

B3-XV
TIFR Centre for
Interdisciplinary Sciences
(TCIS)



TIFR Centre for Interdisciplinary Sciences

1. Name of the Centre :

TIFR Centre for Interdisciplinary Sciences (TCIS)

2. Year of establishment :

2010

AEC approved for establishment of TIFR-H in July 2010 & TCIS, a part of TIFR-H started its academic activities from Dec 2011.

3. Is the Department part of a School/Faculty of the university?

TCIS is an off-campus Centre of TIFR.

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc., D.Litt., etc.)

1. Ph.D.
2. Integrated M.Sc.-Ph.D.

Students may avail of an M.Phil. Degree as an early exit option provided they have finished a specified set of requirements. However, there is no separate M.Phil programme.

5. Interdisciplinary programmes and departments involved

Although the students fulfill their course requirements under any one of the subject boards mentioned below, they can take up any interdisciplinary subject for their Ph.D. At present, the following subject boards are involved: -

1. Subject Board of Physics
2. Subject Board of Chemistry
3. Subject Board of Biology

6. Courses in collaboration with other universities, industries, foreign institutions, etc.

A list of such courses in the period 2011 – 2015 follows.

	Institution	Course Name	Faculty member	Year
1.	University of Hyderabad	Statistical Mechanics	Surajit Sengupta, K P N Murthy, R Nityananda	2012
2.	University of Hyderabad	Bridge Mathematics	Rama Govindarajan & Saroj Panigrahi	2012
3.	University of Hyderabad	Dynamical Systems and Chaos	Bindu Bambah, Ram Ramaswamy & Rama Govindarajan	2013
4.	University of Hyderabad	Advance Dynamics	Rama Govindarajan & Surajit Sengupta	2013
5.	Tata Institute of Social Sciences	Introduction to the Physical and Chemical Sciences	Surajit Sengupta, Shubha Tewari, M Krishnamurthy	2013
6.	Tata Institute of Social Sciences	Introduction to the Physical and Chemical Sciences	Surajit Sengupta, Shubha Tewari, Subodh R Shenoy	2014
7.	Tata Institute of Social Sciences	Introduction to the Physical and Chemical Sciences	Surajit Sengupta, Shubha Tewari, M Krishnamurthy, Rama Govindarajan	2015

7. Details of programmes discontinued, if any, with reasons

There are no such programmes.

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System

Students of the TCIS are offered a Course Work programme based on a mixture of compulsory Core Courses, choice-based Elective Courses and compulsory Project Work / Experimental course / Lab rotation course. The structure is given in the table below.

Subject Board of Physics:

Programme	Duration (years)		Basic & Core Credits	Elective Credits	Project Credits	Total Credits
	Overall	Coursework				
Ph.D.	5	1.5	28	16	16	60
Ph.D. (for students with 4 years of University Training in other than Physics)	5	2.0	48	16	16	80
I-Ph.D.	6	2.5	52	32	16	100

Subject Board of Chemistry:

Programme	Duration (years)		Course Credits	Project Credits	Total Credits
	Overall	Coursework			
Ph.D.	5	1.5	26	34	60
I-Ph.D.	6	2.0	42	58*	100

* includes 24 credits of M.Sc. Thesis

Subject Board of Biology:

Programme	Duration (years)		Course Credits	Research Credits	Total Credits
	Overall	Coursework			
Ph.D.	5	1.5	20	40	60
I-Ph.D.	6	2.5	28	32	60

* includes credits of M.Sc. / Final Thesis

The Academic Session is divided into two semesters: the Autumn Semester (August – November) and the Spring Semester (February – May). In addition, there may be courses run during the Winter break (December – January) and Summer break (May – July). Students are encouraged to participate in conferences / schools / research projects with faculty members of their choice during the breaks.

In each semester, students are evaluated by a Continuous Evaluation process which are a combination of the following: -

1. Assignments
2. Tests

3. Mid-semester Examination
4. End-semester Examination
5. Presentations / Term Papers

All students are required to do Departmental Projects & Experimental courses as required by the respective subject board. The students can take up the course of their choice in any other subjects in addition.

9. Participation of the department in the courses offered by other departments

Since the prime mission of TCIS is research in interdisciplinary sciences, students are encouraged to take up additional courses in the subject of their choice. The students can do their departmental projects with more than one faculty member and from other disciplines.

10. Number of faculty positions:

	Faculty Designation with DAE Grade	Abbreviation (Item 11)	Number
1.	Senior Professor (I)	Sr. Professor (I)	2
2.	Professor (I)	Professor (H)	5
3.	Reader (F)	Reader (F)	10
4.	Reader (E)	Reader (E)	2
5.	Fellow (Young Researcher-INSPIRE fellow)	Fellow	1
		Total	20

11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

	Name	Deg *	Designation	Specialisation	Exp [†]	Stu [‡]
1.	Sriram Ramaswamy	Ph.D.	Centre Director & Sr. Professor (I)	Nonequilibrium, soft-matter and biological physics	29	2
2.	Surajit Sengupta	Ph.D.	Professor (H) & Dean	Equilibrium and non-equilibrium materials physics	22	7
3.	K V R Chary	Ph.D.	Sr. Professor (I)	Molecular Biophysics, NMR Spectroscopy and Structural Biology	31	2
4.	Narayanan Menon	Ph.D.	Professor (H)	Experimental non-equilibrium and soft-matter	18	2

