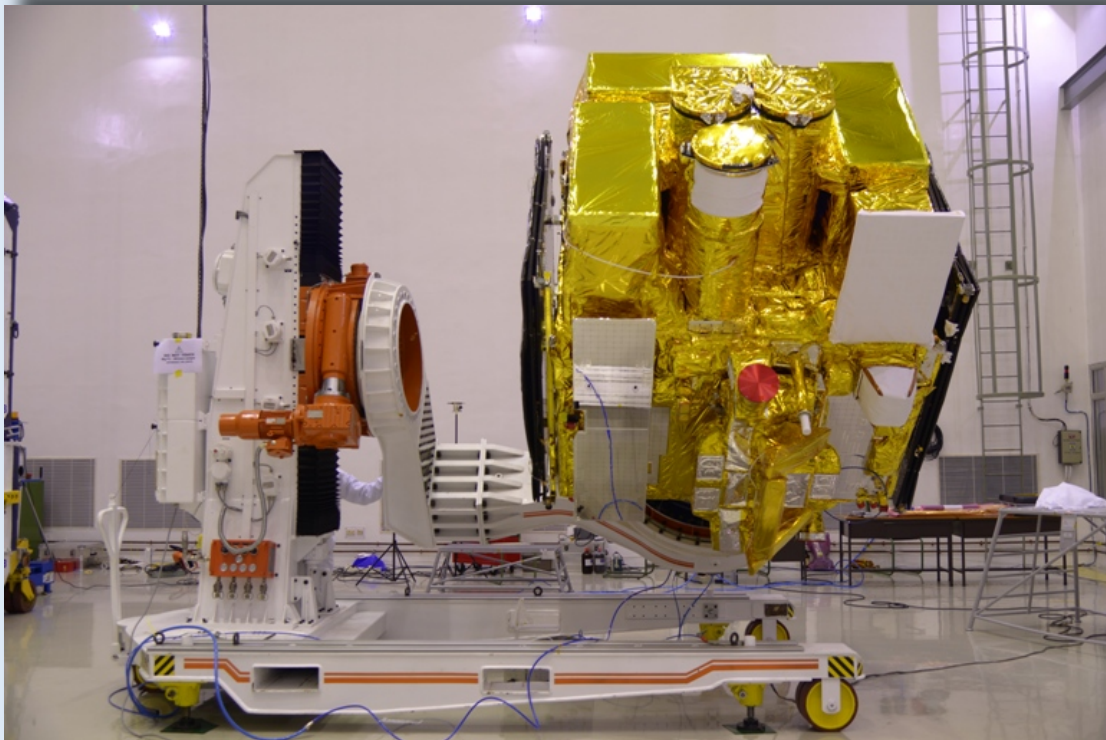


B3-II
Department of Astronomy
and Astrophysics
(DAA)



Department of Astronomy and Astrophysics

1. Name of the Department :
Department of Astronomy and Astrophysics (DAA)
 2. Year of establishment : 1945
TIFR was divided into Research Groups in the period 1945 – 1997.
The present Departments were formed on December 12, 1997.
 3. Is the Department part of a School/Faculty of the university?
The DAA is a part of the Faculty of Natural Sciences.
 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.
 3. M. PhilNo students are admitted purely for an M.Phil programme. However, sometimes students in the Ph.D. and Integrated Ph.D. programmes are permitted to exit with an M.Phil. degree provided they have successfully completed the Course Work and an M.Phil. dissertation.
 5. Interdisciplinary programmes and departments involved
The DAA does not offer interdisciplinary programmes. However, there is a lot of research collaboration among the Departments, and the graduate school has Instructors drawn from all five physics departments in Colaba.
 6. Courses in collaboration with other universities, industries, foreign institutions, etc.
A list of courses taught by DAA faculty members outside TIFR in the period **2011 – 2015** follows.
-

	Institution	Course Name	Faculty member
1.	CBS, Mumbai	Numerical methods	H.M.Antia
2.	CBS, Mumbai	General Relativity and Cosmology	D. Narasimha

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

No programmes have been discontinued since the inception of the TIFR University.

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

Students of the DAA are offered a Course Work programme based on a mixture of compulsory Core Courses, choice-based Elective Courses and compulsory Project Work, on topics of their own choice. The detailed structure is given in the table below.

Programme	Duration (years)		Basic & Core Credits	Elective Credits	Project Credits	Total Credits
	Overall	Coursework				
Ph.D.	5	1.5	28	16	16	60
Int. M.Sc.-Ph.D. (J)	6	2.5	56	28	16	100

N.B. Integrated M.Sc.-Ph.D. students who join after 4 years B.Sc. or equivalent are required to do only 36 Core Credits, i.e. 80 Credits in total.

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 who are not doing courses during the breaks are encouraged to participate in research projects with faculty members of their choice.

In each one-semester semester, students are evaluated by a Continuous Evaluation process consisting of

1. Assignments

2. Quizzes
3. Mid-semester Examination
4. End-semester Examination
5. Term paper (optional)

All students are required to do 16 Credits of Project work in their allotted Departments as a part of the Coursework. In Departmental Project I (8 Credits), they are required to study a topic of current interest outside of the textbooks and write a report on the state of art in that subject. In Departmental Project II (8 Credits), they are required to do a small original work, preferably (but not compulsorily) in the same area, or review some highly technical work which is known to be very difficult. Both these Projects are evaluated by a Committee of Faculty Members drawn from the different Departments.

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

TIFR Physics Courses are divided into four levels, as per the table below.

Level	Course Content	Participation
I	Basic Subjects	All 5 Physics Departments jointly
II	Core Subjects	All 5 Physics Departments jointly
III	Review Courses (Basic Elective)	Relevant Department
IV	Topical Courses (Advanced Elective)	Relevant Department

Thus, DAA faculty are involved in teaching the Level I and II courses in sharing with faculty from other Physics departments, and exclusively involved in teaching all Level III and IV courses in Astronomy and Astrophysics, as well as General Relativity and Cosmology and Fluid Dynamics.

DAA students are free to choose Electives in other Departments, even outside Physics, in consultation with the Subject Board of Physics.

10. Number of faculty positions:

	Faculty Designation with DAE Grade	Abbreviation (in Item 11)	Number
1.	Distinguished Professor (J)	Dist. Prof. (J)	—
2.	Senior Professor (I)	Sr. Prof. (I)	5
3.	Professor (H)	—	6
4.	Associate Professor (G)	Assoc. Prof. (G)	3
5.	Reader (F)	—	2
6.	Fellow (E)	—	—
		Total	16

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

	Name	Designation	Deg*	Specialisation	Exp [†]	Stu [†]
1.	K. P. Singh	Sr. Prof. (I)	Ph.D	X-ray and Optical Astronomy, X-ray Instrumentation	40	1
2.	H. M. Antia	Sr. Prof. (I)	Ph.D.	Helio- and astro-seismology	37	1
3.	Swarna K. Ghosh	Sr. Prof. (I)	Ph.D	Interstellar Medium and Star Formation, Astronomical Instrumentation Development	37	—
4.	Alak K. Ray	Sr. Prof. (I)	Ph.D	Supernovae, Nuclear Astrophysics and Pulsars	34	—
5.	Pankaj S. Joshi	Sr. Prof. (I)	Ph.D	Gravitation & Cosmology	32	1
6.	D. Narasimha	Professor (H)	Ph.D	Gravitational Lensing	38	—
7.	A. R. Rao	Professor (H)	Ph.D	Exptl. High Energy Astrophysics	36	3
8.	Mayank N. Vahia	Professor (H)	Ph.D	Archaeoastronomy	36	—

9.	J. S. Yadav	Professor (H)	Ph.D	X-ray and Gamma ray Astronomy, Cosmic rays	34	–
10	T. P. Singh	Professor (H)	Ph.D	Gravitation & Cosmology	26	3
11	Devendra K. Ojha	Professor (H)	Ph.D.	Interstellar Medium and Star Formation, Astronomical Instrumentation Development	19	2
12	Bhaswati Mookerjea	Assoc. Prof. (G)	Ph.D	Infrared and Sub-Millimeter astronomy, Astro-chemistry	8	–
13	Sudip Bhattacharyya	Assoc. Prof. (G)	Ph.D.	High Energy Astrophysics	8	2
14	A. Gopakumar	Assoc. Prof. (G)	Ph.D	Gravitational waves	6	1
15	Manoj Puravankara	Reader	Ph.D	Infrared and Sub-millimeter Astronomy	2	–
16	Shravan M. Hanasoge	Reader	Ph.D.	Helioseismology	2	3

* 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

There were none appointed during the period 2011 – 2015.

