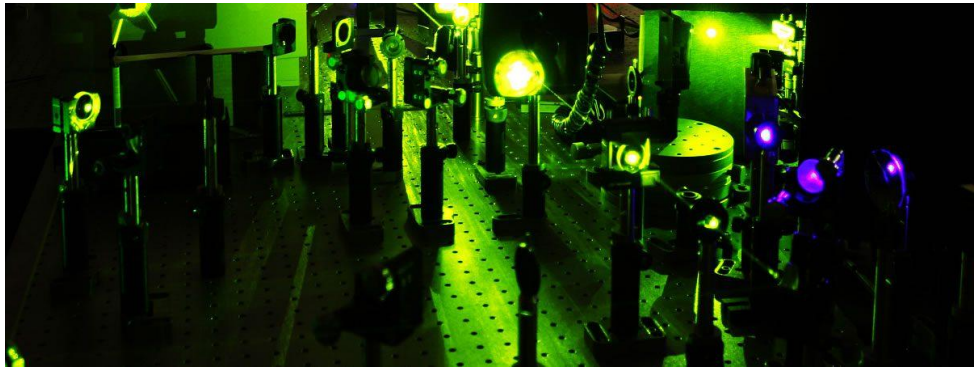
The faculty to student ratio in thedepartment compares very well with leading Institutions around the world and in India. Here is a sample:

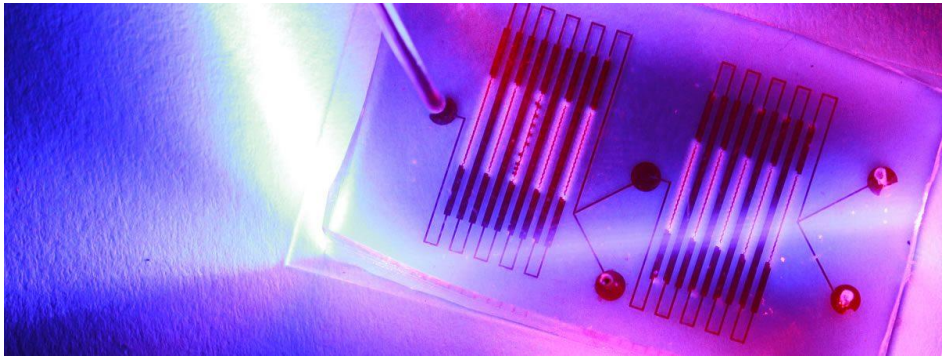
(i) Caltech: 17:30
(ii) UC Berkeley: 150:189
(iii) Purdue: 109:149
(iv) HRI: 13:29
(v) TIFR: 29:29
(vi) IISC: 20:56

Strengthen some of the areas like PDE, Dynamical systems, Hermitian and Algebraic Geometry.

Aim to recruit at least two mathematicians each year to increase the size of the faculty from the twenty five at present to about thirty in five years.

Instrumentation and Applied Physics





- Established in **1967** as **Central Instrumentation and Services Laboratory which later became Regional Instrumentation centre and Instrumentation and Services Unit**
- **Department of Instrumentation : Founded in 1996.**
- **Research: analytical, electronic, optical and laser, solar-energy and thermal, and vacuum and thin-film instrumentation.**
- **Teaching Programmes: M.Tech., and Post-M.Sc. PhD and Integrated PhD Programmes; Undergraduate Programme.**
- **Interactions with industry; several start-up companies.**

Instrumentation and Applied Physics: Faculty and Research

Faculty	Faculty
S. Asokan G. Mohan Rao N.C Shivaprakash Partha Pratim Mondal Abha Misra Sanjiv Sambandan G.R. Jayanth Atanu Mohanty Sai Siva Gorthii K.R. Gunasekhar	Ramgopal S. T.K. Mondal Chandni U. Asha Bhardwaj Baladitya Suri Jaya Prakash V.C. Vani K. Rajanna Suneetha Sebastian (Inspire Faculty)
Research	**Research**
Applied Photonics Sensing Microscopy and Nanoscale Imaging Materials Science and Engineering Surface Engineering	Integrated Systems and Electronics System Design and Instrumentation Energy Systems Environment and Urban Solutions Quantum Technologies

METRICS

Patents and Publications (2012-2017)

Number of Papers Published : 284

Number of Patents filed : 29

Number of books with ISBN : 2

FUNDING (2012-2017)