	Name	Deg *	Designation	Specialisation	Exp ⁺	Stu ⁺
				physics		
5.	Rama Govindarajan	Ph.D.	Professor (H)	Fluid Mechanics	18	3
6.	M Krishnamurthy	Ph.D.	Professor (H)	Matter at extreme temperature and density using very high-powered ultrashort lasers	18	3
7.	P K Madhu	Ph.D.	Professor (H)	Nuclear Magnetic Resonance and Biophysics	12	2
8.	Rajat Varma	Ph.D.	Reader (F)	Immunology, Cell Biology and Optical Microscopy	7	0
9.	Shubha Tewari	Ph.D.	Reader (F)	Soft matter Physics, Outreach & Education	16	0
10.	Smarajit Karmakar	Ph.D.	Reader (F)	Glass Transition, Spin Glass, Mechanical Properties of Disordered Solids, Granular Materials	3.3	5
11.	Kanchan Garai	Ph.D.	Reader (F)	Regulation of amyloid aggregation in human diseases and bacterial biofilms	3	2
12.	T N Narayanan	Ph.D.	Reader (F)	Carbon Nano Materials, Magnetic materials and Electrochemistry	3	2
13.	Prasad Perlekar	Ph.D.	Reader (F)	Multiphase flows, Turbulence, Population dynamics, Non-equilibrium statistical mechanics	2.5	1
14.	Pramodh Vallurupalli	Ph.D.	Reader (F)	Biophysics	2	1
15.	Anukul Jana	Ph.D.	Reader (F)	Low-Valent Low-Coordinate Organometallic Chemistry	2	2
16.	Aprotim Mazumder	Ph.D.	Reader (F)	Cell and Cancer Biology	1	1
17.	Vipin Agarwal	Ph.D.	Reader (F)	Development and Application of Solid State NMR Methods for Biomolecules and Materials	0.6	0
18.	Karthik V Raman	Ph.D.	Reader (E)	Experimental condensed matter physics	2	1
19.	Jagannath	Ph.D.	Reader (E)	computer simulation and	0.5	0

	Name	Deg *	Designation	Specialisation	Exp [†]	Stu [‡]
	Mondal			statistical mechanics in chemical and biochemical topics		
20.	Kaustubh R Mote	Ph.D.	Fellow (INSPIRE)	Solid-State NMR based Structural Biology of Membrane Proteins	1	0

* Highest degree obtained

† Years of Experience as a regular Faculty Member (TIFR and elsewhere)

‡ Ph.D. students guided within the last 4 years (including those joined and those graduated)

12. List of senior Visiting Fellows, adjunct faculty, emeritus professors

Visiting Faculty :

- Prof. Subodh R Shenoy
- Prof. N D Hari Dass C

Adjunct Faculty :

- Prof. Amitabha Chattopadhyay
- Prof. V Chandrasekhar
- Prof. Srikanth Sastry
- Prof. J B Joshi
-

Emeritus Professors :

- Prof. Mustansir Barma

13. Percentage of classes taken by temporary faculty – programme-wise information

	Programme	Course	Semester	Faculty	Percentage
1.	Ph.D. & Integrated M.Sc.-Ph.D. (Physics)	Quantum Mechanics II	Aug-Nov 2014	Prof. A K Kapoor	100%
2.	Ph.D. & Integrated M.Sc.-Ph.D. (Physics)	Quantum Mechanics II	Jan – Apr 2015	Prof. A K Kapoor	100%
3.	Ph.D. & Integrated M.Sc.-Ph.D. (Physics)	Optics	Jan – Apr 2015	Prof. Nirmal Viswanathan	100%

14. Programme-wise Student Teacher Ratio

	Programme	Students (S)	Faculty (F)	Ratio S/F
4.	Ph.D.	42	20	2.05
5.	Integrated M.Sc.-Ph.D.	16	20	0.8

15. Number of academic support staff (technical) and administrative staff:

Scientific Staff	Technical Staff	Administrative Staff	Auxiliary Staff
7+2*	2*	5+13*	43*

* As the Centre is very young, many staff members are either temporary or on contract

16. Research thrust areas as recognized by major funding agencies

	Research Thrust Areas	Funding Agency
1	Cancer research, Cell Biology	DAE
2	Syntheses of compounds involving low-valent low-coordinated main group elements	SERB-DST, AvH Foundation, DAE
3	Theoretical chemistry	Ramanujan Fellowship, SERB-DST
4	Biomolecular Solid-state NMR	DST and DAE
5	Molecular biophysics, spectroscopy, nuclear magnetic Resonance	DST, CEFIPRA, Royal Society, Indo-Danish Science Agency
6	Molecular Biophysics, Biological Chemistry, Structural Biology, Nuclear Magnetic Resonance	DAE, DST, DBT, CSIR, ICMR, Japan Society for Promotion of Science (JSPS), UNESCO Molecular and Cell Biology Network (UNESCO-MCBN), Welcome Trust, International Centre for Genetic Engineering and Biotechnology (ICGEB), International Council for Magnetic Resonance in Biological Systems (ICMRBS)

17. Number of faculty with ongoing projects from a) national b) international funding agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise.

National

	Agency	Project Title	Total Grant (Rs. lakhs)	Duration	Faculty
1	Science & Engineering Research Board, DST	2 Dimensional nanosheets based ultra-low density sponges for energy and environment applications	26	3 years starting from 2014-15	T N Naryanan
2	Indian Institute of Tropical Meteorology, Ministry of Earth Sciences	Coupled physical processes in the Bay of Bengal & Monsoon Air-sea Interaction	44	3 years starting from 2015-16	Rama Govindarajan
3	Science & Engineering Research Board (SERB), Department of Science & Technology	Ramanujan Fellowship	87	Total 5 years, started from 2015-16	Kathik V Raman
4	Department of Science & Technology, Innovation in Science Pursuit for Inspired Research	Structural and Mechanistic Characterization of the mitochondrial pyruvate carrier complex	83	Total 5 years starting from 2015-16	Kaustubh R Mote
5	Science & Engineering Research Board (SERB), Department of Science & Technology	Rational Design for the syntheses of multiple bonded compounds involving heavier group 14 elements and their reactivity	26	Total 3 years starting from 2015-16	Anukul Jana
6	Wellcome Trust/DBT India Alliance	Control of T Cell Biochemistry by MHC	288	Total 5 years starting	Rajat Varma

	Agency	Project Title	Total Grant (Rs. lakhs)	Duration	Faculty
		Alleles		from 2015	
7	Ministry of Science & Technology Australia - India Strategic Research Fund	Tailoring plant protease inhibitors for control of the crop pest Helicoverpa armigera	27	Total 2 years starting from 2015	K V R Chary

International

	Agency	Project Title	Total Grant (Rs. lakhs)	Duration	Faculty
1.	Indo-German Sciences & Technology Centre, Stuttgart, Germany	Tailoring interface spin transport towards molecular spintronics	3	Total 4 years starting from 2015	Karthik V Raman
2.	Centre framco - Indien Pour la Promotion de la instabilities	Rotating and curved boundary layer instabilities	17	Total 3 years starting from 2013	Rama Govindarajan

18. Inter-institutional collaborative projects and associated grants received

National

	Collaborating Institutions	Project Title	Total Grant (Rs. lakhs)	Duration	Faculty
1.	Indian Institute of Science	Coupled physical processes in the Bay of Bengal & Monsoon Air-sea Interaction	44	3 years starting from 2015-16	Rama Govindarajan

International: None

19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received.