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

DAA does not employ temporary faculty.

14. Programme-wise Student Teacher Ratio

	Programme	Students (S)	Faculty (F)	Ratio S/F
1.	Ph.D.	10	16	0.62
2.	Integrated M.Sc.-Ph.D.	11	16	0.69
3.	M.Sc.	–	–	–
	Total	21	16	1.31

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

	Scientific & Technical Staff	Administrative & Auxiliary Staff	Total
DAA	36	2	38
PBL	29	19	48
Total	65	21	86

16. Research thrust areas as recognized by major funding agencies

- X-Ray and Gamma-Ray Astronomy
- Infrared and Optical Astronomy
- Theoretical Astrophysics
- Classical and Quantum Gravity

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.

(a) National

	Agency	Project Title	Duration (years)	Total Grant (Rs. lakhs)	Department Member
1.	ARIES, DST	TIFR-ARIES Near Infrared Spectrometer	5	1000.00	D.K. Ojha

	Agency	Project Title	Duration (years)	Total Grant (Rs. lakhs)	Department Member
2.	ISRO Satellite Centre	For The Development And Realisation Of Three X-Ray Astronomy payloads	12	205.62	J.S.Yadav
3.	ISRO	BAFA Phase II	5	100.00	D.K. Ojha
4.	FICCI	Raman Fellowship Astrosat Program	2	52.76	K.P. Singh
5.	ISRO, DOS	Infra-Red Spectroscopic Imaging Survey (IRSIS)	5	29.18	S.K.Ghosh
6.	Jamsetji Tata Trust	Study Of The Prehistoric Past Of India Using Modern Technologies , Drawing Particularly From Fields of Astronomy	6	26.00	M.N.Vahia
7.	ISRO Satellite Centre	For The Development And Realisation Of Three X-Ray Astronomy payloads	10	24.96	K.P. Singh
8.	SERB	Ramanujan Fellowship	5	14.10	S.M. Hanasoge
9.	Shell India Markets Pvt. Ltd.	Real-Space Renormalisation In Porous Media	1	9.00	S.M.Hanasoge
10.	ISRO , DOS	RT-2 experiment On-Board The Coronas-Photon Satellite	9	5.83	A.R.Rao
11.	DST	Multi-Wavelength Studies Of Accretion Phenomena With ASTROSAT And SALT	3	5.47	K.P. Singh
12.	DST	Study Of Neutral And Ionized Gas In Star Forming Regions	2	5.41	D.K. Ojha
13.	DST	Investigation Of The Distribution Of Various Gas Components In Star Forming Complexes	2	4.51	D.K. Ojha
14.	DST	Interaction Of Ionized. Atomic &	3	4.40	D.K. Ojha

	Agency	Project Title	Duration (years)	Total Grant (Rs. lakhs)	Department Member
		Molecular Gas In Star Forming Regions			

(b) International

	Agency	Project Title	Duration (years)	Total Grant (Rs. lakhs)	Faculty
1.	U. o f Leicester, UK	High Energy Astrophysics With ASTROSAT: Understanding The Variable X-Ray Universe.	8	27.41	K.P. Singh
2.	John Templeton Foundation	The Need To Reformulate Quantum Mechanics Without Classical Spacetime : The Consequent Nonlinearity & Its Potential to solve the measurement problem	3	19.43	T.P.Singh
3.	Max Planck Gesellschaft	Max Planck Partner Group With The Max Planck Institute For Solar Systems Research	1	13.88	S.M.Hanasoge
4.	British Council Division (UKIERI)	Astrophysics With ASTROSAT Programme	4	8.71	K.P. Singh
5.	FQXI	The quantum measurement problem	4	3.41	T.P.Singh
6.	IFCPAR	Probing Dense Matter And Strong Gravity	4	1.26	S. Bhattacharyya

18. Inter-institutional collaborative projects and associated grants received

(a) National

	Collaborating Institutions	Project Title	Duration	Total Grant (Rs. lakhs)	Faculty
1.	ISRO Satellite Centre	ASTROSAT Development Of Satellite Payloads	10	24.96	K.P. Singh
2.	ISRO , DOS	RT-2 experiment On-Board The Coronas-Photon Satellite	9	5.83	A.R.Rao

(b) International

	Collaborating Institutions	Project Title	Duration	Total Grant (Rs. lakhs)	Faculty
1.	U. o f Leicester, UK	High Energy Astrophysics With ASTROSAT: Understanding The Variable X-Ray Universe.	8	27.41	K.P. Singh
2.	Max Planck Gesellschaft	Max Planck Partner Group With The Max Planck Institute For Solar Systems Research	1	13.88	S. Hanasoge

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

	Agency	Project Title	Duration	Total Grant (Rs. lakhs)	Faculty
1.	DAE	XII Plan Project -- DAA	5 years	2424	All DAA faculty

20. Research facility / centre with

- state recognition :
- national recognition :
- international recognition :

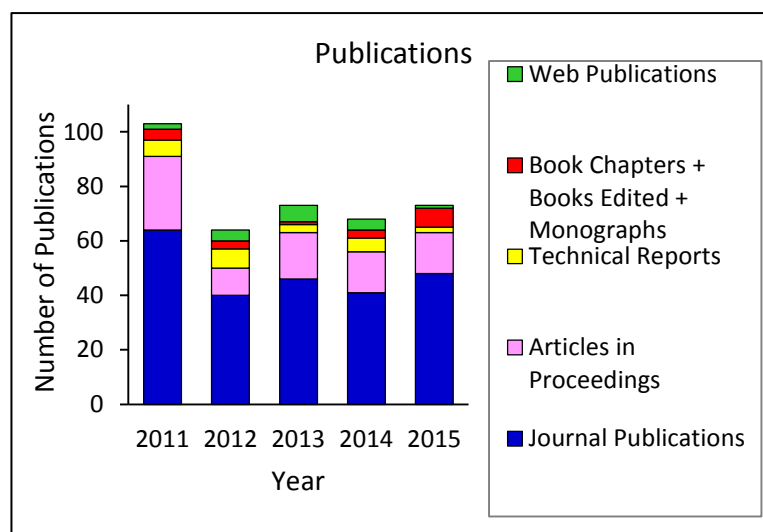
At present, there are none such in the DAA.

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

At present, there are none such in the DAA.

22. Publications:

DAA	Journal Publications	Articles in Proceedings	Technical Reports	Web Publications	Book Chapters	Books Edited	Mono-graphs
2010-11	64	27	6	2	3	1	—
2011-12	40	10	7	4	2	1	—
2012-13	46	17	3	6	—	—	1
2013-14	41	15	5	4	1	—	2
2014-15	48	15	2	1	6	1	—
Total	239	84	23	17	12	3	3



* Books with ISBN with details of publishers

- (i) *The Story of Collapsing Stars*
by Pankaj S. Joshi, Oxford University Press (2015)
ISBN-13: 978-0-19-151026-7, ISBN: 0-19-151026-2
- (ii) *Numerical Methods for Scientists and Engineers (3/E)*
by H. M. Antia, Hindustan Book Agency (2012)
ISBN 978-3764367152
- (iii) *Gravitational Collapse and Spacetime Singularities*
by Pankaj S. Joshi, Cambridge University Press (2008)
ISBN-13: 978-1-107-40536-3, ISBN: 1-107-40536-X
- (iv) *Global Aspects in Gravitation and Cosmology*
by Pankaj S. Joshi, Clarendon Press (Oxford, 1993),
ISBN-13: 978-0-19-850079-7, ISBN: 0-19-850079-3

* Citation Index :

Total number of citations: 23184 (Source: Astrophysica Data System -- ADS)

Citation per faculty: 1449

* h-index :

Range: 11 - 36

23. Details of patents and income generated :

At present, there are none in the DAA.