Number of Research Projects: 64

Total grant received: 16.1 cr

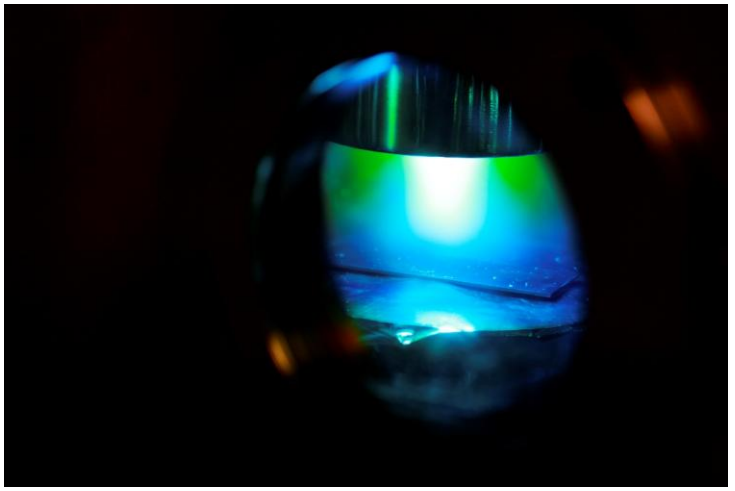
Consultancy Income: 22.56 lacs

International Collaboration : 1.2 cr

Societal Impact

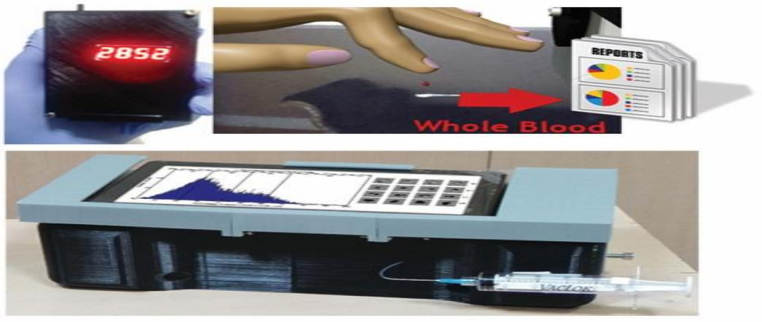
Openwater.in
(Prof. Sanjiv Sambandan)
Spin-off from Flexible Electronics Lab, IAP.
High throughput water treatment and waste water management

openwater.in
anyone. anywhere.



Plasma Coaters Pvt. Ltd.
(Prof. G. Mohan Rao)
Development of high end industrial coatings using plasma process for industry and defence, and development of plasma-based systems for varied applications

ShanMukha Innovations Pvt. Ltd.
(Prof. Sai Siva Gorthi)
Open Platform Point-of-care diagnostic devices, capable of performing cyto, molecular, biochemical and immuno-diagnostics from a drop of blood, at affordable prices, to provide quality healthcare to urban and rural population



High Energy Physics

- Founded in 2004. [Earlier the Centre for Theoretical Studies founded by Professor ECG Sudarshan.]
- Research: quantum field theory, physics at particle colliders, experiments at CERN, string theory, non-commutative geometry, quantum information and computing, and field theory in condensed-matter systems.
- New programme in Experimental High Energy Physics started in 2016. IISc has joined CMS at CERN, 2016
- Teaching Programmes: Post-M.Sc. and Integrated-Ph.D. Programmes; Undergraduate Programme.

Centre for High Energy Physics: Faculty and Research

Faculty	Faculty
B. Ananthanarayan Biplob Bhattacherjee Somnath Choudhury Justin R. David Prasad Hegde Jyothsna Rani Komaragiri Rohini Godbole	Chethan Krishnan Apoorva D. Patel Diptiman Sen Aninda Sinha Sachindeo Vaidya Sudhir Vempati [3 Postdoctoral Fellows and 30 PhD students.]
Research	**Research**
High Energy and Particle Physics Particle Phenomenology Beyond Standard Model Physics Experiments at CERN (CMS)	Quantum Field Theory String Theory Lattice Gauge Theory Field Theory and Condensed Matter Physics Quantum Computing and Technologies
	Long and short term visitors.
In red: CMS HEP experimental faculty	

High Energy Physics

- Publications in high impact, high energy physics journals like JHEP, PRL, PLB, PRD etc. The number of publications with IISc byeline in inspire-HEP data base, in the past ten years is 785 with an h index of 55. Graduate text books and monographs authored by faculty.
- 2 out of 13 faculty (including honorary professor) and 10 out of 30 students are women.
- The center plans to add five faculty members in next five years
- Center members have collaborative projects via CEFIPRA, CNRS, IUSSTF,UKIERI as well as Indo-Austria, Indo-Belgium teams , in areas ranging from detector developments to LHC phenomenology and BSM studies to String Theory.

Centre for Cryogenic Technology

- **Founded in 1999 (grew out of an older facility).**
- **Produces 4,25,000 litres of liquid nitrogen and 35,000 litres of liquid helium per year principally for research programmes at the Institute.**
- **Major users of the facility are experimental groups in Physics, Chemistry, Biology, and the NMR Research Centre.**
- **Research: cryogenics-related research programmes; students taken through the Department of Physics or Instrumentation and Applied Physics.**
- **Interactions with industry.**

Overview

- About 100 Faculty members
- Several Visitors (e.g., Infosys Chair Professors)
- 60 Fellowships of Science Academies in India
- 8 Fellows of TWAS
- 3 FRSs
- 3 Padma Shri Awards
- 314 PhD students
- 15 Master’s students
- 128 Integrated PhD students