	Agency	Project Title	Total Grant (Rs. lakhs)	Duration	Faculty
1.	DAE Science Research Council Awards, Department of Atomic Energy (DAE)	DAE- Science Research Council Outstanding Investigator award scheme for the year 2014 (DAE-SRC-OI)	115	Total 5 years starting from 2015	M Krishnamurthy

20. Research facility / centre with
- state recognition : NIL
 - national recognition : NIL
 - international recognition : NIL

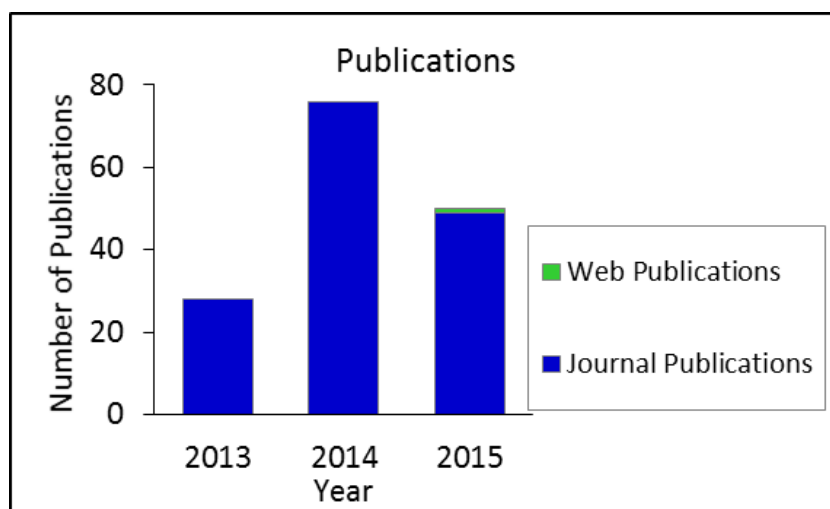
21. Special research laboratories sponsored by / created by industry or corporate bodies

Nil

22. Publications:

TCIS	Journal Publications	Articles in Proceedings	Technical Reports	Web Publications	Book Chapters	Books Edited	Mono graphs
2010-11	NA	NA	NA	NA	NA	NA	NA
2011-12	NA	NA	NA	NA	NA	NA	NA
2012-13	28	---	---	---	---	---	---
2013-14	76	---	---	---	---	---	---
2014-15	49	---	---	1	---	---	---
Total	153	---	---	1	---	---	---

TCIS started its scientific activities in 2012.



* Books with ISBN with details of publishers

- N D Hari Dass: The Principles of Thermodynamics, published by CRC Press Ltd, ISBN 978-1- 4665-1208-5, 2013.
- P K Madhu: Current developments in solid state NMR spectroscopy, Springer Verlag GmbH, ISBN-13 9783211999394.
- Surajit Sengupta: Frontiers in Materials Modelling and Design, Proceedings of the Conference on Frontiers in Materials Modelling and Design, at Kalpakkam, India on August 20-23 1996. V. Kumar, Surajit Sengupta and Baldev Raj, Eds. (Springer, Heidelberg, 1997).
- Vipin Agarwal: Development and Application of MAS Solid-State NMR Methodologies to Biomolecule Number of Pages: 226 pages, Mensch & Buch (November 2009), ISBN-10: 3866646917, ISBN-13: 978-3866646919

* Citation Index – range / average:

Total number of citations: 31740 (Google Scholar)

Number of citations per faculty: 1587

* h-index:

Range: 10 - 27

23. Details of patents and income generated

Nil

24. Areas of consultancy and income generated during 2011-2015

Nil

25. Faculty selected nationally / internationally to visit other laboratories / institutions
/ industries in India and abroad**National**

	Name of Faculty member	Place visited	Date (MM/YYYY)
1.	Prof. N D Hari Dass	Institute of Mathematical Sciences, Chennai	Apr 2014
		Institute of Mathematical Sciences, Chennai	Jan 2015
		Institute of Mathematical Sciences, Chennai	Mar 2015

International

	Name of Faculty member	Place visited	Date (MM/YYYY)
1.	Prof. Rama Govindarajan	Woods Hole Oceanographic Institution	Nov 2012
2.	Prof. Sriram Ramaswamy	Higgs Centre, University of Edinburgh (research collaboration with M E Cates and group)	March 2013
3.	Prof. Srikanth Sastry	EPFL Lausanne, Switzerland	Aug 2012
		Univ. Paris Sud Orsay	2012
		Uni. H. Heine, Dusseldorf, Germany	Feb 2013
4.	Prof. K V R Chary	The Chemistry and Structural Biology Division, Institute for Molecular Bioscience, The University of Queensland, Australia	Aug 2014
		School of Chemistry, University of New South Wales, Sydney	Aug 2014
		Prof. Martin Greens Laboratory, University of New South Wales	Aug 2014
5.	Prof. Surajit Sengupta	University of Dusseldorf (Groups of Profs J. Horbach, H. Lowen and S. Egelhaaf)	Mar-Apr 2014
		The Weizmann Institute	June 2014

26. Faculty serving in

(a) National Committees:

	Name of the Faculty Member	Name of the Committee	Role in the Committee	Term of Service
1	Prof. K V R Chary	IUPAB National Committee	Member	2012-2016
		Asian Biophysics Association	Treasurer	2013-present
			Steering Committee Member	2011-Present
		International Advisory Board, 27th International Conference on Magnetic Resonance in Biological Systems	Member	2014-2016
2	Prof.Rama Govindarajan	Indo-European network on Advanced Instability Methods (AIM).	Steering committee member	--
3.	Dr. Smarajit Karmakar	International conference in IIT-Guwahati, Conference on Computational Physics – 2015.	Local organizing committee member	--
4.	Prof. Sriram Ramaswamy	XXIV international conference on statistical physics of the IUPAP.	Member, Steering Committee	--
5.	Dr. T.N.Narayanan	4th International Conference, COCHIN NANO-2016	National Organizing Committee member	--