24. Areas of consultancy and income generated

DAA has none in the period 2011-15.

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

National Visits :

	Faculty Member	Institution visited	Date
1.	T. P. Singh	ICGC2015, IISER Mohali	12/2015
2.	Alak K. Ray	Current Issues in Cosmology, Astrophysics & High Energy Physics, Dibrugarh University, Assam	11/2015
3.	K.P. Singh	ISAC, Bengaluru: for integration and testing of Astrosat-SXT payload	03/2015
4.	K.P. Singh	National Symposium on Particles, Detectors and Instrumentation, Madurai	03/2015
5.	D. K. Ojha	32nd Astronomical Society of India meeting, IISER Mohali	03/2015
6.	J. S. Yadav	Physics department, IIT Kanpur	03/2015
7.	K.P. Singh	Annual Meeting of the ASI, NCRA, Pune	02/2015
8.	S. Bhattacharyya	Workshop on "Transients", 33 rd ASI Meeting, NCRA, Pune	02/2015
9.	D. K. Ojha	33rd Meeting of the Astronomical Society of India, NCRATIFR, Pune	02/2015
10.	D. K. Ojha	Workshop on Star and Planet Formation, IUCAA, Pune	02/2015
11.	B. Mookerjee	Workshop on Star & Planet formation, Annual Meeting of the Astronomical Society of India, Pune, 16 February	02/2015

	Faculty Member	Institution visited	Date
		2015	
12.	D. Narasimha	Workshop on Transients, NCRA-TIFR, Pune	02/2015
13.	J. S. Yadav	ASI Meeting, NCRA, Pune,	02/2015
14.	Alak K. Ray	Physics Colloquium, Presidency University, Calcutta	02/2015
15.	K.P. Singh	RoboPol and Polarimetry in Astronomy, IUCAA, Pune	01/2015
16.	K.P. Singh	Workshop on Science with LAXPC/ASTROSAT, TIFR National Balloon Facility, Hyderabad	12/2014
17.	S. Bhattacharyya	Workshop on Science with LAXPC/ASTROSAT, Hyderabad	12/2014
18.	J. S. Yadav	Workshop on Science with LAXPC/ASTROSAT	12/2014
19.	A. Gopakumar	Neutron Stars: A brainstorming Workshop, NCRA-TIFR	11/2014
20.	H.M. Antia	DWIH Indo-German Winter School on Astrophysics, TIFR, Mumbai	11/2014
21.	S. Bhattacharyya	Neutron Star Workshop, NCRA, Pune	11/2014
22.	D. K. Ojha	Workshop on Current trends in Near Infrared Astronomy in India, TIFR Balloon Facility, Hyderabad	11/2014
23.	B. Mookerjea	Workshop on Current trends in Near Infrared Astronomy in India, Hyderabad	11/2014
24.	S. Hanasoge	Dynamics of the Solar Atmosphere, IUCAA, Pune,	11/2014
25.	M. Puravankara	Workshop on Current trends in Near Infrared Astronomy in India, TIFR Balloon facility, Hyderabad	11/2014
26.	J. S. Yadav	ISAC, Bengaluru	10/2014
27.	K.P. Singh	Hard X-ray Astronomy: Astrosat and Beyond, International Centre, Goa	09/2014
28.	D. Narasimha	Hard X-ray Astronomy: ASTROSAT and beyond, Goa.	09/2014
29.	J. S. Yadav	ISAC, Bengaluru	08/2014
30.	D. K. Ojha	Workshop on Galaxies and Cosmology, NCRA-TIFR, Pune	07/2014
31.	A. Gopakumar	Cotton College State University, Guwahati, India	06/2014.
32.	J. S. Yadav	ISAC, Bengaluru	06/2014
33.	J. S. Yadav	ISAC, Bengaluru	05/2014

	Faculty Member	Institution visited	Date
34.	S. Hanasoge	IISER Kolkota	05/2014
35.	J. S. Yadav	ASTROSAT Baseline Science Meeting	05/2014
36.	J. S. Yadav	ISAC, Bengaluru	04/2014
37.	H.M. Antia	Plasma Processes in the Solar and Space Plasma at Diverse Spatio-Temporal Scales: Upcoming Challenges in the Science and Instrumentation, ARIES, Nainital	03/2014
38.	K . P. Singh	ASTROFEST, Cotton College, Guwahati	03/2014
39.	K . P. Singh	IISER, Mohali, Meeting of the Astronomical Society of India	03/2014
40.	K . P. Singh	Punjabi University, Patiala, Physics Department	03/2014
41.	K . P. Singh	Thapar University, Patiala	03/2014
42.	K.P. Singh	IIA, Bengaluru: Astrosat Calibration group and Science Working Group meetings	02/2014
43.	S. Bhattacharyya	Transients with Astrosat, IUCAA, Pune	01/2014
44.	D. K. Ojha	The India- TMT science and instrumentation meeting, Indian Institute of Astrophysics, Bengaluru	01/2014
45.	J. S. Yadav	Black hole transients with LAXPC/ASTROSAT, IUCAA	01/2014
46.	A.R. Rao	Symposium on ``Transients with Astrosat'', IUCAA	01/2014
47.	S. Bhattacharyya	Relativistic spectral emission lines from X-ray binaries; National Symposium on VHE Gamma Ray Astronomy 2013, BARC, Mumbai	11/2013
48.	A.R. Rao	National Symposium on VHE Gamma Ray Astronomy, BARC	11/2013
49.	K.P. Singh	Conference on High Energy Emission from AGN, University of Kashmir	10/2013
50.	K . P. Singh	University of Kashmir, Srinagar	10/2013
51.	K . P. Singh	ISAC, Bengaluru	10/2013
52.	A.R. Rao	Black holes, jets and outflows, Kathmandu, Nepal,	10/2013
53.	S. Bhattacharyya	Accretion on to Black Holes, International Center, Goa, India	09/2013
54.	K . P. Singh	ISAC, Bengaluru	09/2013
55.	D. Narasimha	Meeting on Accretion in Black Holes, Goa,	09/2013
56.	A.R. Rao	“Unsolved” observational problems in Accretion onto	09/2013

	Faculty Member	Institution visited	Date
		Black Holes; Accretion onto Black Holes, Goa	
57.	K . P. Singh	ISAC, Bengaluru	08/2013
58.	J. S. Yadav	ISAC, Mysuru	07/2013
59.	D. Narasimha	JVN75, IUCAA, Pune	07/2013
60.	S. Bhattacharyya	Advances in Astroparticle Physics and Cosmology (AAPCOS-2013), Shimla, India	06/2013
61.	K . P. Singh	ISAC, Bengaluru	05/2013
62.	K.P. Singh	IIT Guwahati and Cotton College State University, Guwahati	03/2013
63.	S. Bhattacharyya	ASTROFEST 2013 conference, Cotton College State University, Guwahati	03/2013
64.	S. Bhattacharyya	Recent trends in the study of compact objects: Theory and Observation conference, IIT Guwahati	03/2013
65.	S. Bhattacharyya	Transients and Timing: A Multiwavelength Approach conference, IUCAA, Pune	03/2013
66.	K . P. Singh	IUCAA, Pune	03/2013
67.	K . P. Singh	IIT Guwahati and Cotton College State University, Guwahati	03/2013
68.	K . P. Singh	National meeting on Recent trends in the study of compact objects: Theory and Observation, IIT/Guwahati	03/2013
69.	K . P. Singh	Transients and Timing Meeting, IUCAA, Pune	03/2013
70.	J. S. Yadav	IUCAA, Pune	03/2013
71.	M. N. Vahia	Workshop on Analytical Strategies in Archaeology, Department of Ancient History, University of Allahabad	03/2013
72.	A.R. Rao	Astrofest, Cotton College, Guwahati,	03/2013
73.	A.R. Rao	RETCOS Conference, IIT, Guwahati,	03/2013
74.	A.R. Rao	Transient and Timing Meeting, IUCAA, Pune,	03/2013
75.	K.P. Singh	IUCAA, Pune	02/2013
76.	K . P. Singh	IUCAA, Pune	02/2013
77.	B. Mookerjea	Meeting of the Astronomical Society of India, Thiruvananthapuram	02/2013
78.	J. S. Yadav	ISAC, Bengaluru	01/2013

	Faculty Member	Institution visited	Date
79.	Alak K. Ray	IAU Symposium 296 "Supernova Environmental Impacts", Raichak, West Bengal	01/2013
80.	K.P. Singh	HRI, Allahabad	12/2012
81.	D. Narasimha	INSPIRE Internship meeting, Kannur	12/2012
82.	H.M. Antia	International Symposium on Solar-Terrestrial Physics, IISER Pune	11/2012
83.	H.M. Antia	International Symposium on Solar-Terrestrial Physics, IISER Pune	11/2012
84.	T. P. Singh	IIT Kanpur	11/2012
85.	S. Bhattacharyya	Neutron Stars: Inside and Outside conference, SINP, Kolkata	10/2012
86.	D. K. Ojha	Aryabhata Research Institute of Observational Sciences (ARIES), Nainital	09/2012
87.	T. P. Singh	IIT Kanpur	08/2012
88.	S. Bhattacharyya	39 th COSPAR Scientific Assembly, Bengaluru.	07/2012
89.	K . P. Singh	39 th COSPAR Scientific Assembly, Mysuru	07/2012
90.	D. K. Ojha	International Workshop on Chemical Evolution of Star Forming Region and Origin of Life, SNBNCBS, Kolkata,	07/2012
91.	J. S. Yadav	39th COSPAR Scientific Assembly, Mysuru	07/2012
92.	D. Narasimha	"Successful Indo-French Projects", 25 years of Indo-French Centre for the promotion of advanced research, Chennai	06/2012
93.	S. Bhattacharyya	X-ray View of Cosmos conference, PRL, Ahmedabad	04/2012
94.	K . P. Singh	Conference on X-ray View of Cosmos, PRL, Ahmedabad	04/2012
95.	K . P. Singh	Conference on X-ray View of Cosmos, PRL, Ahmedabad	04/2012
96.	A.R. Rao	Symposium on X-ray Universe, Place/Date: PRL, Ahmedabad	04/2012
97.	S. Bhattacharyya	Advances in Astroparticle Physics and Cosmology 2012, Darjeeling	03/2012
98.	K . P. Singh	HRI, Allahabad	03/2012
99.	K . P. Singh	National Symposium on Particles, Detectors and Instrumentation (NSPDI), TIFR, Mumbai	03/2012

	Faculty Member	Institution visited	Date
100.	S. Bhattacharya	Advances in Astroparticle Physics and Cosmology 2012, Darjeeling, India	03/2012
101.	K . P. Singh	Winter School on High Energy Astrophysics: Accretion onto Compact Objects, (HEAP12), HRI, Allahabad	02/2012
102.	H.M. Antia	Interdisciplinary workshop on High Performance Computing, Physical Research Laboratory, Ahmedabad	01/2012
103.	K . P. Singh	International Workshop on Stellar Spectral Libraries, Delhi University, Delhi	12/2011
104.	D. K. Ojha	International Workshop on Stellar Spectral Libraries (IWSSL 2011), University of Delhi, New Delhi	12/2011
105.	D. K. Ojha	National Workshop on Role of Small Telescopes in Modern Astronomy Research, held at SBNCBS, Kolkata	11/2011
106.	D. K. Ojha	International conference on Interstellar Dust, Molecules and Chemistry (IDMC-2011), IUCAA, Pune	11/2011
107.	K . P. Singh	Indian Institute of Astrophysics, Bengaluru	08/2011
108.	K . P. Singh	Anniversary of the VBT, IIA, Bengaluru	08/2011
109.	D. K. Ojha	International workshop on Recent Advances in Star Formation, IIA, Bengaluru	06/2011
110.	H.M. Antia	Indian Institute of Astrophysics, Bengaluru	03/2011
111.	H.M. Antia	M. S. University, Vadodara	02/2011
112.	S. Bhattacharyya	Meeting of Astronomical Society of India, Raipur	02/2011
113.	K.P. Singh	Indian Institute of Space Science and Technology, Thiruvananthapuram	01/2011
114.	S. Bhattacharyya	IAGRG Meeting, HRI, Allahabad,	01/2011
115.	S. Bhattacharyya	Conference on Wideband X-ray Astronomy: Frontiers in Timing and Spectroscopy, IUCAA, Pune	01/2011
116.	K . P. Singh	XXXV Optical Society of India Symposium and International Conference on Contemporary Trends in Optics and Opto-electronics, Indian Institute of Space Science and Technology, Thiruvananthapuram	01/2011
117.	K . P. Singh	International Conference on Wide-band X-ray Astronomy: Frontiers, IUCAA, Pune	01/2011

International Visits :

	Faculty Member	Institution visited	Date
1.	A. Ray	New York University at Abu Dhabi, UAE	11/2015
2.	A. Ray	Thirty Meter Telescope Science Forum Meeting, Washington, DC, USA	06/2015
3.	A. Ray	Dick McCray Symposium, Univ. of Bern, Switzerland	06/2015
4.	S. Hanasoge	New York University at Abu Dhabi, UAE	04/2015
5.	D. K. Ojha	Institute of Applied Physics, Russian Academy of Sciences, Nizhny Novgorod ,Russia	03/2015
6.	A. Ray	Dept. of Astronomy, Columbia Univ., New York, USA	03/2015
7.	A. Ray	American Museum of Natural History, New York, USA	03/2015
8.	A. Ray	Harvard University, Institute of Theory & Computation, Cambridge, MA, USA	02/2015
9.	A. Ray	Center for Cosmology & Astroparticle Physics, Ohio State University, Columbus, OH, USA	02/2015
10.	S. Hanasoge	New York University, USA	12/2014
11.	S. Hanasoge	American Geophysical Union, San Francisco, USA,	12/2014
12.	D. K. Ojha	Niels Bohr International Academy, Copenhagen, Denmark	11/2014
13.	D. K. Ojha	Workshop on Early Life of Stellar Clusters: Formation and Dynamics, Niels Bohr International Academy in Copenhagen, Denmark	11/2014
14.	M.N. Vahia	National Astronomical Observatory, Japan,	11/2014
15.	M.N. Vahia	International Astronomy Olympiad in Kyrgyzstan	10/2014
16.	T.P. Singh	University of Southampton, UK	09/2014
17.	T.P. Singh	University College, London, UK	09/2014
18.	T.P. Singh	Spacetime, matter, quantum mechanics, Castiglioncello, Italy	09/2014
19.	S. Hanasoge	Max Planck Institute for Solar System Research, Germany	09/2014
20.	S. Hanasoge	Cambridge University, UK	09/2014
21.	S. Hanasoge	HELAS conference, Goettingen, Germany.	09/2014
22.	M. Puravankara	HELAS VI/SOHO meeting on Helioseismology & Applications, Max-Planck-Institut fur Sonnensystemforschung, Gottingen, Germany	09/2014
23.	D. K. Ojha	National Astronomical of Japan, Mitaka, Tokyo, Japan	06/2014
24.	K. P.Singh	Conference on Space Telescopes and Instrumentation: UV	06/2014