(b) International Committees :

	Name of the Faculty Member	Name of the Committee	Role of the Committee	Term of Service
	Dr. T.N.Narayanan	EMN Meeting on Electrocatalysis, Energy Materials Nanotechnology, February 15-19, 2016 Orlando, USA.	International Program Committee Member	--

(c) Editorial Boards:

Name of the Faculty Member	Name of the Journal	Impact Factor	Term of Service
Prof. Sriram Ramaswamy	Annual Review of Condensed Matter Physics		2011-2015
	Advances in Physics		Since Jun 2007
	European Physical Journal		Since Dec 2009
	Journal of Statistical Mechanics: Theory and Experiment		Since Jan 2004
Prof. Rama Govindarajan	Physical Review Fluids		Present
	Physics of Fluids		Till 2015
	Pramana		--
	Sadhana		Till 2014
Prof. P K Madhu	Journal of Magnetic Resonance		--
	Journal of Biomolecular NMR		--
	Solid-State Nuclear Magnetic Resonance		--
Dr. T N Narayanan	American Journal of Engineering and Applied Sciences		--
	Carbon-Based Materials – Frontiers in Materials		2015
Prof. Subodh R Shenoy	Physical Review Letters (Condensed Matter)		2000-2003
	Pramana		2007-2013
	Philosophical Magazine		Since 2011
Prof. N D Hari Dass	Quanta		

27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs).

As all TCIS faculty members regularly participate in national and international research-oriented symposia, conferences, workshops and schools, often as the organizers or principal lecturers, they are always in touch with the state of the art in their areas of expertise. Therefore, no separate recharging/refresher programmes are needed, nor are any conducted. In fact, TIFR faculty are in great demand as lecturers in such programmes in other institutions, both inside and outside India.

28. Student projects

- percentage of students who have done in-house projects including inter-departmental projects

All (100%) TCIS students are required to do Departmental Projects / Laboratory rotations (see Item 8 above).

- percentage of students doing projects in collaboration with other universities / industry / institute

Almost all TCIS faculty and laboratories have collaborations with scientists in India and abroad. Students of these faculty members and laboratories participate in these projects.

29. Awards / recognitions received at the national and international level

- Faculty Members:**

National Awards

	Year	Name of the Awardee	Name of the Award
1.	2014	Kaustubh R Mote	Inspire Faculty Award
2.	2012-2017	Prof. K V R Chary	Sir J C Bose National Fellowship (DST)
	2010-2011		The "Dharamsi Morarji Chemical Co. Visiting Fellowship in Chemistry" of the Institute of Chemical Technology, Mumbai
	2009-2010		Professor J.C. Ghosh Memorial Award of the Indian Chemical Society
	2006		Professor Rango Krishna Asundi Memorial Lecture Award of Indian National Science Academy, New Delhi
	1989		Anil Kumar Bose Memorial Award, Indian National Science Academy
	1986		Young Scientist Medal, Indian National Science Academy, New Delhi
	1986		Young Scientist Award, BRUKER, 1986.
3.	2012	Dr. Kanchan Garai	TIFR Alumni Patent Award in 2012 for innovative scientific research from TIFR leading to the award of a patent.

	Year	Name of the Awardee	Name of the Award
4.	2015	Prof. M Krishnamurthy	DAE-SRC Outstanding Investigator award
	2007		Head of the Max Planck India Partner group, for collaborative research in intense field science with Max Planck Institute for kernphyisk, Heidelberg
	2006-2007		Swarnajayanti Fellowship in Physics
	2003		B.M. Birla Science prize for physics
	2001		INSA Young Scientist Medal for Physics by the Indian National Science Academy, Delhi
	2001		S.N. Ghosh Young scientist medal by Indian society for Atomic and Molecular Physics
	1999		Associate of the Indian Academy of Sciences, Bangalore
5.	2013	Dr. Prasad Perlekar	NVIDIA Innovation Award
6.	2007	Prof. Rama Govindarajan	Shanti Swarup Bhatnagar Prize (Engineering Sciences)
7.	2010-2012	Dr. Smarajit Karmakar	Dean's Fellowship, Weizmann Institute of Science
	2003-2004		Kumari L. A. Meera Memorial Award for the year for being the best Integrated PhD Student in Physical Sciences, IISc, Bangalore, India
8.	2011	Prof. Sriram Ramaswamy	Infosys Prize for the Physical Sciences
	2007		J C Bose Fellowship
	2006		G. D. Birla Prize for Science
	2000		Shanti Swarup Bhatnagar Prize for the Physical Sciences
	2000		NASI Young Scientist Millenium Award
	1996		B.M. Birla Memorial Prize for Physics
	1988		N.S. Satyamurthy Award
	1988-1992		Associate of the Indian Academy of Sciences
9.	1994-1999	Prof. Surajit Sengupta	Associate of the Indian Academy of Sciences, Bangalore
10.	1980-1985		Jagadish Bose National Science Talent Search Scholarship
11.	2015-2018	Dr. T N Narayanan	ACS membership award
12.	1992	Prof. Subodh R Shenoy	Shanti Swarup Bhatnagar Prize of CSIR India for Physics
13.	1998	Prof. N D Hari Dass	Fellow of the National Academy of Sciences, Allahabad

	Year	Name of the Awardee	Name of the Award
	2006-2010		DAE Raja Ramanna Professorship

International Awards

	Year	Name of the Awardee	Name of the Award
1.	2010	Dr. Anukul Jana	Alexander von Humboldt (AvH) Fellowship for Post Doctorate Research by the Humboldt Foundation, Germany.
2.	2014	Dr. Aprotim Mazumder	The Koch Institute Image Award (2014).
	2010		CEHS MIT Pilot project grant award (along with Mark Bathe)
3.	2011	Dr. Kanchan Garai	Nomination for Poletsky Award by Dr. Carl Frieden for outstanding contribution in Alzheimer's disease
4.	1976	Prof. N D Hari Dass (Visiting Faculty)	Gravity Foundation Honorable Mention for the essay A new spin test for the equivalence principle

- **Students, Postdocs, Scientific Staff and Others:**

National Awards

Nil

International Awards

Nil

30. Seminars/Conferences/Workshops organized and the source of funding (national / international) with details of outstanding participants, if any.