		to Gamma-Ray, Montreal, Canada	
25.	M.N. Vahia	Study of archaeological sites in Pingguo County, Quangxi Prov., P. R. China	06/2014
26.	M.N. Vahia	Eclipse records in ancient India, Special Discussion Meeting, Astronomical Observatory of Japan, Tokyo	06/2014
27.	S. Hanasoge	University of Heidelberg and Max-Planck Institute for Solar System Research, Germany	06/2014
28.	B. Mookerjea	Physikalisches Institut, University of Cologne, Germany	05/2014
29.	P. S. Joshi	New Perspectives in Black Hole Physics (colloquium), Physics Department, Osaka City University, Osaka, Japan	05/2014
30.	A.R. Rao	9th IACHEC Meeting, Airlie Center (Warrenton, VI), USA	05/2014
31.	M. Puravankara	European Space Astronomy Center, European Space Agency, Madrid, Spain	04/2014
32.	T.P. Singh	Conference on Fundamental Problems in Quantum Physics; Weizmann Institute of Science, Israel	03/2014
33.	B. Mookerjea	Max Planck Institute for Extraterrestrial Physics, Garching, Munich	03/2014
34.	S. Bhattacharya	RIKEN, Japan	12/2013
35.	S. Bhattacharya	ISAS, Japan	12/2013
36.	K. P. Singh	First COSPAR Symposium on Future of Space Astronomy, Bangkok, Thailand	11/2013
37.	A.R. Rao	The 1st COSPAR Symposium, Bangkok, Thailand	11/2013
38.	A. Ray	First COSPAR Symposium, Bangkok, Thailand	11/2013
39.	A. Gopakumar	University of Zurich, Switzerland	10/2013
40.	A. Ray	IAU Symposium No. 303: "The Galactic Center", Santa Fe, New Mexico, USA	10/2013
41.	A. Ray	Harvard University, Institute for Theory and Computation, Cambridge, MA, USA	10/2013
42.	J. S. Yadav	" Black holes, jets and outflows ", Kathmandu, Nepal	10/2013
43.	A. Gopakumar	Theoretisch-Physikalisches Institut, Friedrich-Schiller-University Jena, Germany	09/2013
44.	A. Gopakumar	6th Numerical Relativity - Data Analysis meeting, Spain, Mallorca, Spain.	09/2013
45.	M.N. Vahia	International Astronomical Olympiad at Vilnius, Lithuania	09/2013

46.	T.P. Singh	the University of Trieste, Italy	05/2013
47.	B. Mookerjea	Physikalisches Institut, University of Cologne	05/2013
48.	D. K. Ojha	Institute of Applied Physics, Russian Academy of Sciences, Nizhny Novgorod (Russia),	11/2012
49.	M.N. Vahia	International Olympiad in Astronomy and Astrophysics, held in Brazil	11/2012
50.	P. S. Joshi	Collapsing Objects, Fudan University, Shanghai, China	10/2012
51.	A. Gopakumar	Max Planck Institute for Gravitational Physics, Potsdam, Germany	09/2012
52.	T.P. Singh	University of Southampton, UK	09/2012
53.	S. Bhattacharyya	Research Institute in Astrophysics and Planetology, Toulouse, France	09/2012
54.	S. Bhattacharya	Research Institute in Astrophysics and Planetology, Toulouse, France	09/2012
55.	D. K. Ojha	South Africa - India joint Ground-based Astronomy Workshop, CapeTown, South Africa	08/2012
56.	B. Mookerjea	I. Physikalisches Institut, University of Cologne. Germany	06/2012
57.	A. Gopakumar	Max Planck Institute for Gravitational Physics, Potsdam, Germany	05/2012
58.	A. Gopakumar	Institut Astrophysique de Paris, France	05/2012
59.	A. Gopakumar	The 9th LISA Symposium, , Paris, France	05/2012
60.	A. Gopakumar	Theoretisch-Physikalisches Institut, Friedrich-Schiller-University, Jena, Germany	04/2012
61.	T.P. Singh	Quantum Malta 2012: Fundamental Problems in Quantum Physics, Malta	04/2012
62.	P. S. Joshi	Conference on 'Black Holes: From Quantum To Gravity' Malta	04/2012
63.	D. K. Ojha	Institute of Applied Physics, Russian Academy of Sciences, Nizhny Novgorod, Russia	03/2012
64.	K. P.Singh	University of Leicester, UK	12/2011
65.	D. K. Ojha	Besancon Observatory, France	10/2011
66.	T.P. Singh	University of Turku, Finland,	08/2011
67.	T.P. Singh	Workshop on Inhomogeneous Cosmologies, University of Jyväskylä, Finland	08/2011
68.	S. Bhattacharyya	Harvard University, MIT and University of Maryland, USA	08/2011

69.	T.P. Singh	University of Vienna, Austria	07/2011
70.	T.P. Singh	Meeting on Quantum Physics and the Nature of Reality, Traunkirchen, Austria	07/2011
71.	B. Mookerjea	Asian-Pacific Regional IAU Meeting, Chiang-Mai, Thailand	07/2011
72.	A. Gopakumar	Theoretisch-Physikalisches Institut, Friedrich-Schiller- University Jena, Germany	06/2011
73.	A. Gopakumar	Astronomical Institute 'Anton Pannekoek', University of Amsterdam, The Netherlands	06/2011
74.	T.P. Singh	University of Trieste, Italy	06/2011
75.	B. Mookerjea	Physikalisches Institut, University of Cologne, Germany	06/2011
76.	B. Mookerjea	Ecole Normal Superieur, Paris	05/2011
77.	A. Ray	NASA/Goddard Space Flight Center, Greenbelt, MD, USA	05/2011
78.	A. Ray	Astronomy Dept., Univ. of Virginia, Charlottesville, VA, USA	05/2011
79.	A. Ray	Institute for Gravitation & Cosmos, Pennsylvania State Univ., PA, USA	03/2011
80.	A. Ray	Physics Dept., Washington State University at St. Louis, Missouri, USA	02/2011
81.	A. Ray	West Virginia University, Physics Dept., Morgantown, WV, USA	01/2011
82.	A. Ray	Yukawa Institute of Theoretical Physics, Kyoto Univ., Japan (Long term Workshop on Supernovae & GRBs)	11/2011

26. Faculty serving in

(a) National Committees :

	Name of the Faculty Member	Name of the Committee	Role in the Committee	Term of Service
1.	D.K. Ojha	International Astronomical Union National Committee (INSA-ICSU)	Member	Oct 2015 —

2.	D.K. Ojha	IIA Time Allocation Committee (IIA-TAC)	Chairperson	Jan 2016 —
3.	D.K. Ojha	Astronomical Society of India	Councillor	2010 – 2012
4.	D.K. Ojha	TIFR Balloon Facility Management Board	Member	2011 —
5.	D.K. Ojha	ARIES Science Advisory Committee (ARIES-SAC)	Member	2011 —
6.	D.K. Ojha	ARIES External Screening Committee (ARIES-ESC)	Member	2014 —
7.	D.K. Ojha	Scientific Organizing Committee of the workshop on “Current trends in Near Infrared Astronomy in India”	Chairperson	Nov 2014
8.	S. Bhattacharyya	ASTROSAT Science Working Group	Member	2011 —
9.	S. Bhattacharyya	SKA India Consortium	Member	2015 —
10.	S. Bhattacharyya	Indian team for ISRO-CNSA cooperation	Member	2015 —
11.	S. Bhattacharyya	Science Working Group of Astronomical Society of India	Member	2011 – 2013
12.	S. K. Ghosh	ARIES Governing Council	Member	2011 —
13.	T. P. Singh	7th International Conf. on gravitation and cosmology, Goa	Chair, LOC	Dec 2011
14.	T. P. Singh	8th International Conf. on gravitation and cosmology, IISER Mohali	Member, ScOC	Dec 2015
15.	M. N. Vahia	Indian National Astronomy Olympiad Programme	National Coordinator	2012 – 13
16.	K. P. Singh	NCRA Management Board, Pune	Member	2012 – 15
17.	K. P. Singh	TIFR Balloon Facility Management Board	Member	2012 – 15
18.	K. P. Singh	JNU-IUCAA Academic Committee (JIAC), Pune	Member	2012 – 13
19.	M. N. Vahia	Indian Junior Science Olympiad Programme	National Coordinator	2011
20.	M. N. Vahia	NCSM, Executive Committee for Western Region	Member	2012 – 13
21.	M. N. Vahia	Planning & programme Committee of Nehru Science Centre	Chairman	2012 – 13

22.	P. S. Joshi	Indian Association of General Relativity and Gravitation	President	2010 – 12
23.	P. S. Joshi	Scientific Organizing committee, ICGC, Goa	Member	2011
24.	B. Mookerjea	Scientific Organizing Committee of Astronomical Society of India	Member	2013 – 16
25.	B. Mookerjea	GMRT Time Allocation Committee	Member	2012 – 15
26.	H. M. Antia	NCRA Management Board, Pune	Member	2013 –
27.	A. Ray	SKA India Science Working Group on Transients	Member	2014-
28.	A. Ray	SKA India Science Working Group on Pulsars	Member	2014-

(b) International Committees :

	Name of the Faculty Member	Name of the Committee	Role in the Committee	Term of Service
1.	D.K. Ojha B. Mookerjea M. Puravankara S. Bhattacharyya D. Narasimha A. Gopakumar	TMT International Science Development Team (ISDT)	Member	2014 –
2.	S. Bhattacharyya	Science Working Group of the future European X-ray space mission Athena	Member	2015 –
3.	H. M. Antia	National Committee of International Astronomical Union	Chair	2012 – 2015
4.	M. N. Vahia	Coordination Committee, International Earth Science Olympiad, Mangalore	Member	Sep 2013
5.	K. P. Singh	Organising Committee of Division D, Commission 44 (Space and High Energy Astrophysics) of IAU	Member	2012 – 13
6.	M. N. Vahia	Executive Committee of the International Conference on Oriental Astronomy	Member	2012 – 13
7.	M. N. Vahia	International Astronomy Olympiad Kyrgyzstan	Observer	2014 – 15

8.	M. N. Vahia	Scientific Organising Committee of the Asian Records of Eclipses in Asia, Astronomical Observatory of Japan, Tokyo	Member	Aug 2014
9.	S. Hanasoge	Max Planck Partner Group Head	Group Head	2015 —
10.	S. Hanasoge	Centre for Space Sciences, New York University at Abu Dhabi	Co-PI	2015 —
11.	T. P. Singh	Silver Jubilee 7th International Conference on Gravitation and Cosmology, Goa	Chair, LOC	Dec 2011
12.	T. P. Singh	Management Committee of the European COST Action on Foundations of Quantum Mechanics	Member	2011
13.	A. Ray	IAU Symposium No. 296: "Supernova Environmental Impacts", Raichak, W.B. India	Chair SOC	2013
14.	A. Ray	IAU Symposium No. 331: "SN 1987A, 30 years later", La Reunion Island, France, Feb 2017	Co-Chair SOC	2015-2017

(c) Editorial Boards :

	Name of the Faculty Member	Name of the Journal	Impact Factor	Term of Service
1.	S. Bhattacharyya	Journal ISRN Astronomy & Astrophysics	4.47	2012 —
2.	K. P. Singh	Journal of Astronomy and Astrophysics	4.47	2012 —
3.	S. K. Ghosh	Journal of Astronomy and Astrophysics	4.47	2012 —

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

As all TIFR 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%) TIFR students are required to do two Departmental Projects, viz. Departmental Project I and Departmental Project II (see Item 8 above).

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

Almost all TIFR faculty and laboratories have collaborations with scientists in India and abroad. Students of these faculty members and laboratories participate in these projects. Thus the percentage of students involved in such projects may be 95% or more.

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

(a) National Awards

	Awardee	Details of the Award/Honour	Year
1.	Devendra K. Ojha	Fellow, Indian Academy of Sciences, Bengaluru	2015
2.	Devendra K. Ojha	Fellow, National Academy of Sciences, Allahabad	2015
3.	Pankaj S.Joshi	Sandipani Gaurav Award, Sandipani Sanskruti Pratishtan, Porbandar	2013
4.	Shravan M. Hanasoge	Ramanujan Fellowship, DST	2013
5.	Pankaj S.Joshi	Prof A.C. Banerjee Memorial Award, National Academy of Sciences, India	2013

	Awardee	Details of the Award/Honour	Year
6.	Pankaj S.Joshi	Fellow, Indian National Science Academy, New Delhi	2012
7.	Pankaj S.Joshi	The Vaidya-Raychaudhuri Endowment Award, Indian Association of General Relativity and Gravitation	2012
8.	A.R. Rao	Fellow, Indian Academy of Sciences	2011
9.	Pankaj S.Joshi	Umang Foundation Award, Bharatiya Vidya Bhavan, Mumbai	2011
10.	Swarna K. Ghosh	Fellow, Indian National Science Academy, New Delhi	2010
11.	Pankaj S.Joshi	President, Indian Association of General Relativity and Gravitation	2010
12.	H. M. Antia	Fellow, Indian National Science Academy, New Delhi	2008
13.	K. P. Singh	Fellow, National Academy of Science, Allahabad	2006
14.	Swarna K. Ghosh	Fellow, Indian Academy of Sciences, Bengaluru	2006
15.	K. P. Singh	Award for Space Sciences & Applications Astronautical Society of India	2004
16.	K. P. Singh	Fellow, Indian Academy of Sciences, Bengaluru	2000
17.	H. M. Antia	Fellow, Indian Academy of Sciences, Bengaluru	1999
18.	H. M. Antia	Hari Om Ashram prerit Vikram Sarabhai award in Space Sciences	1999
19.	A. R. Rao	Hari Om Ashram prerit Vikram Sarabhai Research Award for Space Sciences	1997
20.	D. Narasimha	BOYSCAST Fellow, DST	1989

(b) International Awards

	Awardee	Details of the Award/Honour	Year
1.	Alak K. Ray	Fulbright-Nehru Academic Professional Excellence Fellowship, Indo-US	2015
2.	T.P.Singh	FQXi Essay Contest Fourth prize	2011
3.	T.P.Singh	FQXi Essay Contest Fourth prize	2012
4.	T.P.Singh	FQXi Essay Contest Second prize	2013

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

(a) National Awards

	Awardee	Name of the Award/Honour	Year
1.	Poonam Chandra	Swarna Jayanti Fellowship of the Dept. of Science & Technology	2014
2.	Sayan Chakraborti	Indian National Science Academy Young Scientist Medal	2014
3.	Naveen Yadav	Shyama Prosad Mukherjee Fellowship of CSIR (PreDoctoral)	2013

(b) International Awards

	Awardee	Name of the Award/Honour	Year
1.	Sayan Chakraborti	Dr. Pliny A. & Margaret H. Price Prize in Cosmology & AstroParticle Physics, CCAPP, Ohio State Univ., USA	2011
2.	Sayan Chakraborti	Junior Fellowship, Harvard Society of Fellows and ITC Fellow, Harvard University, USA	2012-2016
3.	Poonam Chandra	Young Scientists Prize of the International Union of Pure & Applied Physics (IUPAP Commission on Astronomy)	2010

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

	Dates	Name	Funding	Faculty organisers
1.	Dec 14 - 19, 2011	7th International Conference on Gravitation and Cosmology	TIFR	T. P. Singh
2.	Dec 10 - 17, 2012	Winter School on Astronomical and Cosmological Surveys	TIFR	B. Mookerjea S.Bhattacharyya
3.	Jan 07 - 11, 2013	IAUS 296: Supernova environmental impacts	IAU, INSA, TIFR, IIA	A. K. Ray (Co-Chair, SOC)
4.	Sep 05 - 07, 2013	Accretion onto Black Holes	TIFR	A. R. Rao
5.	Sep 24 - 26, 2014	Conference on Hard X-ray Astronomy: Astrosat and Beyond	TIFR	A. R. Rao

	Dates	Name	Funding	Faculty organisers
6.	Nov 3 - 7, 2014	Winter School on Solar and Stellar Astrophysics	TIFR	S. Hanasoge
7.	Nov 25 - 27, 2014	Workshop on "Current trends in Near Infrared Astronomy in India"	TIFR	D. K. Ojha
8.	Dec 15 - 17, 2014	Science with LAXPC/ASTROSAT	TIFR	J. S. Yadav
9.	Mar 28, 2015	Second Mumbai Area Physics Meet	TIFR	D. Narasimha
10.	Dec 7 - 11, 2015	Advances In Seismology: A Dialogue Across Disciplines	TIFR	S. Hanasoge/ H. M. Antia

31. Code of ethics for research followed by the departments

DAA follows the TIFR code of ethics (see annexure B2-B)

32. Student profile programme-wise:

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

Programme	Applications received #	Selected		Joined		Pass Percentage*	
		Male	Female	Male	Female	Male	Female
Ph.D.	21,370	25	4	8	3	100	100
Int.M.Sc.- Ph.D.		18	3	14	0	100	-
Total		43	7	22	3		

Applications include numbers for of all 5 Physics departments, viz. DAA, DCMP&MS, DHEP, DNAP and DTP.