Seminars are held frequently in TCIS by eminent scientists from India and abroad. A list of seminars held in TCIS may be accessed through the link <http://www.tifrh.res.in/tcis/event/seminars.html> and a few seminars by eminent scientists are listed below.

Conferences / Workshops

	Year	Name	Funding Agency	Faculty members
1.	2016	NMR Meets Biology	TCIS, Hyderabad & TIFR, Mumbai (in association with University of Leipzig, Germany, and University of Aarhus, Denmark)	Prof.P K Madhu Dr. Vipin Agarwal
2.	2015	National Poster Symposium	TCIS, Hyderabad & Royal Society of Chemistry, London – Deccan Local Section, India	Prof. K V R Chary
3.	2015	Summer Research Symposium	TCIS, Hyderabad & National Academies of Sciences	Dr. Shubha Tewari
4.	2015	TCIS-IITH-IITB meeting on Flow Instability	TCIS, Hyderabad, IIT-Madras, IIT-Bombay & IIT- Hyderabad	Prof. Rama Govindarajan
5.	2014	TCIS Symposium	TCIS, Hyderabad	-- NA --
6.	2014	Summer Research Symposium	TCIS, Hyderabad & National Academies of Sciences	Dr. Shubha Tewari
7.	2014	Program on Active Matter, Cytoskeleton, Cells, Tissues and Flocks	TCIS, Hyderabad & Kavli Institute for Theoretical Physics, Univ of California, Santa Barbara	Prof. Sriram Ramaswamy (jointly with M C Marchetti, Syracuse Univ, C Schmidt, Goettingen and I Couzin, Princeton)
8.	2014	Workshop on Soft Matter Self Assembly and Dynamics	TCIS, Hyderabad & University of Hyderabad	Prof. Narayanan Menon Prof. Srikanth Sastry
9.	2014	Symposium on Fragility	TCIS, Hyderabad & JNCASR, Bangalore	Prof. Srikanth Sastry
10.	2014	IUTAM Symposium - 2014	TCIS, Hyderabad & IIT - Hyderabad	Prof. Rama Govindarajan Dr. Prasad Perlekar
11.	2013	Chemistry Symposium	TCIS, Hyderabad	Prof. V Chandrasekhar
12.	2013	Perspectives in Nonlinear Dynamics 2013 (PNLD 2013)	TCIS, Hyderabad & University of Hyderabad	Prof. Rama Govindarajan Dr. Prasad Perlekar

13.	2013	TCIS-IITH-IITB meeting on Flow Instability	TCIS, Hyderabad, IIT-Madras, IIT-Bombay & IIT- Hyderabad	Prof. Rama Govindarajan
14.	2012	Meeting on Soft and Biological Matter	TCIS, Hyderabad & University of Hyderabad	-- NA --
15.	2012	TCIS Symposium	TCIS, Hyderabad	-- NA --

31. Code of ethics for research followed by the departments

TCIS follows the TIFR Guidelines on Academic Ethics.

32. Student profile programme-wise:

Numbers are **summed over 2011 – 2015** batches.

Name of the Programme (refer to question no. 4)	Applications received	Selected		Joined		Pass percentage for		
		Male	Female	Male	Female	Male	Female	
Ph.D.	Biology	TIFR Mumbai	6	2	2	1	50	100
	Chemistry	TIFR Mumbai & TCIS-71	31	10	14	4	93	100
	Physics	TIFR Mumbai & TCIS-526	34	5	24	6	83	100
Integrated M.Sc.-Ph.D.	Biology	--	--	--	--	--	--	--
	Chemistry	TIFR Mumbai	11	7	2	--	100	--
	Physics	TIFR Mumbai & TCIS-306	36	7	11	1	100	100

33. Diversity of students:

(a) Based on geography:

Students	Ph.D.		Integrated-Ph.D.		M.Sc.		Total
	Male	Female	Male	Female	Male	Female	
From the state where the university is located	3	2	--	--	NA	NA	5
From other states of India	33	6	13	1	NA	NA	53
NRI students	--	--	--	--	NA	NA	--
Foreign students	--	--	--	--	NA	NA	--
Total	36	8	13	1	--	--	58

(b) Based on undergraduate institution:

	Ph.D.		Integrated M.Sc.-Ph.D.		Total
	Male	Female	Male	Female	
From Universities	20	6	12	1	39
From premier science institutions †	4	0	0	0	4
From premier professional institutions #	12	1	1	0	14
From others*	1	0	0	0	1
Total	37	7	13	1	58

† Science institutions, e.g. CBS, NISER, etc.

IITs, NITs, etc.

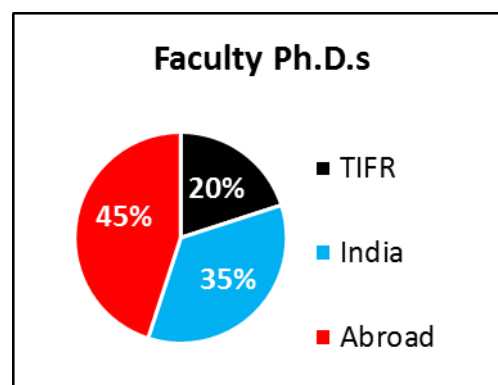
34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise.

	Examination	No of students who cleared
1.	CSIR – NET	3
2.	GATE	20
3.	JEST	12
4.	OTHERS (TIFR)	23

35. Student progression

- Ph.D. / Integrated M.Sc.-Ph.D programme : Students admitted to TCIS go on to complete the course work and get their Ph.D.s. Rarely a student may opt out of the programme, for various reasons. After completing their Ph.D., the students have great potential to pursue postdoctoral research anywhere in the world and go on to academic / industry careers.