33. Diversity of students

(a) geographical

Students	Ph.D.		Int.-Ph.D.		M.Sc.		Total
	Male	Female	Male	Female	Male	Female	
From the state where the	2	—	—	—	—	—	2
From other states of India	6	2	7	2	—	—	17
NRI students	—	—	—	—	—	—	—
Foreign students	—	—	—	—	—	—	—
Total	8	2	7	2	—	—	19

(b) undergraduate institution

Students from	Ph.D.		Int.-Ph.D.		M.Sc.		Total
	Male	Female	Male	Female	Male	Female	
Indian Universities	2	1	6	2	—	—	11
Premier science institutions †	1	—	—	—	—	—	1
Premier professional institutions #	5	1	—	—	—	—	6
Others*	—	—	1	—	—	—	1
Foreign Universities	—	—	—	—	—	—	0
Total	8	2	7	2	—	—	19

† 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
1.	NET	9
2.	GATE	8
3.	JEST	5
4.	Others	6

35. Student progression

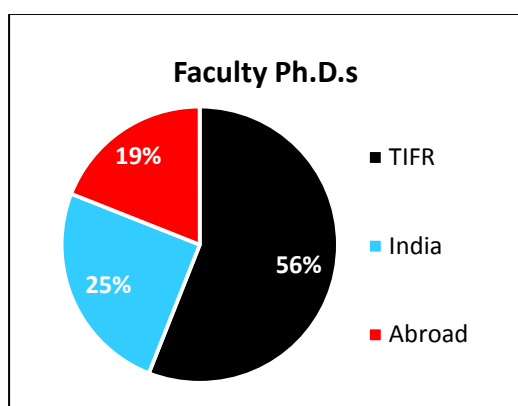
- Ph.D. programme : Most of the students admitted to the DAA go on to complete the course work and get their Ph.D.s. Once in a while (less than one per year), a student may opt out of the programme, for various reasons. Normally, after completing their Ph.D., students have to leave TIFR. The vast majority go elsewhere for postdoctoral research. A small number (< 10%) go for other

employment, such as teaching positions or industry.

- Integrated M.Sc.-Ph.D. programme : Most of the students admitted to the DAA go on to complete the course work and get their M.Sc.'s and Ph.D.s. Once in a while (less than one per year), a student may opt out of the programme, for various reasons. Normally, after completing their Ph.D., students have to leave TIFR. The vast majority go elsewhere for postdoctoral research. A small number (< 10%) go for other employment, such as teaching positions or industry

36. Diversity of staff

Number of faculty who are Ph.D.'s	
from TIFR :	9
from other institutions in India :	4
from institutions Abroad:	3
Total :	16



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

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

38. Present details of departmental infrastructural facilities with regard to

a) Library

DAA, like other Departments of TIFR in the Colaba campus, makes use of the TIFR Library and Scientific Information Resource Centre (SIRC) (see Section B2, Item no 4.2)

b) Internet facilities for staff and students

DAA, like other Departments of TIFR in the Colaba campus, makes use of the

TIFR Computer Centre and Communication Facility (see Section B2, Item no 4.3)

c) Total number of class rooms

DAA, like other Departments of TIFR in the Colaba campus, makes use of the common class rooms and lecture theatres of TIFR (see Section B1, Item no 12)

d) Class rooms with ICT facility

All the classrooms above have ICT facilities like overhead projectors, Wi-Fi, etc. Video-conferencing possibilities are also available in most of the lecture rooms.

e) Students' laboratories

- For the compulsory Experimental Physics courses and for all the Projects, students have access to the well-equipped laboratories of DAA (see Item f) below)
- In addition students of both Ph.D. and Integrated-Ph.D. have one Teaching Laboratory which has specific experimental setups which are used during the coursework period.

f) Research laboratories

	Name of Laboratory	Fac[*]	PDF[†]	Stu[‡]	Brief description of research activity
1.	Infrared Astronomy	2	1	1	Development of ground- and space-based infrared instrumentation.
2.	X-ray LAXPC	2	1	-	Development of space-based X-ray instrumentation.
3.	X-ray CZT	1	1	2	Development of space-based X-ray instrumentation.
4.	X-ray SXT	1	1	-	Development of space-based X-ray instrumentation.

5.	TIFR National Balloon Facility, Hyderabad	0	0	0	TIFR National Balloon Facility in Hyderabad is one of the major balloon facilities in the world which provides a complete solution in scientific ballooning. It is also one of its kind in the world since it combines both, in-house balloon production and complete flight support for scientific ballooning. The facility has been used by National and International groups for conducting balloon flights in the area of Astronomy, Astrobiology and Atmospheric sciences.
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* 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		Post-doctoral fellows	
1.	Joe P. Ninan	1.	Maria Haney
2.	Kuldeep Verma	2.	Tapas Baug
3.	Vikas Chand	3.	Jun-Qi Guo
4.	Dattaraj Bhalchandra Dhuri	4.	Sunil Chandra
5.	Prashant Kocherlakota	5.	Suman Ghosh
6.	Santanu Dey	6.	Chandrachur Chakraborty
7.	Sayan Mandal	7.	Shabnam I. Syamsunder
8.	Jishnu Bhattacharya	8.	Blesson Mathew
9.	Sayantani Bera		
10.	Shreya Banerjee	JRFs	
11.	Debdutta Paul	1.	Jai V. Chauhan
12.	Krishnendu Mandal	2.	Yash D. Bhargava
13.	Siddhesh Chandrakant Ambhire		
14.	Srimanta Banerjee	SRFs	
15.	Sudip Chakraborty	1.	Vinita Navalkar
16.	Lankeswar Dey		

17.	Mayank Narang		
18.	Abhimanyu S		
19.	Srishti Tiwari		

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

ALL the students of DAA (13) are in doctoral programmes, and hence they are all given TIFR fellowships.

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

DAA, and TIFR as a whole, has been training students for Ph.D. since its inception in 1945. During the 1990's, a need was felt for a special programme to allow exceptionally bright students an early entry into research, i.e. directly after their B.Sc.'s. This was felt on the basis of the Institute's well-established VSRP programme (see Item 48 below), where it was seen that many of the best students were already prepared for graduate school, even though they were only half-way through their M.Sc. programmes. It was therefore, decided to admit some exceptionally bright B.Sc. students directly to the Ph.D. programme, teach them the basic M.Sc. courses in a period of one year, and then permit them to do advanced electives and project work similar to M.Sc.'s. Based on the success of this move, the Integrated M.Sc.-Ph.D. programme, was formally started in 2012.

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?

The Subject Board of Physics includes a Course Coordinator, who is constantly in touch with the Instructors of different courses, and collects their feedback at regular intervals. This is used to (a) advise the Instructors, (b) update the Syllabus, and (c) fine-tune the curriculum.

In 2012, an exercise was carried out, in which feedback was requested from all the Instructors of the previous 5 years. Based on their suggestions, the course curriculum was thoroughly revised and rejuvenated.

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

The Course Coordinator (see above) also collects anonymous feedback on every course from the students in a form specifically designed for this purpose. The relevant portions in this are communicated to the Instructors, for modification and rectification in their pedagogic styles. These feedback forms also form an important input in selecting a faculty for the Excellence in Teaching Award of the TIFR Alumni Association.

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

Currently no such feedback is collected on a formal basis.

43. List the distinguished alumni of the department

	Alumnus	Reason for Distinction
1.	J. V. Narlikar	Padma Vibhushan, Founder Director of IUCAA
2.	S. M. Chitre	Padma Bhushan, Professor Emeritus at CBS
3.	T. Padmanabhan	Padma Shri, Distinguished Professor at IUCAA
4.	P. C. Agrawal	Distinguished Guest Faculty at CBS; Principal Investigator of ASTROSAT
5.	A. K. Kembhavi	Former Director, IUCAA; Vice-President, Executive Committee of IAU Member, Space Commission

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

As Item No 30 shows, the DAA regularly conducts conferences etc. which are attended by all the doctoral students, and these provide the required

introduction to the state of the art in the subjects of their research. In addition, TIFR has a vibrant programme of seminars, colloquia and public lectures which the students are encouraged to attend and absorb as much information as they can.

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

The DAA generally adopts the conventional blackboard teaching methods. Often slides are shown to illustrate experimental or numerical facts. For project work, students are required to work hands-on in a laboratory.

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

The DAA Chairperson and another member of the DAA faculty are members of the Subject Board of Physics, which constantly monitors the progress of the students and obtains feedback from faculty and students alike.

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

DAA faculty, postdocs and students regularly participate in the Outreach Activities of TIFR.

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

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

- DAA Seminar
- NSF Colloquium
- VSRP Programme

49. State whether the programme/ department is accredited/ graded by other agencies? If yes, give details.

The Academic performance of DAA was reviewed by a panel of international experts in 2009, set up by the Governing Council of TIFR. In addition, a Review Committee constituted by the UGC, visited TIFR during February 2010, and commented that the deemed to be university status of TIFR offers a unique

multidisciplinary environment for carrying out research. The present composition of the faculty members and research facilities at DCS are equally well placed to meet the above description.

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied.
- AstroSat, India's first dedicated astronomy satellite, was launched on 2015 September 28. It was the 30th successful launch of India's work-horse rocket, Polar Satellite Launch Vehicle. The satellite was precisely placed at the desired near Earth orbit of 650 km, thus saving the onboard fuel meant for orbit correction to any future eventualities and ensuring a very long orbital life for the satellite. AstroSat, weighing 1550 kg, carried a suite of scientific instruments for multi-wavelength astronomical observations. Within six months of operation, the Performance Verification phase has been completed and a very complex satellite like AstroSat is working flawlessly and as planned. Three of the five major payloads of AstroSat, viz., Large area X-ray Proportional Counter, Soft X-ray Telescope, and Cadmium Zinc Telluride Imager, were built by the dedicated leadership of TIFR scientists.
 - State-of-the-art instrumentation for use with the Indian telescopes to study the formation of stars in our Galaxy as well as in other galaxies. Role of grains, outflows and accretion in understanding the mechanisms by which planetary systems form around young stars.
 - Helio- and asteroseismology : Stellar seismology is a science that studies the internal structure of pulsating stars by interpreting the oscillation frequencies observed on their surface. TIFR Group is pioneer in the study of pulsation of the Sun and stars with more than 4 decades of experience. The group at TIFR, tries to understand the properties of solar and stellar interior using the observations made by the Solar Dynamics Observatory and the Kepler spacecraft. Well established theory is used and computational techniques developed to reliably interpret the high quality measurements from the space missions. The Sun –

being the closest star – serves as a perfect laboratory to test our understanding of the stellar physics. The group has been working on the 3-dimensional imaging of the Sun through the observations of the seismic waves on its surface; particularly, they are developing a self-consistent physical understanding of complex and transient features such as flows, magnetic fields, and their interaction with waves. Recent results from the group have cast doubts on conventional methods of imaging the flows in the Sun, and they are exploring more reliable analysis techniques. Along a slightly different line, the group tries to understand the bigger picture of stellar evolution by studying the fundamental properties of ensemble of stars. They have recently demonstrated that the Helium abundance in the envelope of sun-like stars can be estimated using the observed low-degree oscillation frequencies, which cannot be determined using spectroscopic techniques. Such measurements of envelope Helium abundance can potentially constrain the models of atomic diffusion and galactic chemical evolution.

- An experiment was proposed for detecting the anomalous Brownian motion predicted by those stochastic modifications of the Schrodinger equation which solve the quantum measurement problem. An influential review was published in *Reviews of Modern Physics* on 'Models of wave-function collapse, underlying theories, and their experimental tests'.
- Gravitational lensing is the bending and distortion of a beam of photons from a distance source by the gravitational pull of an intervening mass. This is a famous prediction of General Relativity. Multiple images of identical intrinsic properties, independent of wavelength and time delay in observation of intrinsic variability in the source are the main signatures of lensing, which make it a powerful observational technique. All matter, luminous and dark, are effective in lensing. Hence, in the Universe where less than five percent of matter is of known nature, lensing becomes a reliable probe of the structures and large scale geometry of Universe. TIFR are pioneers in Computational modeling of multiply imaged lens systems. One of the earliest lens code was developed from scratch, which had fair success in predicting unseen lenses as well as phenomena like Einstein Ring. Right now two basic questions being addressed are (1) Important theoretical concepts in General Relativity like Cosmic Censorship are being tested through Relativistic

lensing. (2) technique is being developed to study microlensing due to binary black holes, which is not exhibited by usual binary star lensing.

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

Strengths

- In the DAA the observational and theoretical astronomy is doing well in comparison with other astronomical institutes within India (most of which are dedicated astronomical institutes).
- Many members of DAA are recognized to be the experts in their respective fields.
- The experimental and instrumentation areas have done extremely well as is proved by the major instruments onboard ASTROSAT as well as the ground-based infrared instruments in use in various Indian observatories.
- Research on wide areas of astronomy such as solar & stellar seismology, interstellar medium & star formation, astrochemistry, compact binaries & gravitational waves, stellar coronae & cataclysmic variables, supernovae and pulsars, active galactic nuclei & clusters of galaxies, general relativity & quantum gravity and black holes & neutron stars has resulted in competitive science and many publications in refereed journals.

Weaknesses

- The vibrant atmosphere of a department is often created by a healthy number of students and DAA is currently suffering badly on this count. Lack of students in the different experimental and observational projects has proven to be a major problem.
- Students joining DAA through the TIFR graduate admission exams are often found to not be interested in even receiving any information on the experimental/observational activities.

Opportunities

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- Participation in the science and instrumentation efforts of upcoming large international projects like Thirty Meter Telescope (TMT), Square Kilometre Array (SKA) and hopefully Laser Interferometer Gravitational-Wave Observatory (LIGO-India) are some of the programs in which the department is strongly investing its resources to strengthen the core science areas for the same.
 - DAA needs to have access to guaranteed observation time in international optical/near-infrared facilities with capabilities suited to match the preparatory needs for the above mentioned large projects.
 - With ISRO providing many opportunities for small and large astronomical payloads to be launched over the next few years, the department may take a leading role in planning and executing of competitive proposals for new space missions.

Challenges

- Due to the limited campus accommodation, DAA is not able to attract good postdoc applicants which is an issue that affects the entire institute. The institute should work towards resolving this problem which comes in the way attracting bright postdoc candidates.
- After the launch of ASTROSAT there is a danger of experimental and instrumentation expertise being lost due to lack of young academics who can carry forward these programs to the next level. This will require inductions of few academics in the field of astronomical instrumentation.
- DAA's training and research facilities and capabilities should be made more attractive to students and postdocs, if necessary through special positions recruited through our international collaborations and multinational agreements. There should be more mobility of students and postdocs between apex institutions of astrophysics elsewhere in the world through formal agreements and appropriate funding.

52. Future plans of the department

The research programs in the Department of Astronomy & Astrophysics (DAA)

address formation, physics and evolution of a vast range of astronomical objects starting from the Sun, the stars, compact objects (black holes & neutron stars), the matter between the stars, the galaxies, to the distant galaxy clusters. The DAA also carries out research in general relativity, cosmology and quantum gravity. In future the DAA will consolidate the existing fields and expand into new areas of astrophysics.

The DAA also emphasizes on the building of astronomy instruments, performing observations and formulation of theoretical and computational models to explain the outcome of observations of astronomical objects. The DAA has built instruments onboard the first Indian multi-wavelength astronomy satellite ASTROSAT and are leading multiple scientific projects with the ASTROSAT.

The DAA also has vibrant science and instrumentation collaborations on the upcoming projects on the Thirty Meter Telescope (TMT), the 3.6-meter Devasthal Optical Telescope (DOT), the Square Kilometer Array (SKA) and the Laser Interferometer Gravitational-Wave Observatory (LIGO). In future the DAA will consolidate and expand TIFR's niche in Instrumentation for Astronomy (X-ray and Infrared) and will also participate in national and international large projects (e.g. SKA, LIGO, TMT, DOT).