36. Diversity of staff

Number of faculty who are Ph.D.'sfrom **TIFR** : 4from other institutions in **India** : 7from institutions **Abroad**: 9**Total No 20**

37. Number of faculty who were awarded M.Phil., Ph.D., D.Sc. and D.Litt. during the assessment period

The minimum eligibility criteria for selection as a member of the TIFR faculty is a Ph.D. degree. Thus, this number is not relevant.

38. Present details of departmental infrastructural facilities with regard to

a) Library

- Floor area- 20.90 Sq metres
- Total seating capacity – 10

- Working hours - 24*7
 - The library has two internet enabled systems (desktop), two dedicated VPN access for library users will also be procured shortly.
 - The library has a total of 450 books with an average annual addition of 150 books, e-books 41,020 & e-journals 3,888
- b) Internet facilities for staff and students
- Primary internet - 40 Mbps leased line 1:1 with RF connectivity (ISP - Bharti Airtel)
 - Secondary internet - 4 Mbps leased line 1:1 with optical connectivity (ISP - BSNL India)
 - 100 Mbps LAN network
 - Student hostels are provided with 12 mbps broadband connections with Wi-Fi connectivity
- c) Total number of class rooms
- Two classrooms to seat 20 students each
- d) Class rooms with ICT facility
- Two classrooms to seat 20 students each
- e) Students' laboratories
- Two 4 students' laboratories with a total capacity around 60
- f) Research laboratories

	Name of Laboratory	Fac*	PDF [†]	Stu [‡]	Brief description of research activity
1	Synthesis Lab	1	2	2	Syntheses and Reactivities of Main-Group Compounds with Low-Valent Low-Coordinate Group 13-15 elements

					Hydrocarbon soluble Silicon enriched molecular cluster Rational design of metal cluster by using different multi-dented ligands Study of different catalytic reactions using Main-Group compounds
2	Biophysics Lab	2	3	3	Single molecule biophysics of protein amyloids Role of indigenous proteins of amyloid aggregation Conformational Dynamics of Biomolecules
3	Biology	2	2	1	Regulatory roles of Genome organization in gene expression and DNA repair Stress-induced mutagenesis as a mechanism for hastening evolution Immunology, Cell Biology and Optical Microscopy
4	Laser Matter Lab	1	1	3	Ion acceleration Neutral-Atom accelerators Bright, Hard X-Ray sources Laser-Plasma dynamics at mesoscopic length scales
5	Material Science	1	2	2	Engineering of Nanomaterials Catalysis and Energy Devices
6	NMR	4	5	4	Biomolecular Solid-State NMR Spectroscopy Development of new NMR methodologies to understand the structure-function paradigm of biomolecules NMR characterization of the 3D structures of biologically important proteins and studying their dynamics, interaction with other ligands/biomolecules to understand structure-function relationships Development of computer-aided complete-turn-key packages for both NMR assignments and 3D structural analysis. Solid state NMR spectroscopy
7	Spintronics	1	1	1	Interspace spin chemistry and magnetism arising due to the molecule-transition metal-interface interactions
8	Soft Matter	3	2	4	Non-equilibrium soft matter and biological physics
9	Hyper-polarization	1	0	0	Creating hyperpolarization in noble gases by spin exchange optical pumping methods.

					Optical magnetometry
10	Computational Science	5	3	16	Statistical Mechanics of soft matter: Deformation, Elasticity & Plasticity Active Segregation of chromosomes Fluid mechanics, Multiphase flows Statistical physics of Disordered systems: Elusive order in disordered system and the associated correlation length Ideal glassy states in systems with quenched disorder and their connection to spin glass physics Glasses with metallicity Brittleness and Ductility of amorphous solids Amorphization Transition Computer simulation of protein-drug binding Understanding mechanisms of actions antibiotic and antimicrobial peptides Theoretical understanding of role of water and cosolutes on conformation and self –assembly of biomacromolecules Deciphering spatial organization inside bacterial cell

* no of faculty members using the laboratory

† no of postdoctoral fellows using the laboratory

‡ no of graduate students using the laboratory

39. List of doctoral, post-doctoral students and Research Associates

	Doctoral students		Doctoral students
1	Anshul Deep Singh Parmar	30	Naresh Kumar
2	Vinutha H A	31	Dube Dheeraj Prakashchand
3	Sharath K Jose	32	S. V. Rahul
4	Mamta Raju Jotkar	33	Lokrshi Prawar Dadhichi
5	S. Ravi Chandran	34	Navdeep Rana
6	Debabrata Sinha	35	Keerthan Subramanian
7	Habeeba Tamkeen K S	36	Archit Bhardwaj
8	Sumit Kumar Birwa	37	Vikash Pandey
9	S Ganga Prasath	38	Rahul Sharma
10	Rashmi Ramaadugu	39	Debabrata Dhara
11	Shubhadeep Pal	40	Debdeep Mandal
12	Rayan Chatterjee	41	Timir Baran Sil
13	Rahul Kumar Gupta	42	Janeka Gartia

Doctoral students		Doctoral students	
14	Rajsekhar Das	43	Kshama Sharma
15	Mrinmoy Mukherjee	44	Saurabh Chaudhary
16	Bhanu Prasad Bhowmik	45	Sudeshna Patra
17	Pappu Acharya	46	Subhrajyoti Dolai
18	Praveen Kumar	47	Mukul G Jain
19	Indrajit Tah	48	Subhendu Pandit
20	Shashank Yadav	49	Khandekar Jishan Bari
21	Jaya Krishna Koneru	50	Subhajit Ghosal
22	Kallol Paul	51	Aslam Uddin
23	Ritabrata Thakur	52	Sumit Bawari
24	Vishnu V Krishnan	53	Avijit Maiti
25	Debankur Das	54	Subhajit De
26	Rahul Chajwa	55	Shamasree Ghosh
27	Dhuppar Shivnarayan Tillesh	56	Anusha Bargavi Gopalan
28	Pankaj Popli	57	Nikhita Pasnuri
29	Pardeep Kumar	58	P S Kesavan

Post-doctoral fellows	
1	G Gopi Krishna
2	Seshagiri Rao R.V.
3	Kiran Kumar Tadi
4	Deepa Jaiswal
5	Sitara Roy
6	Abhijeet A Joshi
7	Deepu P
8	Satya Prakash
9	Balaji Yendeti
10	S. Mathimalar
11	Biswajit Santra
12	M. Anand
13	Khevath Praveen Kumar Naik
14	Sunita Patel
15	Sarada Seetharaman
16	Kartika Padhan
17	Chandrakala Gowda
18	Angana Ray
19	Ravi Kumar Biroju
20	C. Neeraja
21	Swarnali Bandyopadhyay

	JRFs	SRFs
1	Sarika Kumari	NIL
2	Akshi Gupta	
3	Rakesh Kumar Y	
4	Swapneel Amit Pathak	
5	Paswa Nath	
6	Subrata Kuilya	
7	Sambit Mohapatra	
8	Sreedevi K N	

40. Number of post graduate students getting financial assistance from the university.

Most of the students (57 out of 58) of TCIS are in doctoral programmes and hence they are all given TIFR fellowships. One doctoral student is receiving a scholarship from CSIR.

41. Was any need assessment exercise undertaken before the development of new programme(s)? If so, highlight the methodology.

No.

42. Does the department obtain feedback from

a. faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?

Constant effort is made by the Academic Advisory committee (AAC) to ensure the quality of curricula offered. The syllabus is regularly discussed and revised depending on interaction with peers and feedback received from faculty.

b. Students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?

Student feedback is obtained formally at the end of each course in the form of a filled course evaluation form (Student Response to Instructions – SRTI). The ratings are discussed in the AAC and relevant information is passed onto the teacher.

- c. Alumni and employers on the programmes offered and how does the department utilize the feedback?

No feedback is taken by alumni at present.

43. List the distinguished alumni of the department (maximum 10)

None

44. Give details of student enrichment programmes (special lectures / workshops / seminar) involving external experts.

As Item No 30 shows, TCIS regularly conducts seminars, conferences & workshops, which are attended by all the doctoral students. These provide the required introduction to the state of the art in the subjects of their research.

45. List the teaching methods adopted by the faculty for different programmes.

Faculty members are encouraged to design their own teaching methods and within certain parameters, allowed to choose topics of instructions. They may also design & float new elective courses. A significant component of take-home assignments is encouraged. The mode of evaluation is decided by the teacher.

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

Constant effort is made by the Academic Advisory committee (AAC) to ensure the quality of curricula offered. The syllabus is regularly discussed and revised depending on interaction with peers and feedback received from faculty and students.

Student feedback is obtained formally at the end of each course in the form of a filled course evaluation form (Student Response to Instructions – SRTI). The ratings are discussed in the AAC and relevant information is passed onto the teacher.

47. Highlight the participation of students and faculty in extension activities.

Outreach: The institute has initiated three distinct areas of outreach activities with different audiences in mind. The purpose of the outreach activities is to educate and inform the public about our research efforts, and to encourage young students to become scientists and be informed about current efforts in Science.

For the general public: We started a discussion series on Science titled “Sawaal-Jawaab: Conversations on Science” at a public venue, Lamakaan, in Hyderabad. We have hosted many eminent researchers who speak about their research and engage in conversation with the general public. The speaker is typically asked to prepare half an hour of material, but questions flow freely from the audience and the typical duration of the entire event is two hours. This is now a recognized event in Hyderabad with 50 – 60 attendees per session.

For school and college students: The institute has hosted a number of visiting groups from schools and colleges. In addition to a lab tour, the students engage in experiments/hand-on activities that demonstrate the playful side of science, but are designed in part to introduce them to the research areas of our institute. The activities are led by TCIS students.

For college students: With the help of funding from the National Academies, we have organized and hosted two annual undergraduate research symposiums in summer 2014 and 2015 in which students engaged in summer research present their work to their peers. These symposiums have each featured a plenary talk by one TCIS and one external faculty member on their research.

Students & faculty members regularly participate by giving talks and presenting posters at National & International conferences.

48. Give details of “beyond syllabus scholarly activities” of the department.

TCIS conducts and participates in the following activities on a regular basis.

- Seminars
- Colloquium
- VSRP Programme

-
- Sawaal-Jawaab, a series of discussions about current issues in science for general public
 - Outreach activities: visits by schools and colleges are organised and simple experiments are demonstrated to introduce them to scientific research.
49. State whether the programme/ department is accredited/ graded by other agencies? If yes, give details.
- No
50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied
- Regimes of break-up delineated for a bubble rising through liquid.
 - Relevance of caustics in droplet aggregation and coalescence demonstrated.
 - Viscosity stratification can create several new instabilities in shear flow, and is a singular effect.
 - Development of transport and hydrodynamics models to study the properties of hot and dense nucleus / quark gluon plasma formed in relativistic heavy ion collisions.
 - We have discovered how T4 lysozyme interconverts between two compact conformations. Contradictory to expectations the activation barrier is just $\sim 6kT$.
 - Prediction of a propagation gap for wavelike excitations in large-scale flocks with rotational inertia; important consequences for signalling in biological groups
 - Spontaneous flocking phase transition in a vibrated granular monolayer: experiment, simulation and predictive theory; discovery and elucidation of a new type of flocking interaction between self-propelled particles
 - Theory of the dynamics of the plasma membrane of the living cell, consequences include the emergence of spontaneous membrane waves, as widely seen in crawling cells
 - Theoretical principles for the quantitative design of chemotactic behaviour of active colloids, dramatic collective behaviour predicted, including precise analogues to gravitational collapse
 - Theory of spontaneous synchronization in active matter, with relevance to

metachronal waves and bacterial swimming

- Our work on the effective of self-propelling activity on suspension viscosity highlighted in Nature (N & V) 525, 37 (2015) in connection with experiments on bacterial suspensions that bear out our predictions.
- We show that high resolution proton-detected NMR spectra can be obtained on large biomolecules in the solid state at slow-moderate MAS frequencies.
- Developed a strategy to combine pulse sequences using multiple receivers and multiple sequential acquisitions in biomolecular solid state NMR. The time savings for a single case can be as much as 2-3 weeks
- Unification of heteronuclear spin decoupling schemes in solid-state NMR to improve resolution and sensitivity of NMR spectra.
- Identification of unique structural folds in Aβ peptides upon binding to membranes.
- Design of asynchronous schemes that enhance geometry elucidation efficiency in solid-state NMR.
- Generation of hyperpolarised xenon gas with optical pumping, to be used for imaging.
- Using diironnonacarbonyl, $[\text{Fe}_2(\text{CO})_9]$ as a source of Lewis acid fragment, we have stabilized germanium dichloride, GeCl_2 . In the solid state, it exhibits a dimeric structure with a Ge_2Fe_2 -four-membered ring.
- Understanding the observed long delays in post-quench equilibration of athermal martensites, through protein folding concepts such as golf holes and entropy barriers.
- Rapid adaptation of yeast to environmental stress showing signatures of stress-induced mutagenesis.
- Cell-cycle dependent DNA damage responses on a cell-by-cell basis in mammalian cell populations.
- We showed that different ways of calculating static length scale (including our proposed method) in glass forming liquids are actually same. This will help us reduce some degree of complexity if there were multiple length scales in the glass transition problem which is already very complex in nature.
- Vanishing of configurational entropy may not imply an ideal glass transition in randomly pinned liquids.

-
- Short-time relaxation processes known as β -relaxations in glass-forming liquids are cooperative in nature and the scale of the cooperative is same as that observed at long time scale. This will help us understand how ageing and rejuvenation happen in glassy systems
 - Patchy colloidal model has many properties similar to that of networked liquids such as water and silicate glass. The model produces several kinds of stable crystalline structures at low temperatures. Under certain conditions it remains glassy. Some of our predictions have been verified experimentally in a complex nano-particle system consisting of Au/PbS nano “dumbbells”
 - It is known that gene dense chromosomes appear to be concentrated towards the centre of the nucleus in a Eukaryotic cell while those with low gene density segregate to the nuclear surface. No real explanation for this fact was known. We have now shown using computer simulations and simple physical arguments that this is a consequence of differential transcriptional activity associated with the chromosomes.
 - The existence of “super solids” i.e. solids with crystalline order which flow like a superfluid, has been debated for many years. There have been many experiments which provide evidence in one direction or the other. Our work suggested that a super solid fraction may appear as a long-lived transient which vanishes with annealing. This may provide a resolution of many perplexing issues concerning a variety of experiments on bulk solid helium.
 - The technologically important phenomenon of irreversible plastic deformation of crystalline and glassy solids is ill understood from a fundamental viewpoint. Non-affine displacement fluctuations appear to be suggestive of a new direction in this field. This may have important ramifications for understanding deformations of solids in a unified setting.
 - The spreading rate of a shear flow is universal in an intermediate regime which is also marked by strong correlations.
 - It is proved that Killing Vectors for the FLRW metric, when suitably scaled by functions, are non-normalizable zero modes of the scalar Laplacian on these spaces.

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department.

Strengths

- Faculty of outstanding quality, selected by a demanding internationally peer-reviewed screening process. Although most faculty members are less than four years into their roles, they are already leaders on the global stage in several areas of research. Successes from work published by TCIS faculty include: new understanding of length-scales at the glass transition; insights into intrinsically disordered proteins; new light on protein-aggregation diseases; ultra-hydrophobic surfaces; non-affinity and the yield and flow of solids; extraordinary enhancement of laser-driven ion acceleration by bacterial cells
- The Interdisciplinary nature of the Centre provides an excellent platform for larger problems to be attacked from different angles by individuals with completely different expertise.
- Strong and comprehensive teaching programme governed by the exacting standards of the TIFR University. Students are on an average of very high quality and very motivated.
- Significant seed funding for faculty's research programmes
- Strong outreach activities, already very visible on the Hyderabad education circuit.

Weaknesses

- Research funding flow is ad hoc, not predictable, posing problems for a growing campus.
- Slow development of the main campus at Hyderabad, delaying the full growth of TIFR Hyderabad and the availability of a campus setting for faculty and students.
- Faculty members having to spend large amounts of time in Centre-building.
- Dependence on local rentals for student accommodation.

- Administrative and purchase procedures complicated and inflexible, posing an inordinate demand on faculty time and energy, with adverse effect on research and institution-building.

Opportunities

- Tremendous possibilities for cross-disciplinary collaborations within the Centre between experimenters, theoreticians and simulators, across the chemical, biological and physical sciences, and engineering, facilitated by the PI-centric rather than departmental structure.
- Exciting opportunities for technological application, as the fundamental research pursued at the Centre has major translational implications, as can be seen from material presented under **Strengths** and **Future Plans of the Centre**.
- Achievements of our faculty globally recognized, as seen in many invited talks at international conferences and membership of prestigious editorial boards, resulting in many opportunities for international collaboration.
- High-quality research seminars, colloquia and workshops offer our young investigators and their groups the opportunity to interact with the world leaders in the field. The Centre maintains a vibrant visitors' programme, hosting colleagues from all disciplines from various parts of India and across the world.

Challenges

- Delays in infrastructure development.
- Insufficient space unless an additional building is made ready.
- Subsequent difficulty in recruiting excellent new faculty members.
- Inadequate computing and other facilities to provide a level playing field against international competition.
- Complex and opaque rules and procedures.

52. Future plans of the department

The growth of TIFR Hyderabad hereafter must take place in a massively parallel way in the various proposed disciplines. Five years from now we expect a campus with about 100 faculty members and 500 to 800 students, postdocs and interns, and the necessary physical infrastructure in the form of academic buildings, laboratories and hostels. We anticipate and plan a balanced growth of research across all the sciences and engineering. The areas explored will in part be natural outgrowths of those present at the inception of TCIS, but will also emerge from the evolving priorities of the growth plan of TIFR-H. We expect major collaborations at the interfaces and overlaps of the life sciences with the chemical and physical sciences, and with critical applied areas such as materials science and engineering (both conventional and nanoscale), translational research in drug design and disease biology, as well as climate science. The research will be supported by major dedicated facilities for high-performance computation, magnetic resonance spectroscopy, intense-field laser science, imaging based on visible light as well as electrons, and nanofabrication.